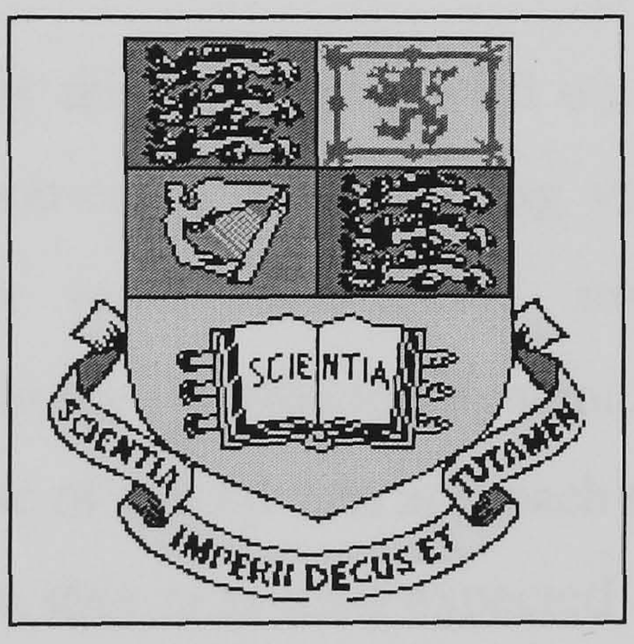
RESIDUAL INCOME INFORMATION DYNAMICS AND EQUITY VALUATION: A STUDY USING UK DATA

By

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Abstract

This research examines the role of residual income (*RI*) in equity valuation, focusing on the residual income linear information dynamics (LID) and the residual income valuation model (RIVM) of Ohlson and Feltham's framework (OFF). This study uses accounting information for estimating a prediction model, identifying which of these accounting variables are significant in the prediction model and which variables are relevant for valuing the equity of firms.

This research extends previous studies by using a different modeling technique and dataset. Using a large dataset of firms in the London Stock Exchange (LSE) over 12 years from 1990 to 2001, this study investigates the pool and cross-sectional properties of accounting data consisting of residual income, book values, and a comprehensive set of non-earnings accounting variables (CSV). The CSV considered are based on the theoretical justifications of the OFF and GAAP, and from previous empirical studies which suggest that these variables might be relevant in predicting future financial performance of firms and in equity valuation.

The empirical testing for this study is carried out in two steps. Firstly, past and current residual income and non-earnings accounting variables are used to estimate a cross-sectional/pool prediction model for future residual. Secondly, statistically significant variables identified in the information dynamics are then used as fundamental variables to explain market value of equity. The approach taken here is consistent with the OFF in which variables that are able to predict expected residual income are also value-relevant. Previous research has used linear information dynamics to theoretically motivate empirical estimation of equity valuation models, but little research has investigated the relationship between empirically estimated linear information models and estimated equity valuation models. The contribution of this research is to provide UK evidence on both the usefulness of a range of accounting data as predictors of future residual income and their value-relevance as explanatory variables for security prices (market values).

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磨杵成针　Mo Chu Cheng Zhen

Perseverance and hard work can assure success

Thesis of

钟贵强

Choong Kwee Keong

NOMENCLATURE

Note that abbreviations in *italics* indicate variables.

ASRB/AASB	Australian Standard Review/Accounting Standard Board
AD	Advertising (expenditures)
AIC	Akaike Information Criterion
AICPA	American Institute of Certified Public Accountants
AMEX	American Stock Exchange
AR	Autoregressive Process
ASB	Accounting Standards Board, UK
ASC	Accounting Standards Committee, UK
ASX	Australian Stock Exchange
B/M	Book-to-Market ratio, which is the inverse of M/B
BV (BVE)	Book Value (of Equity)
CAPM	Capital Asset Pricing Model
CAR (CER)	Cumulative Abnormal (Excess) Earnings
CF (CFO)	Cash Flows (from Operations)
CI	Capital Investments
CML	Capital Market Line
CMRA	Capital Market Research in Accounting
CMH	Coherent Market Hypothesis
CSR	Clean Surplus Relation
DC	Distribution Costs
DCF	Discounted Cash Flow
DDM	Dividend Discounting Model
Dep	Accounting Depreciation
DIV	Ordinary Dividends
DSRDS	DataStream Relational Database System
DSSAS	DataStream Spreadsheet Automation System
DSW	DataStream Windows (V2, 2002)
EBO	Edwards-Bell-Ohlson Model
ECM	Earnings Capitalization Model
EDBV	Equations Deflated by closing Book Values
EDMV	Equations Deflated by closing Market Values
EDMV-N (EDMV-I)	Equations Deflated by opening Market Values with No Intercept (with Intercept)
EDMVs	EDMV, EDMV-N, EDMV-I
EMH	Efficient Market Hypothesis
EPS	Earnings-per-share
ERC	Earnings Response Coefficient
EVA ®	Economic-Value-Added
EVAS	Econometric View Automation System
FA	Financial Assets
FASB	Financial Accounting Standard Board, US
FCF (FCFM)	Free Cash Flows (Model)
FIBV	International Federation of Stock Exchanges
GAAP	General Accepted Accounting Practice
GPFR	General Purpose Financial Reporting
HR	Human Resource (costs)
HRM	Human Resource Management

NOMENCLATURE

HKC	Hong Kong, China
HKCPA	Hong Kong Institute of Certified Public Accountants
HKSARC	Hong Kong, Special Administrative Region of China
HKSE	Hong Kong Stock Exchange
IA	Intangible Assets
IASB	International Accounting Standard (Board)
ICAEW	Institute of Chartered Accountants in England and Wales
ISO	International Standards Organization, Switzerland
JB	Jarque-Bera statistic
LID (LIM)	Linear Information Dynamics (Models)
LSE	London Stock Exchange
MAFE	Mean Absolute Forecast Error
M/B or B/M	Market-to-Book value ratio
MBAR	Market-Based Accounting Research
M&M	Modigliani and Miller (1958), and Miller and Modigliani (1961)
MSFE	Mean Square Forecast Error
MV (MVE)	Market Value (of Equity)
NI	Net Income (Earnings)
NPV (+NPV projects)	Net Present Value (Positive NPV projects)
NYSE	New York Stock Exchange
OA	Operating Assets
OED	Operating Abnormal Earnings Linear Dynamics
OFA	Operating Financial Assets
OFF	Ohlson-Feltham Framework. This includes the papers of Ohlson (1995), and Feltham and Ohlson (1995, 1996).
ORI	Operating Residual Income or Operating abnormal earnings
Prop-LID	The Proposed Linear Information Dynamics Model
Prop-VM	The Proposed Market Value Model
PV	Present Value
PVED	Present Value of Expected Dividends
r, r_E, r_W, r_R	Cost of capital (or generic discount rate), cost of equity capital, total cost of capital, risk-adjusted rate
RBT	Rational Bubble Theory
RD	Research and Development (expenditures)
RHS	Right-hand side
RI	Residual Income
RIVM	Residual Income Valuation Model
RSS	Residual Sum of Squares
SAC	Statement of Accounting Concepts, Australia
SBT	Speculative Bubble Theory
SEC	Securities and Exchange Commission, US
SFAC	Statement of Financial Accounting Concepts, US
SSAP	Statements of Standard Accounting Practices, UK
SSAPHK	Statements of Standard Accounting Practices, Hong Kong
TD	Total Debt
UG	Unrecorded Goodwill
VM	Valuation Model
WACC	Weighted-Average-Cost-of-Capital

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RESIDUAL INCOME INFORMATION DYNAMICS AND EQUITY VALUATION: A STUDY USING UK DATA

OVERVIEW OF THE RESEARCH 1

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CHAPTER 1
OVERVIEW OF THE RESEARCH

1.1. Introduction

The capital market facilitates the investment process by encouraging investors to allow the firm to retain its earnings and accumulate its capital without going through the expensive process of issuing capital (Rees, 1995). The World Development Indicators (World Bank, 1999, p. 277) states that financial market development is closely related to an economy's overall development, particularly in mature economies where specialized financial intermediaries and equity markets are well developed and the domination of commercial banks over the financial system declines. Table 1.1 lists the major equity markets of the world in terms of several leading indicators used by the International Federation of Stock Exchanges (FIBV):

1	2	3	4	5	6	7	8
#	Exchanges	Capitalization (US$b)	% Change (01/00)	Avg. Amt. Traded per day (000,000)	Number of Transactions per day (000)	No. Share Traded per day (000,000)	Number of Companies
1	New York	11,026,586	–2.8	42,295.7	339,104.8	307,509.3	2,400
2	NASDAQ	2,739,675	–14.2	44,091.0	602,956.4	471,509.3	4,063
3	Tokyo	2,264,528	2.1	6,750.1	NA	204,194.0	2,141
4	London	2,164.716	–1.8	17,986.2	32,668.0	901,527.4	2,332
5	Euronext *	1,843,529	–6.9	12,518.9	54,136.0	49,555.0	1,132
6	Deutsche	1,071,749	0.0	5,698.2	84,000.0	32,832.0	983
7	Toronto	611,493	–6.8	1,838.5	26,155.0	37,190.4	1,299
8	Italy	527,467	–1.0	9,004.3	44,265.0	140,247.7	294
9	Swiss	527,375	–1.0	2,379.7	9,530.0	1,775.9	412
10	Hong Kong, China	506,375	9.7	991.8	24,124.0	1,532,367.0	867
11	Australia	405,981	0.3	964.8	13,269.0	135,244.0	1,410
12	Shanghai, China	387,515	14.9	515.8	397.8	441,000.2	732

Table 1.1 – Major Securities Exchanges of the World at December 2001 (Source: FIBV, http://www.world-exchanges.org, October, 2002)

Legend:

- 3 Excludes investment funds, rights, warrants, convertibles, foreign companies and includes common and preferred shares, shares without voting rights, otherwise stated.
- 4 Percentage Annual increase/decrease in Capitalization (2000 to 2001)
- 6 The sale and purchase of a share are counted as one transaction.
- 8 Total number of companies listed, domestic and foreign.

* Consists of Paris, Brussels and Amsterdam

The economy of some countries depends heavily on the securities market as shown by its total capitalization value exceeding the country's Gross Domestic Products (GDP):

#	Country	GDP (US$b)	Market value (MV)	$\frac{MV}{GDP}$ (%)
1	Hong Kong, China	162.6	623.4	383.4
2	Switzerland	241.2	792.3	328.4
3	Finland	121.3	293.6	242.1
4	United Kingdom	1,417.6	2,612.2	184.3
5	Luxembourg	19.0	34.0	179.0
6	Netherlands	369.1	640.5	173.5
7	Singapore*	92.3	155.1	168.2
8	United States	9,963.1	15,214.6	152.7
9	Sweden	227.3	328.3	144.5
10	Malaysia	89.3	113.2	126.7
11	France	1,294.8	1,446.6	111.7
12	Malta	3.6	4.0	111.5
13	Canada	711.1	770.1	108.3
14	South Africa	125.9	131.3	104.3
15	Australia	381.8	372.8	97.7

Table 1.2 – Stock Markets' Importance in the National Economy at December, 2001 (Source: International Federation of Stock Exchanges, http://www.world-exchanges.org, October, 2002) * based on Capitalization and Capital raised

Understanding the market is necessary to the investors because to maximize the shareholders' wealth, they must be able to identify mispriced securities in the market because empirical evidence shows that information can alter investors' beliefs about the attributes of the market, such as security prices (Beaver, 1998, p. 69). Relating security prices and information is a central feature of the capital markets because market efficiency deals with how information in general is processed and how information from financial reporting is incorporated into prices (p. 125). Market efficiency has important implications for the accounting profession because the choice of accounting methods or disclosures without a direct cash flow effect, a signalling effect or incentive consequences does not affect security prices in an efficient market (Kothari, 2001, p. 110).

Most empirical researchers on the capital market assume the market is efficient (eg Ball and Brown, 1968; Aharony and Swary, 1980; Summers, 1986) and early evidence tends to support the notion that the market is largely informationally efficient, but recent evidence of anomalies and long-term abnormal earnings suggests that the market is inefficient. Consequently, market efficiency, particularly the Efficient Market Hypothesis

(EMH) has not been an accepted 'theory' to many people, especially management, speculators, irrational traders and those working in financial institutions, such as financial analysts. The popularity of the EMH as a sound theoretical framework supported by empirical evidence crashed on 19th. October 1987 when security prices plummeted in many major markets, such as the New York, Sydney, Hong Kong Special Administrative Region of China (HKSARC)[1], Singapore and London.

The mounting evidence of market inefficiency has created an entirely new area of research examining long-horizon movement in share prices in relation to company performance (Kothari, 2001). This has fuelled accounting researchers' interests in **fundamental analysis**, **accounting-based valuation**, **value-relevance reporting and tests of market efficiency** (p. 107). Since there is no formal theory of market inefficiency, Kothari advocates a need for a more structured theory to test for market inefficiency and expects research in accounting on issues surrounding market efficiency, fundamental analysis, and valuation to continue. Despite the controversies surrounding the EMH, and especially none of the alternative theories has dispelled the theory of market efficiency, the EMH is still regarded as an important and useful concept for the capital market, and thus, most research in accounting on matters relating to the capital market still assume market efficiency.

Traditionally, accrual accounting information is considered to be the main source of information used for evaluating security prices and firms' performance because the major accounting standard setters consider it to be a superior measure used in making rational investment decisions, however, empirical research concerned with modeling the relations between share returns with accounting information (usually earnings), commonly referred to as **Market-based Accounting Research (MBAR)** that spawned a period of thirty-five years following the seminar work of Ball and Brown (1968); and Beaver (1968) shows that annual earnings is only one source of accounting information that affects security prices, but it is not timely information, and are pre-empted by alternative, more timely sources (see Beaver, 1998). Many believe that there are good reasons for expecting both earnings and cash flow data to be useful in the assessment of corporate financial performance, ie by improving the explanatory power in explaining returns (eg Rayburn, 1986; Bowen et al., 1986, 1987; Livnat and Zarowin, 1990; Clubb, 1995; and Charitou and Clubb, 1999).

[1] It is sometimes referred to as Hong Kong, China or HKC for short.

Other common problems of financial information cited are: (1) inadequate to meet a diverse groups of users; (2) subject to manipulation by management (eg collapse of Enron Corp. in December 2001); (3) auditor reports are increasingly questionable (eg demise of Arthur Andersons); and (4) erosion of ethical practices in the market. With these confounding problems, the usefulness of accounting information in meeting the needs of investors and creditors has been questioned from many quarters in recent years, notably in the US and more recently in UK, Australia and even New Zealand.

To enhance traditional financial reporting, academics and policymakers have suggested that financial statement users be provided with financial and nonfinancial timely performance information that are contemporaneously associated with financial variables, and may enhance users' ability to evaluate and predict financial performance, because they felt that corporate financial reporting and disclosure are not keeping pace with a dynamic changing business world (eg Lev and Zarowin, 1999). Unfortunately, the main difficulty here is what constitutes useful information since there is very little guidance, theoretically or empirical, on the usefulness of nonaccounting information to market participants.

Nevertheless, investigations into the usefulness of nonaccounting performance measures have been carried out, some of which have found value-relevance, for example the use of fundamental analysis using a Wall Street Journal weekly column, Management Discussion and Analysis (MDA) information, firm reputation, intangibles, and high-growth, industry-specific industry, such as the cellular and the US airline industries. More recently, there are attempts to theorize the relationship between security prices and other information as one of the explanatory variables, such as the Residual Income Valuation Models (RIVM) of Ohlson (1989a, 1989b, 1990, 1991, 1995); and Feltham and Ohlson (1995, 1996). Collectively, these models by Ohlson and Feltham are known as the **Ohlson-Feltham Framework (OFF)** in this thesis. Penman (1992a)[2]; Bernard (1995); and Walker (1997) consider the OFF provides a powerful argument for a change of emphasis away from excessive attention on the return approach to the fundamental measurement perspective. Following the models by Ohlson and Feltham, a surge of both theoretical studies (eg Clubb, 1996; Frankel and Lee, 1998; Lo and Lys, 2000a; Lundholm and O'Keefe, 2001) and empirical studies (eg Hand and Landsman, 1999; Dechow et al., 1999; Myers, 1999; Ahmed et al., 2000) are carried out with interesting implications.

[2] Applies only to Ohlson (1989a, 1989b, 1990, 1991) models.

1.2. Capital Market Research in Accounting (CMRA)

Capital Markets Research in Accounting (CMRA) includes fundamental analysis, accounting-based valuation, value-relevance reporting, signalling hypotheses in the form of 'news' to the market, tests of market efficiency, returns-earnings studies using information content and event study methodology (MBAR), earnings response coefficient (ERC), properties of financial analysts' forecasts, and other studies examining market behaviour. Kothari (2001); Beaver (2002); and Dumontier and Raffournier (2002) provide insight into CMRA in the US and Europe. Beaver (2002) indicates that capital markets research is primary empirical, rather than theoretical.

Kothari (2001, p. 108) cites at least four sources of the demand for capital markets research in accounting that explain the rise in its popularity: (1) fundamental analysis and valuation; (2) tests of capital market efficiency; (3) role of accounting in contracts and in the political process; and (4) disclosure regulation. The CMRA topics of primary interest to researchers currently appear to be (1) tests of market efficiency with respect to accounting information, (2) fundamental analysis and accounting-based valuation; and (3) value-relevance of financial reporting. He notes that the growth in the popularity of accounting research in fundamental analysis, valuation and tests of market efficiency is motivated by mounting evidence of apparent market inefficiency.

Similarly, Beaver (2002, p. 453) considers five research areas that have made the greatest contribution to our knowledge over the past ten years: (1) market efficiency; (2) Feltham-Ohlson modelling; (3) Value-relevance; (4) Analysts' behaviour; and (4) Discretionary behaviour. The first two areas are basic platforms that permit us to organize our thinking about the role of CMRA. Like Kothari, Beaver too considers that the capital markets are now largely inefficient

Dumontier and Raffournier (2002) in a review paper list three types of CMRA in Europe: (1) studies of the market reaction to the release of new accounting information in order to determine whether the disclosures of accounting information are useful to market participants; (2) studies of the long-term association between stock returns and accounting numbers, which examine the extent to which the information in accounting figures is consistent with that reflected in stock prices; and (3) complementary studies devoted to the use of accounting data by investors and to the influence of market considerations on

accounting choices. The last type of studies usually use qualitative or experiment study to analyse how investors perceive accounting data among a range of other sources of information. For example, Day (1986) uses a laboratory experiment to extract UK investment analysts' perceptions on the role of accounting data in relation to other information. The review also reports that fundamental analysis is widely used in Europe, particularly by professional analysts.

Overall, Kothari (2001); Beaver (2002); and Dumontier and Raffournier (2002) consider (1) market efficiency; (2) value-relevance of financial reporting; (3) accounting-based valuation and fundamental analysis; (4) event studies; (5) association studies; and (6) usefulness of accounting information as the most important areas of CMRA in the US and Europe. These six areas of CMRA can be further summarized into three areas. The value-relevance of accounting data, valuation models, market efficiency and fundamental analysis are intertwined, and hence they are grouped as market-based theoretical framework and valuation models. Event studies and association studies are information content studies and together with earnings response coefficient form part of MBAR. I will discuss the above developments in CMRA in chronological order as follows: (1) Market-based theoretical framework and valuation models; (2) MBAR; and (3) revival of valuation approach, focusing on the RIVM since they are essentials to my research.

1.2.1. Market-based Theoretical Framework and Valuation Models

According to Kothari (2001, p. 112); *"concurrent developments in economics and finance constituted the theoretical and methodological impetus to the early CMRA"*. In modelling the capital markets, researchers rely heavily on mathematics and econometric techniques. The theoretical framework for CMRA relies on the neo-classical economic theory in which the objective of a firm is to maximize shareholders' wealth which is identical to maximizing the present value of their lifetime consumption. In 1930, making use of the agency relationship between investors and management, Irving Fisher theorised that consumption and investment decisions are separate such that shareholders, as owners delegate investment decisions to management of the firm, and in return, management are obliged to maximize the owners' wealth by choosing to invest until the rate of return on the least favourable project is exactly equal to the market-determined rate of return. This is known as the Separation Theorem: Separation of Shareholder's Preferences from the Production/Investment Decision, which is depicted in Figure 1.1.

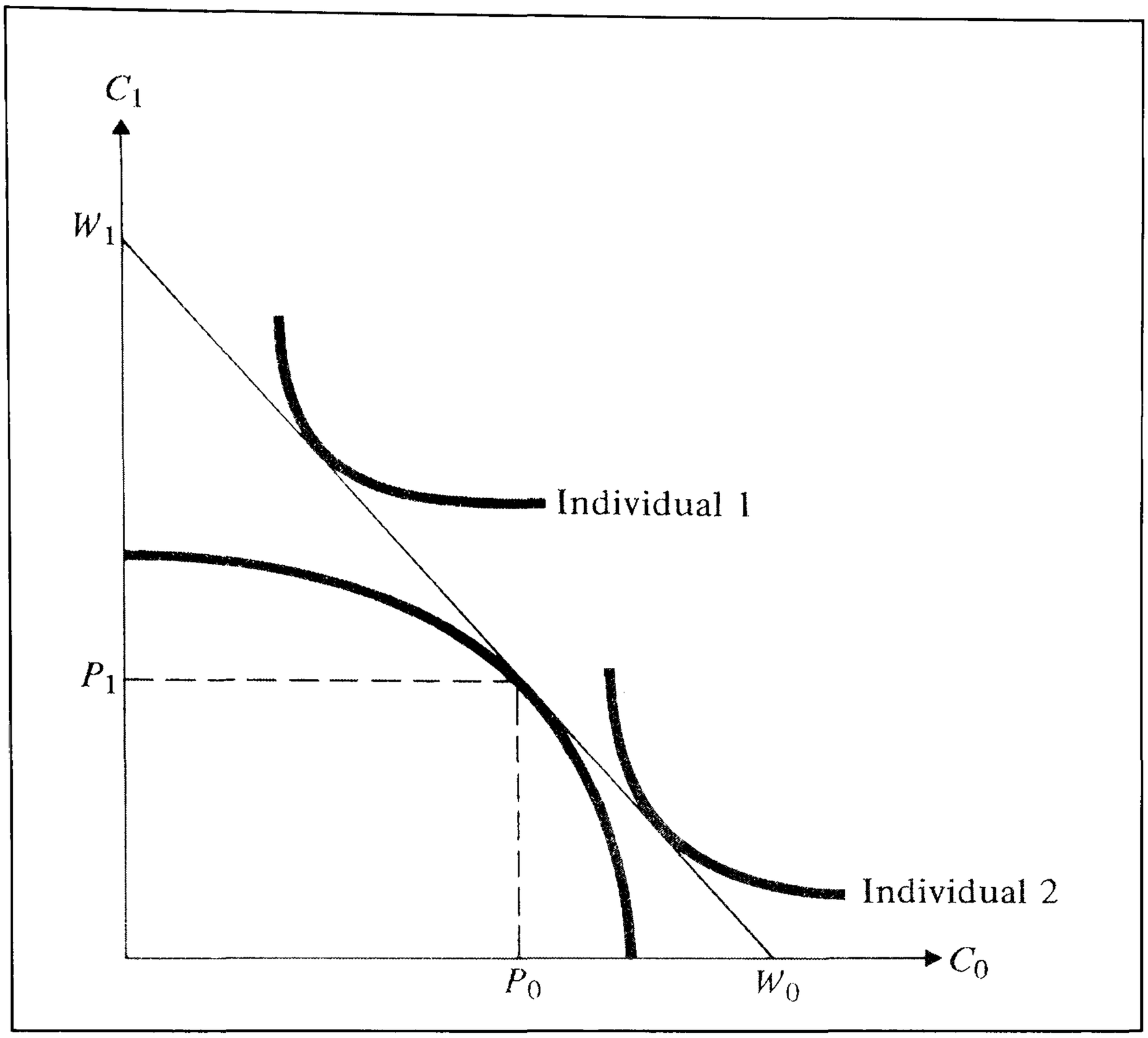


Figure 1.1 – Fisher's Separation Theorem – Separation of Shareholder's Preferences from the Production/Investment Decision (Source: Copeland and Weston, 1992, Figure 2.1, p. 19)

From this graph, the optimum investment (P_0, P_1) is the one that maximizes the present value of the shareholders' wealth (W_0). At this point, individual shareholders (ie individual 1 or 2) can borrow and lend along the capital market line (CML) in order to satisfy their time pattern for consumption. This implies that a **rational** individual according to one's preference can either take the cash payouts from the firm and use them for current consumption or save them for future consumption. Mathematically, the objective to maximize shareholders' wealth is identical to maximizing the present value of their lifetime consumption, thus:

$$W_0 = CS_0 + \frac{CS_1}{1+r} \tag{2.1}$$

where:

- W_0 = Maximization value of Shareholders' Wealth
- CS_0 = Consumption (Zero Investment)
- CS_1 = Consumption (Zero Consumption)
- r = Rate (market) of interest

The next important development in economic theory that has relevance in accounting and finance is the **concept of income** by Hicks (1946). He defines normal earnings as the "*opening economic value (ie the present value of future cash flows) at the beginning of the period multiplied by the interest rate*":

$$\boxed{X_t \equiv rV_{t-1} = C_t - Dep_t = V_t + C_t - V_{t-1}} \qquad (2.2)$$

Where:

- X_t = Economic Income
- r = Interest rate
- V_{t-1}, V_t = Present value of future net cash flows at the beginning (and end) of the period
- C_t = Net Cash flows of the period
- Dep_t = Depreciation in the period, where $Dep_t = V_t - V_{t-1}$

This economic income concept applies only to the total entity, ie the present values of the future net cash flows cannot be disaggregated and attributed to elements (eg divisions) of the firm. Defining income in terms of the present value of future cash flows indicates that the value of an asset (firm) is measured in terms of its past, current and future economic benefits, and is consistent with investing in positive NPV projects. The term $X_t = V_t + C_t - V_{t-1}$ is equivalent to the clean surplus concept if consumption (C_t) is substituted by dividends. The clean surplus concept states that all gains and losses (cash flow or income) must first pass through the income statement and that value is the accumulation of income (loss) over the years. Hence, Hicks provide us with three important concepts: (1) definition of economic income; (2) definition of the value of a firm; and (3) clean surplus equivalent concept. All these three concepts are essential to the development of theoretical models in accounting and finance, and have important implications to this research.

The works of Fisher and Hicks provide the theoretical valuation framework in accounting and finance research. Some of the notable valuation models are the formula-based DCF to calculate the intrinsic value of a firm using dividends, collectively known as the Dividend Discounting Model (DDM), the Earnings Capitalization Model (ECM) and the Residual Income Valuation Model (RIVM).

The DDM has been a traditional valuation model used to value the intrinsic value of firms (shares), however, some researchers (eg Penman, 1992a; Penman and Sougiannis, 1998) argue that the use of dividends as a surrogate for economic income is not theoretically valid to be used in valuation analysis. Empirically, the use of DDM has produced a positive and statistically significant relationship to share values (eg Woolridge,

1988; Brief and Zarowin, 1999); but its R^2 is low (eg Jacobs and Levy, 1988; Bernard, 1995). ECMs are popular in accounting research and much of the earnings response coefficient (ERC) models rely on them. In ERC applications of ECM, forecasted earnings are either based on time-series properties of earnings (eg Beaver et al., 1980; Kormendi and Lipe, 1987; Collins and Kothari, 1989) or analysts' forecasts (eg Dechow et al., 1999).

In addition to the formal valuation approach, researchers have also formulated the **dividend-signalling hypothesis** and the **leverage-signalling hypothesis** by assuming there is information asymmetry in the financial market and that (1) market prices do not reflect all information; (2) management may use changes in dividends or capital structure to convey credible information to the market; and (3) share prices may be affected by any favourable (adverse) signal provided. Generally, the evidence suggests that dividends provide a positive signal to the market while finding that the signalling effect of leverage and debt is mixed.

One other popular market theorem is market efficiency, which deals with how information in general is processed and incorporated in prices (Beaver, 1998, p. 125). However, there are inconsistencies to the theorem of market efficiency (see EMH of Fama, 1970 and 1976 vs. Investors' Heterogeneity of Beaver 1981) and over the years, the notion of market efficiency (particularly the EMH) began to encounter massive scepticism (eg anomalies) and apparent market inefficiencies have been identified, eg the constant wide fluctuations of the stock index in major stock markets (see graph below).

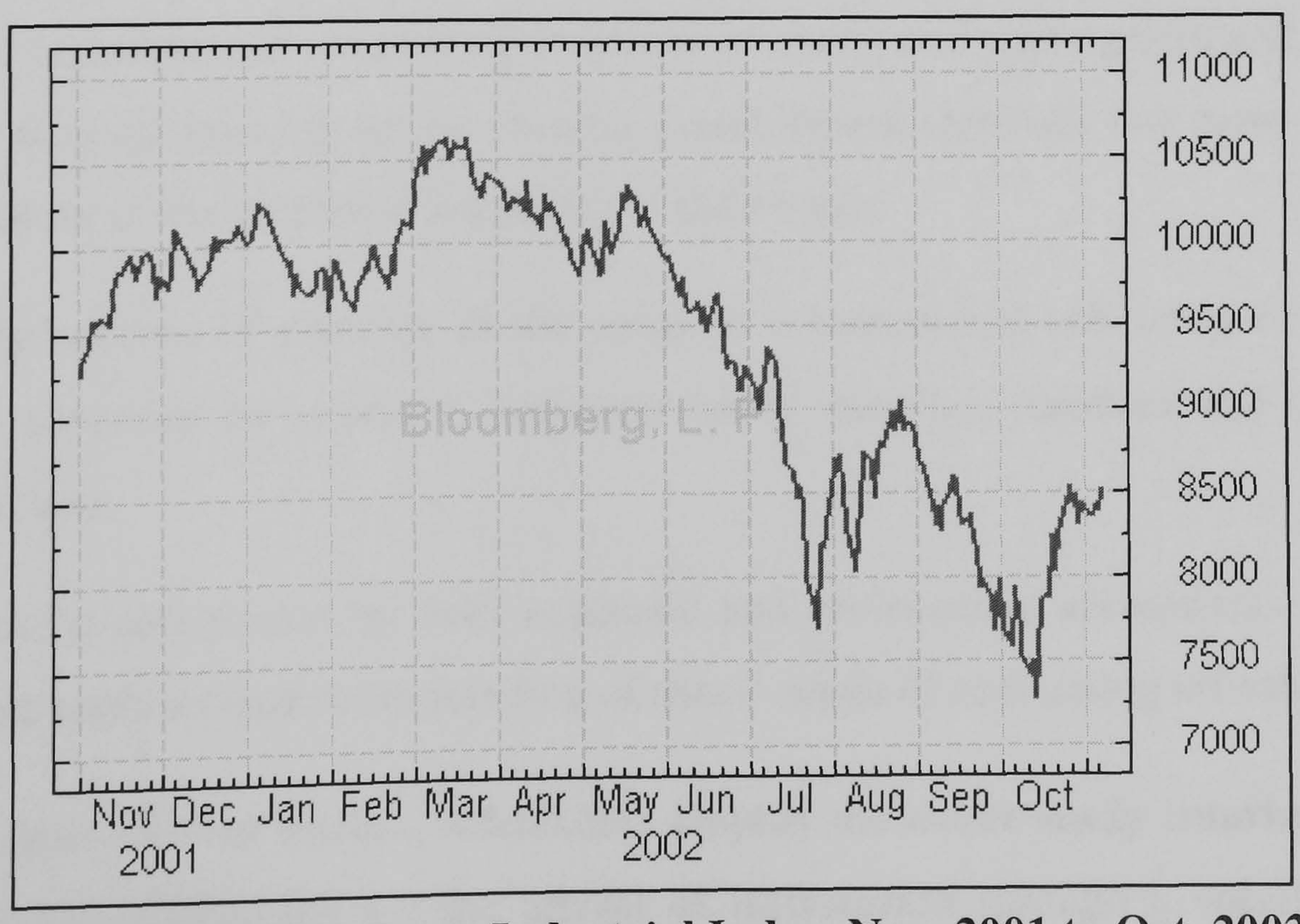


Figure 1.2 – Monthly Dow Jones Industrial Index, Nov. 2001 to Oct. 2002 (Source: Bloomberg Website, http://www.bloomberg.com, October, 2002)

Figure 1.2 shows the erratic monthly stock prices of the DOW Industrial Index. In mid-March 2002, the index was approximately 10,700 but declined to about 7,250 in mid-October 2002, a drop of 3,450 (33%) in just seven months! The credibility of the EMH came to an undeniable halt on 19th. October 1987 when the major stock markets crash, sending academics to seek alternative hypotheses in an attempt to better explain prices, such as the fixation hypotheses, Coherent Market Hypothesis (CMH) and the Speculative Bubbles Theory. Despite controversies surrounding the EMH, none of the alternative theorems managed to dispel the theory of market efficiency, and hence, the EMH is still regarded as a useful concept for CMRA. Market efficiency has important implications for the accounting profession because financial statements would be less prominent and fundamental analysis would diminish in an efficient market (Kothari, 2001, p. 110).

1.2.2. Market-Based Accounting Research (MBAR)

A second economic-based approach in relating accounting information and security prices began to emerge following Ball and Brown (1968); and Beaver (1968). This form of research is known as **'information content'** studies or popularly referred to as **Market-based Accounting Research (MBAR)**. These researchers study the correlation between abnormal returns and one (or more) accounting variables. While MBAR is not a valuation approach, the objectives of both approaches are the same. Walker (1997, p. 342) lists some of the key influences for the emergence of MBAR. They are:

- The emergence of the positivist research approach in US accounting research, which sought to test empirical accounting propositions using real share prices and accounting data led to a questioning of the income measurement theorists that have little or no consideration of the empirical testability of their ideas;

- The early success of research in the areas of informational efficiency of the capital markets, enhanced by access to computer-based securities database and econometric software; and

- The growing recognition by both academic and professional accountants of the need for a more sophisticated understanding of users' needs of accounting information.

For short-interval studies, researchers employ the **event study** (**market reaction**) approach. Event studies test for the arrival of information through a specific event or 'news' ie it measures the effect of abnormal (unexpected) returns in a short-period window

around the date of announcement. The use of event studies enables researchers to examine the relationship between an accrue-based variable or cash flow and abnormal returns or the effects of new (accounting) information on short-term changes in market prices, trading volume, analysts' forecasts and other capital market phenomena.

For longer-interval studies, researchers use **association studies** or a first difference (changes) approach, ie changes in share price are modelled as reacting to some measure of the change in earnings. An association study tests for a positive correlation between an accounting performance measure (eg earnings or *CFO*) and share price, measured over relatively long, contemporaneous time periods (eg one year), such that it captures many new releases of information about the eventual realization of the accounting measure and many reactions by the market to that information.

1.2.3. Earnings Response Coefficient (ERC) Research

Theoretically, it is misleading to focus on the definition of profit (accounting income or earnings) to provide a measure of the dividend-paying capacity of the firm. Cottle et al. (1988) overcome the weakness of accounting earnings by theorizing that permanent economic income (Hicksian income) reflects the dividend stream (cash flow) that could be paid out in perpetuity. Using the standard valuation methodology, he expresses the relation of permanent income and dividends in the form:

$$\frac{Permanent\ Income}{r} \equiv \sum_{t=1}^{\infty} \frac{D}{(1+r)^t}$$

$$\equiv P_0$$

$$\therefore \boxed{Permanent\ Income \equiv rP_0} \tag{2.3}$$

where:

- r = Discount (interest) rate, assumed to be constant over time
- P_0 = Current Price per share

As earnings are subject to changes over time, ie they can be higher (lower) than average at different points of time (mean-reverting or otherwise known as the Molodovsky effect[3]) that may influence stock returns, we need a proxy that can capture unexpected earnings. Researchers term this proxy as "**earnings persistence**" which refers to the extent to which an innovation in earnings causes investors to revise their expectations about future earnings (Kormendi and Lipe, 1987, p. 324; Penman, 1992b, p. 563). Therefore,

[3] See Molodovsky (1953) for more details.

earnings changes (unexpected earnings) is viewed as having two components: (1) permanent earnings that is likely to persist to affect the stream of future cash flows (earnings); and (2) transitory earnings that is not likely to persist for a long period of time and does not affect future cash flows (earnings). When the unexpected returns (UR_t) are regressed on the unexpected operating earnings (UOE_t), the coefficient on unexpected operating earnings (α_1) is called the earnings response coefficient (ERC). The regression model and the ERC are:

$$UR_t = \alpha_0 + \alpha_1 \frac{UOE_{it}}{P_{it\text{-}1}} \tag{2.4}$$

$$\alpha_1 = ERC_t = \frac{COV\left(UR_t, UOE_t\right)}{VAR\left(UOE_t\right)} \tag{2.5}$$

Kormendi and Lipe (1987) estimate the relation between firm-specific security returns by hypothesing that there is a positive relation between the ERC and persistence of earnings. They measure ERC as the magnitude of current earnings surprises that can change (future) earnings expectations based on a time-series model. The ERC is a statistical measure of how strongly the market reacts to £1 of unexpected earnings, and is not an exact measure of the informativeness of reported earnings. Assuming a one-to-one relation between earnings innovations and innovations of net cash flows to the firm, the PV of (1) unexpected £1 of permanent earnings is $£1 + \frac{£1}{r_R}$[4] (because future earnings depend on current earnings), and (2) unexpected £1 of transitory earnings is £1 (because future earnings are independent of current earnings). They use a two-equation approach to estimate the response coefficient, α_0, and the time-series properties of earnings, b_i:

$$R_{it} = k_{1t} + \alpha_{0i} \frac{UE_{it}}{P_{it-1}} + UR_{it} \tag{2.6}$$

$$\Delta E_{it} = k_{\lambda i} + b_{1i}\Delta E_{it\text{-}1} + b_{\lambda i}\Delta E_{it\text{-}2} + UE_{it}$$

where:

- R_{it} = Percentage annual returns estimated from the Market Model for firm *i's* common security in year *t*.
- UE_{it} = Shock (or innovation) in earnings for firm *i* in year *t*.
- $P_{i,\ t\text{-}1}$ = Share price for firm *i* at the beginning of the year *t*.
- ΔE_{it} = Change in earnings per share (before extraordinary items) for firm *i* in year *t*.
- b_{1i}, $b_{\lambda i}$ = Autoregressive coefficient.
- α_{oi} = Response coefficient that estimates the effect of a unit earnings innovation on 1 unit returns.

[4] r = Annual risk-adjusted discount rate for equity.

R_{it}, $P_{i,t-1}$ and ΔE_{it} are adjusted by the consumer's price index (CPI) in order to mitigate the heteroscedasticity caused by inflation. The autoregressive model of earnings is limited to two lags, and nonlinear-weighted least squares are employed. They test 145 firms that reported on a calendar-year basis over the period 1947-80. The result shows that there is a positive relation between the ERC (α_{oi}) and earnings persistence in the returns/earnings regression. This implies that the cross-sectional variation in stock market reaction to earnings announcements can be partially explained by earnings persistence.

Following Kormendi and Lipe (1987); Easton and Zmijewski (1989); Collins and Kothari (1989); and Lipe (1990) provide further theoretical and empirical developments for the effects of earnings persistence on the returns/earnings relation. Kormendi and Lipe (1987), and Easton and Zmijewski (1989) show that the greater the impact of an earnings innovation on market participants' expectations of future earnings, the larger the price change (ERC). Easton and Zmijewski (1989) find that systematic risk negatively affects ERC and this is valid since greater risk implies a larger discount rate which reduces the present value of the revision in expected future earnings, ie ERC. In Collins and Kothari (1989), the coefficient for growth is statistically significantly negative as expected, while risk and interest rates are significantly negative, which are unexpected. These studies show that the ERC depends not only on the persistence of earnings, but also on other information such as risk, growth and interest rate. Evidence from past empirical studies have estimated that the ERC magnitudes ranged from 1 to 3, which is far 'too small' when one expects a magnitude of 10-20, depending on the time period examined, when one uses P/E multiple as a reasonable estimate of the ERCs. Kothari (2001, p. 128) suggests the observed magnitudes of the ERCs may be due to (1) prices lead earnings; (2) inefficient capital markets; (3) noise in earnings and deficient GAAP; and (4) transitory earnings.

Kothari (2001) lists at least three criticisms of ERC research. Firstly, the research on persistence and its relation to ERCs tends to be statistical in nature. He suggests that research on ERCs can be enriched by focusing on the economic determinants of the time-series properties of firms' earnings. For instance, Ahmed (1994, p. 379) reports there is a relation between the potential to earn economic rents on a firm's assets and the degree of competition in the firm's industry and the firm's cost structure. His finding is consistent with the proposition that if accounting earnings reflect information about future economic rents generated by firms' assets-in-place, ERCs will vary inversely with competition and

directly with the ratio of fixed assets to variable costs. By modelling *RI* instead of total income or changes in income as an autoregressive process, Ohlson (1995) posits that the model better captures the economic effect of product-market competition; and that intense competition in the market will erode a firm's sustained ability to earn supernormal earnings. The second criticism on the research on persistence parameters and ERC is that it tends to present in-sample evidence; and tests that ignore the effect of transitory earnings components in relating ERCs to persistence overstate the importance of persistence (see Ali and Zarowin, 1991). The third criticism on ERC determinants stems from the finding in Watts (1992, p. 238) that it does not control for differences in accounting earnings' ability to proxy for current and future cash flows and differences in accounting methods. This raises the distinct possibility of a correlated omitted variable problem.

1.2.4. Failure of MBAR and the Revival of the Valuation Approach

Despite its early success, MBAR has been criticized on several grounds during the past thirty-five years. Possible reasons cited for the failure of MBAR include: (1) the lack of an objective in MBAR that can assist policymakers in formulating accounting and investment policies (Ball, 1992; Walker, 1997; Beaver, 1998; Ross et al., 1998); (2) poor specification of empirical models and/or poor research design (Lev, 1989; Walker, 1997); (3) the use of GAAP measures may not be appropriate (Lev, 1989; Walker, 1997; Ittner and Larcker, 1998; Lev and Zarowin, 1999); (4) deliberate misapplication of GAAP since reported earnings may be unreliable indicators of firm performance (Scholes et al., 1988; Lev, 1989; Walker, 1997); (5) firms may be faithfully applying GAAP, but the market fails to respond rationally to the information, ie the securities market is informationally inefficient (Lev, 1989; Walker, 1997); (6) the stock market is more sophisticated in its response to accounting information than anticipated (eg Copeland and Weston, 1992; Walker, 1997; Block, 1999); (7) MBAR research has produced extensive evidence that the capital market is inconsistent with market efficiency or that the EMH is inappropriate (Kothari, 2001; Beaver, 2002); and (8) the parameters of the returns/earnings relation exhibit considerable instability over time, which has yet to be explained (Lev, 1989).

The usefulness of returns/earnings correlation in terms of R^2 was poor since 1968 in Lev's (1989) survey of MBAR for the past twenty years. The results show a low correlation between earnings and security returns, ie the ability to explain 2-5% of either the cross-sectional or time-series variability of security returns for narrow windows and up

to 7% for very wide windows or an average (and representative) of about 5% for large, heterogeneous samples. Strong and Walker (1993); and Bao and Bao (1998) indicate that at best, the R^2 produced by returns/earnings studies, regardless of the length of the windows used is not more than 10% and in most times not more than 5%. Earlier, Roll (1988) had indicated that accounting researchers would face the problem of not achieving high R^2 without further advances in financial economics. The expected explanatory power of a simple return/earnings regression model can be illustrated using a contemporaneous one-period return-earnings relation. Let X_t be accounting earnings with two components, x_t = portion of earnings that is news to the market, and y_{t-1} = portion of earnings that the market had anticipated (prices lead earnings) ie $X_t = x_t + y_{t-1}$. Given the earnings assumption, the return in period t is $R_t = x_t + y_t$. The returns/earnings equation is:

$$R_t = a + bX_t + e_t \tag{1.7}$$

where:

- b = ERC.

The estimate of b, given that y_{t-1} = anticipated information, which is irrelevant is:

$$\begin{aligned} b &= \frac{Cov(R_t, X_t)}{Var(X_t)} \\ &= \frac{Cov(x_t + y_t, x_t + y_{t-1})}{Var(x_t + y_{t-1})} \\ &= \frac{Cov(x_t, x_t)}{Var(x_t) + Var(y_{t-1})} \\ &= \frac{\sigma^2}{\sigma^2 + \sigma^2} \\ \therefore\ b &= \frac{1}{2} \text{ (or 50\%)} \end{aligned} \tag{1.8}$$

To determine the explanatory power, R^2 of the regression, consider the decomposition of the dependent variable's variance:

$$\begin{aligned} Var(R_t) &= b^2 Var(x_t) + Var(e_t) \\ 2\sigma^2 &= 0.5^2 \left[Var(x_t) + Var(y_{t-1})\right] + Var(e_t) \\ &= 0.5^2 \left[\sigma^2 + \sigma^2\right] + Var(e_t) \\ &= \left(0.25 X 2\sigma^2\right) + Var(e_t) \\ &= 0.5\sigma^2 + Var(e_t) \\ Var(e_t) &= 1.5\sigma^2 \end{aligned} \tag{2.9}$$

From (2.9), the adjusted R^2 is:

$$R^2 = \frac{2\sigma^2 - 1.5\sigma^2}{2\sigma^2}$$
$$= \frac{0.5\sigma^2}{2\sigma^2} \qquad (1.10)$$
$$= \frac{1}{4} \text{ (or 25\%)}$$

Equations (1.8) and (1.10) provide results of a contemporaneous return-earnings regression with the market anticipating half of the information in earnings growth rates (ie $Var(x_t) = Var(y_{t-1})$) one-period ahead. The ERC = 50% biased and the explanatory power of the regression is 25%. The biasedness of the ERC is caused by y_{t-1}, a large portion is anticipated information that is irrelevant in explaining variation in current returns and constitutes measurement error in the independent variable. As a result, the bias ERC reduces the R^2. This theoretical returns/earnings model demonstrate that the results obtained from past association studies are indeed low.

Some researchers (eg Lev and Ohlson, 1982; Lev, 1989; Lipe, 1990; Amir and Lev, 1996) have expressed that the information content of non-earnings financial data had not been adequately researched. In response to these criticisms of MBAR, attempts have been made to theorize accounting by moving in the direction of a neo-classical framework, particularly in the direction of RIVM based on accounting constructs for the first time following the works of Edwards and Bell (1961); and Ohlson (1991), commonly referred to as the Edwards-Bell-Ohlson model (EBO):

$$\boxed{V_0 = BV_t + \sum_{t=1}^{\infty} \frac{E[AE_t - rBV_{t-1}]}{(1+r)^t}} \qquad (1.11)$$

where:

- $BV_{t,\ t-1}$ = Book value of equity at period t, t-1
- AE_t = Accounting net income at period t
- r_E = Cost of Equity capital

Ohlson (1995); and Feltham and Ohlson (1995, 1996) (OFF) extend the EBO by theorizing that by the evolution of *RI*, share prices are based on both book values and other fundamentals. The OFF attracts considerable interest in CMRA as some researchers consider it to predict and explain prices better than models based on discounting short-term forecasts of dividends and cash-flows (Bernard, 1995; Francis et al., 1997); and it provides a more complete valuation approach to some popular alternatives (Frankel and Lee, 1998). An extensive literature review of the OFF will be presented in the next chapter.

1.3. Research Methodologies used in Capital Market Research in Accounting

Despite close to fifty years of CMRA, no consensus has been reached over the use of an appropriate methodology to conduct research in relating security prices and accounting information. Over the years, researchers have used levels regression; event studies, and association (information content) studies to infer their results. According to Lo and Lys (2000b, p. 1), three different approaches to investigating the implications of accounting information for security prices are identified in CMRA literature. They are:

(1) Approaches based on Beaver (1968) – **Information content** studies;
(2) Approaches based on Ball and Brown (1968) – **Valuation-relevance** studies; and
(3) Association tests between prices and accounting measures – **Value-relevance** studies.

1.3.1. Information Content Studies

This is based on the notation similar to Fama (1976), using discrete time intervals; based on the public information set in a semi-strong form efficient market:

$$\boxed{\Delta\phi_t \text{ has information content if and only if } P_{jt} \neq E(P_{jt} \mid \phi_{t-1})} \qquad (2.12)$$

where:

- $\Delta\phi_t = \dfrac{\phi_t}{\phi_{t-1}}$ = New information disclosed at time t
- P_{jt} = Efficient price incorporating all publicly available information, ϕ_t
- ϕ_{t-1} = Information set just before the information disclosure
- ϕ_t = (Publicly available) Information set (including the disclosure)
- $\phi_{t-1} \subset \phi_t$

In this definition, an announcement has information content if it leads to price changes (regardless of the signs or directions of the change) in excess of the amount due to the passage of time (ie expected return). Since formula (2.12) does not provide for any directional predictions, Beaver (1968) examines the variance of the difference between (deflated) prices and their conditional expectations:

$$\boxed{\mu_{jt}^2 = \left| P_{jt} - E(P_{jt} \mid \phi_{t-1}) \right|^2} \qquad (2.13)$$

Using the above, he compares the value of μ^2 in the announcement period with that in the non-announcement periods. He finds that the stock return variance is higher in the earnings announcement week, and concludes that there is accounting information.

1.3.2. Valuation-relevance

This is based on the relation between accounting information and the evolution (process) of prices over time. To Lo and Lys (2000b, p. 5), the term **"valuation"** denotes a ***process***, whereas **"value"** denotes a ***quantity***. This approach focuses on one (or more) specific accounting summary measure(s) (eg earnings in Ball and Brown, 1968) and how this summary measure(s) relate(s) to price changes. Thus:

$$\left|P_{jt} - E(P_{jt}|\phi_{t-1})\right| = f\left|I_{jt} - E(I_{jt}|\phi_{t-1})\right| + \mu_{jt} \tag{2.14}$$

From the above, analysing valuation-relevance requires the researcher to:

(1) Identify a specific item I_{jt} (eg earnings or may be an information vector);

(2) Specify investors' expectation prior to the disclosure of I_{jt};

(3) Specify a disclosure event and a time interval over which information regarding I_{jt} was made public; and

(4) Specify a valuation function $f()$ that maps the difference between realization and expectations into stock price changes.

If the sign of the earnings news is positively related to changes in stock price, earnings are deemed to be valuation-relevant. Based on formula (2.14), Lo and Lys (2000b, p. 6) define the valuation-relevance of an item of information as:

A (specific) information item, I_{jt} is valuation-relevant if and only if the function $f()$ in equation (2.14) **is non-trivial *** (2.15)

- The term "non-trivial" means it is not a constant.

In Ball and Brown (1968), the expectation of earnings is assumed to be earnings reported in the prior year; and that $f()$ is an indicator function that depends on the **sign** of earnings news: sign $(I_{jt} - I_{jt\text{-}1})$. Subsequent researchers have used this approach to measure the magnitude of the slope coefficient of a linear regression of returns on net income as a metric of the extent to which earnings is more or less relevant in explaining returns. For example, Collins and Kothari (1989) report that higher ERCs can be interpreted as higher quality earnings, ie earnings that are more highly associated with returns. Lo and Lys (2000b, p. 9) indicate that, typically, models based on valuation-relevance methodology use the following specification:

$$r_{jt} - E(r_j) = a_t + b_t \frac{I_{jt} - E(I_{jt}|\phi_{jt-1})}{P_{j,t-1}} + \eta_{jt} \tag{2.16}$$

where:

- r_{jt} = Stock return of a firm j at year t
- η_{jt} = Other information that was disclosed concurrently, with I_{jt} (eg earnings announcement) and 'noise'
- $\frac{I_{jt} - E(I_{jt-1} \mid \phi_{jt-1})}{P_{jt-1}}$ = The difference between realized information (eg earnings) and proxies for the expectations for that information (eg earnings expectations) by investors, which is used to measure earnings surprises. This portion of information is usually obtained using time-series models (eg Ball and Brown, 1968), or analysts' earnings forecasts (eg Bernard and Thomas, 1990).

The independent variable is deflated by $P_{j,t-1}$ to reduce the size-effect and heteroscedasticity (see Christie, 1987; Brown et al., 1999). The explanatory power of equation (2.16) provides a measure of the degree of valuation-relevance of accounting.

Discussion of Information Content and Valuation-relevance

In Definition (2.12), the researcher is interested in investigating whether a 'loosely' specified information set $\Delta\phi_t$ (eg earnings announcement) is informative, whereas Definition (2.15) enables the researcher to identify a specific item (eg net income) that is valuation-relevant (informative). Hence, the measurement of information content is discrete (ie either there is or there is not an event) whereas information is generally measured on a continuum relative to expectations in valuation-relevant studies. Valuation-relevance tests can either be directional or non-directional, although the latter is uncommon because it unnecessarily sacrifices power. As a specification of expectations, I_{jt} appears in Definition (2.15) but not in (2.12), therefore, it is required for valuation-relevance but not for information content. Hence, Definition (2.15) provides a more powerful test than (2.12) -ie the null hypothesis of no information content is less likely to be rejected than the null hypothesis of no valuation-relevance. Information content and valuation-relevance can be the same form by modifying the definition of information content (equation (2.12)) but it is beyond the scope of this thesis to deal with this issue[5]. More recently, empirical researchers have tended to move away from the information content perspective and to focus more on the use of financial statement information that has affected the firm over the fiscal period for which the financial report has been prepared (Easton, 1999).

1.3.3. Value-relevance

The approach typically examines the association between market values and accounting summary measures (eg earnings, *CFO* or book values), generally expressed as:

[5] For more details, see Lo and Lys (2000b, p. 7-8).

$$\boxed{P_{jt} = g(I_{jt}) + \eta_{jt}} \tag{2.17}$$

Based on the above, Lo and Lys (2000b, p. 7) define value-relevance as:

> **A (specific) information item, I_{jt} is value-relevant if and only if the function f(g) in equation** (2.17) **is non-trivial** (2.18)

This approach requires the researcher to identify an item I_{jt}, and a valuation function that maps I_{jt} into prices or market values. While definition (2.18) and definition (2.15) require a function to map information into prices, definition (2.18) requires one less assumption: $E(I_{jt} | \phi_{t-1})$[6] need not be specified. Value-relevance research has a long history since Modigliani and Miller (1958) and following the revitalisation of the RI-based valuation models by Ohlson (1995); and Feltham and Ohlson (1995, 1996), most researchers implementing the value-relevance models use one of the several valuation models formulated by them, eg Bernard (1995); Frankel and Lee (1998); Dechow et al. (1999); and Ahmed et al. (2000).

Discussion on Valuation-relevance and Value-relevance

To Lo and Lys (2000b, p. 11), the only difference between the definitions of valuation-relevance and value-relevance is that the latter does not include expectations on either side of the equation. To illustrate, separate the RHS of the valuation-relevance formula ((2.14)) into two separate terms:

$$\left| P_{jt} - E(P_{jt} | \phi_{t-1}) \right| = f(I_{jt}) - f\left| E(I_{jt} | \phi_{t-1}) \right| \tag{2.19}$$

Equation (2.19) is particularly suited to studies investigating information changes because in changes studies, a variable is deemed to consist of two components. The exact components depend on the research methodology used, eg earnings decomposed between permanent earnings and transitory earnings (eg Cottle, 1988); earnings decomposed between permanent earnings and earnings growth (eg Penman, 1996); earnings decomposed between permanent earnings and noise in price-lead-earning (eg Beaver et al., 1980). Thus, equation (2.19) becomes:

$$P_{jt} = f(I_{jt}) + k_{j,t-1} \quad \text{and} \quad E(P_{jt} | \phi_{t-1}) = f\left| E(I_{jt} | \phi_{t-1}) \right| + k_{j,t-1} \tag{2.20}$$

where:

- $k_{j,t-1}$ = Efficiency requires that the market always use the most up-to-date information.

[6] The second term of the RHS of equation (2.14).

In contrast, equation (2.17) excludes the term, K_{jt-1}, so the value-relevance methodology imposes the restriction that only I_{jt} determines P_{jt}. With this assertion, the researcher is only interested in determining whether or not a specific I_{jt} (eg net income) is associated with P_{jt} (stock price). However, Lo and Lys (2000b, p. 11-12) argue that K_{jt-1} is unlikely to be zero or constant in cross-section or in time-series; and the consequence of omitting this variable constitutes an omission of a relevant variable. But Lo and Lys' argument may not be applicable for the value-relevance methodology because researchers in value-relevance studies usually employ valuation models where only levels (current) information is needed in relating current prices to information. In fact, the valuation-relevant methodology is more problematic because empiricists using returns/earnings models face the odious task of measuring price changes.

Value-relevance research has two major characteristics (Beaver, 2002). Firstly, value-relevance demands an in-depth knowledge of accounting institutions, accounting standards, and the specific features of the reported numbers. For example, in a study of the value-relevance of pension reporting, the researcher must know the stated objectives of financial reporting, the criteria standard setters use, the basis for the pension standards, and details of how to construct the model for the research in question.

Timeliness is not a key issue in value-relevance research because delayed recognition is a well-established fact in the present accrual-based accounting, and researchers are interested in a variety of questions, many of which do not involve timeliness. In contrast to event studies[7], value-relevance research employs levels studies to identify drivers of value that may be reflected in price over a longer time period than assumed in event studies. The theoretical foundation of value-relevance studies is a combination of a valuation theory plus contextual accounting analysis that allows researchers to predict how accounting variables relate to the market value of equity. What the researcher learns from value-relevance studies relates to three questions regarding an accounting number (Beaver, 2002, p. 462):

- Is it priced (ie does it have a coefficient that is significantly different from zero)?
- Is it priced consistently with some theoretical value (eg is the coefficient for a variable = 1)?
- Is a particular accounting number priced equal to or differently from similar accounting numbers (eg do all components of net income have the same valuation multiples)?

[7] But timing of information is crucial in event studies.

Examples of value-relevance studies include the following. Landsman (1986) finds that the unrecognised portions of pension assets and liabilities is priced in a manner consistent with the theory that viewed pension assets as assets of the firm and pension obligations as liabilities of the firm. Aboody and Lev (1998); Barth and Clinch (1998); Lev and Zarowin (1999) find that intangible assets (eg capitalized software, brands, and goodwill) are priced. Studies that find research and development and advertising expenditures are viewed as assets of a firm (eg Chauvin and Hirschey, 1993; Green et al., 1996; Stark and Thomas, 1998).

Final Discussion and summary of relationship between Information content, valuation-relevance and value-relevance. Information content and valuation-relevance studies typically test security price volatility in an announcement period to the volatility in a non-announcement period, ie testing for relative information content based on short windows. Value-relevance studies often employ a long window, typically using annual share prices. The table below depicts the similarities and differences between information content, valuation-relevance and value-relevance studies.

Methodology	Changes		Levels
	Short window	Long window	
Information content	Compatible	Possible but not common in prior research	Incompatible
Valuation-relevance	Compatible	Compatible	Incompatible
Value-relevance	Possible but not common in prior research	Possible but not common in prior research	Compatible

Table 1.3 - Empirical Methodologies typically employed by Information content, Valuation-relevance, and Value-relevance studies (Source: Lo and Lys, 2000b, p. 17)

Information content and valuation-relevance methodologies address two different but related issues. The former focuses on an entire information set while the later focuses on a specific summary measure. Hence, the information content approach makes use of fewer assumptions than valuation-relevance. Both the valuation-relevance and value-relevance methodologies require the researcher to identify a specific item and a valuation function to map information into prices. However, in value-relevance, an expectation is not included in the formula since researchers are only interested in relating current prices to information.

1.4. Motivation and Purpose for this Research

From the first section, three important developments in CMRA are identified: (1) mounting evidence of apparent market inefficiency; (2) the decline in the usefulness of current financial reporting and the need for the inclusion of alternative measures in the reports; and (3) the growing interest in the fundamental perspective of residual income valuation models (RIVM). These serve as the motivating forces for this research.

The academic literature has so far not fully addressed the usefulness of accounting information, particularly the use of earnings in relating to share prices (returns). In over thirty-five years of MBAR research, bottom-line earnings are regarded as the premier explanatory variable in predicting prices (returns) but its usefulness to market participants is unimpressive with $R^2 < 10\%$ in most MBAR studies. This issue may be confounded by (1) the use of an incorrect methodology in such studies, or (2) over-reliance on the theory of market efficiency in testing for the informativeness of accounting information. Lev and Ohlson (1982) and Lev (1989) have called for a refinement of the MBAR approach, with a need for a more explicit use of valuation approaches. In addition, several authors (eg Lipe, 1990; Amir and Lev, 1996) suggest that the information content of non-earnings data has not been adequately researched. Kothari (2001) suggests accounting researchers should use accounting-based valuation to examine long-horizon movement in share prices in relation to company performance in view of the mounting evidence of market inefficiency. Even by moving in the direction of the valuation framework, accounting researchers have not adequately addressed the pitfalls of MBAR or improve value-relevance such as (1) informativeness of earnings as an explanatory variable in helping to predict fundamental performance (ie future residual income); (2) the inclusion of non-earnings data and other information as predictors of a firm's performance and equity value have produced mixed results; (3) the alignment between historical book values and market values has not produced the desired results; (4) there is no coherent methodology in specifying and testing a particular model, eg RIVM.

These issues provide the **motivation and purpose** for this research: (1) by focusing on using empirical research to evaluate the informativeness of non-earnings financial information in relation to firms' performance; and (2) items of information that are useful in evaluating performance are identified and are then used to form an assessment of the market value of equity. For example, if research and development expenditures or

distribution costs are shown to help predict fundamental performance (ie future residual income) one could argue that this justifies adjustment of the balance sheet to include corresponding intangible assets.

The **Ohlson-Feltham Framework (OFF)** provides a powerful argument for a change of emphasis away from excessive attention on returns/earnings models to the direction of the fundamental measurement perspective. The OFF focuses on the fundamental valuation of firms by taking accounting book values, earnings and non-earnings data directly into the valuation process rather than correlating earnings surprises with returns. Since the OFF uses residual income as a performance measure, one can determine whether or not value is created. Walker (1997, p. 348) states that the OFF has many appealing features not found in returns/earnings models or other valuation models as the linear information dynamics (LID) of the OFF allow us to produce a logically consistent representation of several fundamental characteristics of financial reporting systems, such as:

- The importance of persistence of *RI* in determining the relative weighting of earnings and book value in accounting-based valuation models.
- The valuation of observable data before this data is reflected in the published accounts. For instance, the NPV of new projects may be impounded into price either during or before the actual capital expenditure is reported in the accounts.

Clubb (1996); and Kothari (2001) consider the OFF is appealing on both pragmatic and economic grounds as its theoretical assumption that above-normal rates of returns on investments will decay, and positive growth is the result of reinvestment. A particularly appealing feature of the LID is that various fundamentals (accounting and other information) can be specified in a model, and there is no restriction in the number of variables that can be used. Lo and Lys (2000a) state that the attractiveness of the OFF to empiricists is that it provides a testable pricing equation that identifies the roles of accounting and non-accounting information, and that the model provides an internally consistent set of valuation equations for price levels and returns in place of the ad hoc models employed extensively in last three decades. Therefore, the OFF best fits with the objective of this thesis for the investigation of the value-relevance of accounting book values and non-earnings data, and also to examine the role of residual income in equity valuation and in the linear information dynamic.

Unfortunately, research on the use of the OFF has three major pitfalls. Firstly, the OFF provides a wide spectrum of hypotheses that can be tested to align book values with market values. However, studies tend to focus on a very narrow dictum of the framework. For instance, Rees (1997) tests for the value-relevance of dividends, debt and capital expenditure without using the LID. Secondly, researchers tend to use a single variable to infer 'other' information but this has met with limited success. For instance, Dechow et al. (1999) find only a modest improvement in explanatory power in past empirical research using analysts' earnings forecasts and the DDM. Myers (1999) finds that order backlogs fail to predict future residual income and are also not value-relevant. Thirdly, no researcher has attempted to integrate Ohlson (1995); and Feltham and Ohlson (1995, 1996) as a combined framework in testing for the internal consistency of the LID and the valuation model. Moreover, almost all of these studies were undertaken using US data. Therefore, this research extends previous studies by in two directions, both by using a different dataset and by developing new modelling techniques. Using a large dataset of firms listed on the London Stock Exchange (LSE) over 12 years from 1990 to 2001, this study adopts an integrated OFF and uses a comprehensive set of non-earnings accounting variables for estimating a prediction model, identifying which of these other accounting variables are significant in the prediction model and which variables are relevant for valuing the equity of the firms. The integrated OFF in this thesis refers to the integration of Ohlson (1995) and Feltham and Ohlson (1995, 1996) as though they are one framework under a more general assumption of these models. More specifically, the valuation model of this research is based on FO (1995, 1996) in linking book values, *RI*, operating assets (*OA*), capital investments (*CI*) and other information; current *OA* to proxy for conservatism under FO (1995); includes *CI* to measure investment in +NPV projects, which is from FO (1996); assumes autoregressive processes of the various variables based on O (1995); and adopts multiple measures for v_t as per FO (1995). The comprehensive set of accounting variables is motivated by the normative arguments that financial reporting is necessary for making investment decisions, but at the same time, intangibles, such as research & development, human resources, and advertising expenditures and 'signalling' variables (dividends and external debt) are increasingly viewed as value-relevant and hence, should be included to improve equity valuation.

This study should be helpful in evaluating the extent to which arguments in this literature are sufficiently cogent as to present a case for reform in financial reporting

towards an increased emphasis on the use of value-relevant variables. In view of the considerable consensus for the need for financial reporting reform, and in particular, the inclusion of nonfinancial data as part of the reporting system and the proposals generated by this research, further work relating to the development of financial reporting combining nonfinancial measures may represent a significant influence on the direction of financial reporting in the future. It will be seen that empirical evidence reported in this study lends credence in evaluating the future prospects of a firm, and the findings from this research provide potentially useful input to policymakers on what performance measure (s) should be used in financial reporting.

In summary, the motivation and purpose for this research is based on the relative merits of fundamental valuation-based framework to empirically (1) evaluate the informativeness of non-earnings financial information to predict firms' performance (*RI*); and (2) identify variables that are useful in predicting future *RI* to be used in equity valuation. The approach taken here is consistent with the OFF in which variables that are able to predict expected *RI* are also value-relevant in determining a firm's value.

1.5. Outline of this Thesis

The motivation/purpose of this research is the use of the OFF to empirically (1) evaluate the informativeness of non-earnings financial information to predict firms' performance; and (2) identify useful predictors of performance to be used in equity valuation. This is the focus of this chapter.

The remainder of this thesis is organized as follows. **Chapter 2** provides an extensive review and discussion of the use of earnings, accounting, non-earnings and other information in equity valuation, particularly with respect to the fundamental valuation models advocated by Ohlson and Feltham. It also reviews and analyses why the use of financial information has been criticised on various grounds, eg deficient GAAP, creative accounting, and the calls for a review of financial reporting due to changing needs and technological innovation. Many of the critiques suggest that the information content of non-earnings financial data had been not adequately researched, and hence, a normative as well as a positive review of the use of non-traditional earnings information in financial reporting for valuation purposes and whether such data is important for the prediction of future enterprise cash flows.

Chapter 3 first provides the arguments for and against the returns vs. valuation approach used to modelling information in the security market. The selection criteria for the valuation approach for this research and the justifications for the use of a combined residual income valuation model (RIVM) based on the Ohlson and Feltham framework (OFF) consisting of a comprehensive set of accounting variables (CSV) to infer 'other' information are critically evaluated. The comprehensive set of additional accounting variables to infer 'other' information is motivated by the normative arguments that accounting reporting is necessary for making investment decisions, but at the same time, intangibles, such as research and development expenditure, human resources and advertising expenditures and 'signalling' variables such as dividends and external debt are increasingly viewed as value-relevant and hence, should be included to improve fundamental-based valuation. Consistent with previous studies and the OFF, which are linear in form, the chapter also examines the role of residual income (*RI*) in equity valuation, focusing on the *RI* linear information dynamics. Appendix 3.1 provides the development of the models.

Chapter 4 explains the statistical and econometric methods used to estimate the proposed models for this research. It also analyses and reviews statistical, econometric and data extraction issues that are likely to be encountered. As accounting and stock data are collected from DataStream, to eradicate irrelevant and 'bad' data, and to speed up data processing and data analysis, two computer programs have been developed: (1) database software to assemble company, accounting and stock data (2) a spreadsheet automation system to adjust item extracted to the required format. The programs for these two systems are contained in Appendix 4.1. Definition of variables and estimating equations are provided at the end of this chapter.

Chapter 5 empirically test for the residual income (*RI*) linear information dynamics under a more general assumption of the Ohlson-Feltham Framework (OFF) by investigating the pool and cross-sectional properties of future, current and lagged RI-based on a comprehensive set of accounting variables (CSV). The main aim is to identify the variables that are statistically significant in the *RI* model are deemed able to predict residual income so that these variables can be used in determining a firm's value. Tests are also conducted to examine the impact of current and lagged research and development expenditure (*RD*), human resource cost (*HR*) and distribution cost (*DC*) on one-year ahead

residual income to determine whether they can be validly used as proxies for intangibles in the *RI* model. The empirical study is based on a large sample of nonfinancial companies on the London Stock Exchange consisting of 11,214 firm-year observations over a 12-year period from 1990-2001.

Chapter 6 is a follow-up of Chapter 5 by empirically examining the relationship between market value of equity (MV) and other accounting information under the ambit of the Ohlson-Feltham Framework (OFF). It is shown that previous research showing the association between market value of equity and other accounting parameters can be extended to derive a link between current market value of equity and other fundamental parameters under a more general assumption of the Ohlson-Feltham Framework. As in the preceding chapter, the empirical study is conducted by investigating the pool and cross-sectional properties of market value and a comprehensive set of accounting variables (CSV). The chapter concludes by examining whether the parsimonious model or the extended model which encompass intangible asset variables, and the dividend and debt signalling variables provides the best predictor (explainer) of market value.

Chapter 7 concludes the thesis by summarizing the salient arguments and findings from previous chapters, highlighting the main contribution of the study to research in the area and suggesting possible avenues for future research. It is argued that the study contributes to research concerned with the nature of accounting needs of investors by (1) providing evidence of the usefulness of carefully selected accounting data to predict future residual income, and in equity valuation, and (2) suggesting further investigation into the use of non-traditional earnings information in financial reporting for valuation purposes and whether such data is important for prediction of future enterprise cash flows. This study adopts a combined Ohlson-Feltham Framework for the investigation of the value-relevance of accounting book values and non-earnings data, and also to examine the role of residual income in equity valuation and in the linear information dynamics (LID). Since no study has used this approach to identify value-relevant variables in equity valuation, this research will contribute to the growing literature on fundamental-based valuation, focusing on the use of residual income and accounting-based valuation in equity valuation.

RESIDUAL INCOME INFORMATION DYNAMICS AND EQUITY VALUATION: A STUDY USING UK DATA

LITERATURE REVIEW 2

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CHAPTER 2
REVIEW OF THE LITERATURE ON RESIDUAL INCOME AND OTHER FUNDAMENTAL VARIABLES

2.1. Introduction

For the past thirty-five years of CMRA, accounting information is considered to be the main source of information used for evaluating security prices and firms' performance. However, in practice, the use of such information is problematic in view of the wide discretion over the choice of accounting methods under the concept of conservatism, and the likelihood of manipulation of the earnings figure. To enhance financial reporting, academics and policymakers have suggested that financial statement users be provided with timely non-earnings and nonfinancial performance information that is contemporaneously associated with financial variables and that may enhance users' ability to evaluate and predict financial performance. The few empirical studies that investigate the usefulness of non-earnings and non-accounting information, such as research & development expenditures, advertising expenditures and customer satisfaction, have found such information to be valuable in assessing firm performance, and these results are encouraging. Concurrently, the surge in the number of recent empirical studies in relating market values with fundamentals using the residual income valuation model (RIVM) and the Ohlson-Feltham Framework (OFF) has stimulated fresh challenges to CMRA.

The remainder of this chapter is organized in terms of the conceptual and empirical aspects of prior work in the area as follows. **Section 2** provides a normative discussion on financial reporting in major countries, focusing on the UK and US, but discussions are also included regarding the European Union, Australia, Hong Kong, China and the international context. The literature reviewed also covers policymakers' and academics' calls for the use of non-earnings and non-accounting information in appraising share prices. **Section 3** critically reviews and analyses the usefulness of fundamental valuation-based models, particularly the residual income valuation model (RIVM) and how this model has changed CMRA in recent years. **Section 4** reviews and analyses the testing for the relevance of accounting and other information in the capital market. **Section 5** compares the commonly-used models used in CMRA, ie returns vs. valuation models, and **Section 6** concludes.

2.2. Role of Accounting and Other information in the Capital Market

The world's major accounting regulatory bodies and exchange commissions recognize that investors are the primary users of financial statements. Thus, investors naturally demand information that will aid in assessing the future profitability (cash flows) associated with securities and the firms that offer those securities. This shows that the role of investors with regard to financial reporting is an important one because the relation between financial information and security prices can influence investors' demand for financial information.

2.2.1 'Informational' Approach to Financial Reporting

In studying the objectives of financial reporting as defined by standard setters (eg FASB), we need to draw references from the entity and enterprise theories. In the **entity theory**, 'Assets are equal to Equities' (Liabilities + Stockholders´ Equity). The separation of equities between liabilities and the stockholders´ equities is that the valuation of the rights of the creditors and the stockholders can be determined independently while the firm is solvent (Hendriksen, 1982, p. 455). The rights of the stockholders are measured by the valuation of assets originally invested plus the valuation of reinvested earnings and subsequent revaluations (p. 456). The **enterprise theory** is a broader concept than the entity theory, where the firm is considered to be a social institution operated for the benefit of many interested groups, such as stockholders and creditors as well as employees, governments, social groups and others (Hendriksen, 1982, p. 459).

A prominent feature of modern financial reporting is the regulation of the flow of financial information to investors[1]. Regulatory and institutional factors are vital in a capital market because it can boast investor confidence, such as the existence of a security and exchange commission and the adequacy of investor protection laws may influence the functioning of securities markets (World Development Indicators, World Bank, 1999, p. 277). In some countries, eg US, HKC and Australia, the regulators and the accounting professions regulate trading rules and enforce compliance, including financial reporting requirements. But the dual roles of the regulatory bodies and agencies linked to the professions are not clear, eg the SEC and the FASB, although both share similar objectives

[1] Since the primary objective for this thesis is on the informativeness of financial data to the investing community, only investors will be covered.

for financial reporting, such as 'fairness' to investors in securities which are bought and sold in the capital markets. In general, the discussion of accounting standards, accounting concepts, Generally Accepted Accounting Principles (GAAP), legislation of trading in financial institutions and the capital market is very much centred on the US. According to the Financial Accounting Standard Board (FASB) in its Statement of Financial Accounting Concepts No. 1 (SFAC 1, 1978, para. 78), the basic objective of external financial reporting for business enterprises is as follows:

"Financial reporting should provide information that is useful to present and potential investors and creditors and other users in assessing the amounts, timing, and uncertainty of prospective cash receipts ..... Since investors' and creditors' cash flows are related to enterprise cash flows, financial reporting should provide information to help investors, creditors, and others assess the amounts, timing, and uncertainty of prospective net cash inflows to related enterprise"

From the above, it can be seen that financial reporting plays two distinct but related informational roles: (1) to facilitate decision makers such as investors, in selecting the best action needed for investment purposes; and (2) to facilitate contracting between parties, such as management as well as investors for business purposes. Thus, the FASB´s position can be viewed as rendering support for the entity theory. The globalisation of the capital markets has driven many diverse standard-setting bodies towards harmonization of GAAP, many of which adapt the US accounting and regulatory framework (see Brown, 1999).

The Australian Standard Review Board (ASRB)[2] and the Australian Accounting Research Foundation (AARF) in its Statement of Accounting Concepts No. 1 (SAC 1, 1990 updated, para. 7), states the objective of General Purpose Financial Reporting (GPFR) as:

"General purpose financial reports are prepared to provide users with information about the reporting entity which is useful for making and evaluating decisions about the allocation of scarce resources"

Thus, GPFR is a principal source of information for predicting the future potential of the business, and its expected future returns and risk, where the correct decisions derived from the selection and analysis of relevant alternative courses of action are vital when investing in the highly competitive capital market. No doubt this indicates that the ASRB views investors to be the principal users of financial information, however, the GPFR is so widely worded that it could include other users such as management, employees and other stakeholders, a view more consistent with the enterprise theory.

[2] Replaced by the Australian Accounting Standards Board (AASB) in January 2000.

The Hong Kong Society of Accountants (HKSA)[3] in its Statement of Standard Accounting Practice of Hong Kong No. 2.01 (SSAPHK 2.01, 1997, para. 11) states:

"The primary objective of financial statements is to provide information that is useful to users for the purpose of assessing the financial position at a particular point in time and the performance and cash flows of an enterprise during a specified period of time and the stewardship of management during that period...."

In para. 14, the Statement defines the primary users as shareholders (investors) and other users as employees, lenders, suppliers and other trade creditors, customers, governments and their agencies, and the public. While the primary users of financial statements are similar to those mentioned by the FASB and the ASRB/AASB (ie consistent with the entity theory), SSAPHK 2.01 is more explicit in this respect and interestingly, it still retains the stewardship function as one of the primary objectives of financial statements, unlike the FASB or the ASRB/AASB.

In the UK, the Accounting Standards Board (ASB) (1991, paras. 12-13) in its Exposure Draft: *Statement of Principles* defines the objective of financial statements as:

"to provide information about the financial position, performance and financial adaptability of an enterprise that is useful to present and potential investors, employees, lenders, suppliers, and other trade creditors, customers, governments and their agencies and the public in making economic decisions."

In listing a wide range of users, the ASB´s position on financial reporting seems to support the enterprise theory, unlike that of the FASB, ASRB/AASB and SSAPUK.

The relation between the objectives regarding financial reporting and users provided by the accounting authorities of the European Union is rather vague. In general, the accounting authorities of the European Union as well as other internationally influential accounting standard-setting bodies seem to flounder around on the issues of the objectives of financial reporting, user groups, and user needs. Some of the propositions presented seem to support the entity theory while others support the enterprise theory (Troberg and Ekholm, 1995). On an international level, the International Accounting Standards Board (IASB) in Framework for the Preparation and Presentation of Financial Statements (1989, para. 12) states that the objective of financial statements is to provide information about the financial position, performance and changes in financial position of an enterprise that is useful to a wide range of users in making economic decisions. Paras. 13, 15 and 17

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[3] The EGM of the HKSA passed a resolution to change the name of the society to the Hong Kong Institute of Certified Public Accountants while the Chinese title remained unchanged and its membership has already endorsed it on 11th. Nov. 2002. At the time of writing this thesis, the change of name has not taken effect.

specifies that users require an evaluation of the ability of an enterprise to generate cash and cash equivalents and of their timing and certainty, together with information about the performance and profitability of that enterprise. The Framework indicates that users include present and potential investors, employees, lenders, suppliers and other trade creditors, customers, governments and their agencies and the public. Thus, the IASB acknowledges a wide range of users, suggesting that it supports the enterprise theory, ie the firm is considered to be a social institution operated for the benefit of many interested groups, which is consistent to the ASB.

The above requirements issued by the major professional accounting regulatory bodies, such as the FASB, ASB, ASRB/AASB, IASB and HKSA state that users use financial statements in order to satisfy their varying needs for information (see below).

Countries	Bodies	Primary users	Theoretical assumption
UK	ASB	Investors, creditors + other stakeholders	Enterprise
US	FASB	Investors + creditors	Entity
HKC	HKSA	Investors, management	Entity
Australia	ASRB/AASB	Investors + other stakeholders	Enterprise
International	IASB	Investors, creditors + other stakeholders	Enterprise

The balance sheet, the income statement (or profit and loss account) and the various notes and explanations accompanying these statements form the traditional financial statements found in most countries. A part of the growing financial reporting requirement in many countries is the disclosure of cash (or funds) flows statement, in addition to the traditional financial statements. These three statements, together with a director's report and an auditor's report, now form part of many countries' reporting requirements[4]. The disclosure requirements discussed so far are the minimum disclosure requirements set by the various regulatory agencies for each country[5]. Lang and Lundholm (1996) report that

[4] In some countries, detailed official filings are required, either by the security markets or the government, eg the Securities and Exchange Commission (SEC) in the USA requires quoted companies to submit 10-K reports, which contain more details than the traditional accounts and are available to the public.

[5] Besides annual financial reporting, some countries also demand **interim** financial reporting, eg quarterly in the US and semi-annually in most European countries and HKC. While the content of these reports is extremely modest – basically, they contain turnover, profit, taxation, dividends and earnings per share, however, their impact is invaluable (Rees, 1995, p. 28). The more frequent reporting basis of the interim report is more timely than the annual report and therefore the former allows users to adjust their expectations on a more regular basis. Another type of interim statement is the **Preliminary announcement**, which contains the full period of accounts but is limited in content to the interim statement. Preliminary statements are produced shortly after the end of period account and a few weeks before the publication of the formal financial reports.

firms vary substantially in the amount of additional information they provide to the capital markets and even for mandatory disclosures, firms have substantial discretion in the informativeness of the disclosures and the amount of detail provided. More recently, due to pressure from investors and regulators, firms are gradually increasing the amount of voluntary (additional) disclosure to the market and interestingly, the SEC Chairman, Arthur Levitt Jr. has urged firms to disclose material information via the internet (Techweb.com, 15th. December 1999).

The interests of all users in information about a firm have economic dimensions and should therefore be satisfied by such information which is necessary for establishing the firm's intrinsic value. Much theoretical and empirical accounting research have attempted to discover relevant accounting attributes in order to enhance financial statement analysis since the seminal work of Ball and Brown (1968); and Beaver (1968). Researchers found that accounting earnings and some of its components capture information that is contained in security prices. For instance, Brennan (1991, p. 67) states:

"Common sense tells us that accounting information is relevant for valuing stocks. Financial analysts pay large sums for such information, analyze it carefully, and make forecasts about future accounting information (earnings) in justifying their buy and sell recommendations...."

To Ou and Penman (1989a, p. 295):

"Financial statement analysis identifies aspects of financial statements that are relevant to investment decisions...Accounting attributes are inferred to be value-relevant because they are contemporaneously statistically associated with stock prices".

From the comments of Brennan; and Ou and Penman, financial statement analysis is vital to users in making investment decisions to form assessment of stock values. Thus, it is apparent that the accounting standards of the US, UK, HKC, Australia and the IASB state that the primary users of financial statements are investors and the notion of financial data ought to assist them in making future decisions about the value relevance of the firm. Investors are assumed to be long-term owners of ordinary shares and rational, thus, when making an investment or selling an investment already owned, the investor is faced with the problem of predicting the future income and growth potentials of the firm. In addition, they also look at several considerations, such as (1) nature of industry; (2) characteristics of the firm and its financial track records. The income statement and balance sheet provide a rich set of data for investors, such as revenue from products and services, extraordinary items, income tax impacts, earnings, gross and net margin, expenses, cash surplus,

outstanding debt, etc. This shows that the role of investors with regard to financial reporting is an important one because the relation between financial information and security prices can influence investors' demand for financial information.

In summary, nowadays, many countries' reporting requirement consists of the annual financial statements, the minimum disclosure requirements set by the various regulatory agencies for each country. Investors are the primary users of financial statements while information intermediaries are important secondary users. In recent years, due to pressure from investors and regulators, firms are gradually increasing the amount of voluntary (additional) disclosure to the market eg via the internet.

2.2.2 Conceptual Framework of Accounting

Under GAAP, revenues and costs are recognized under the **accrual** basis, rather than on cash basis. In the UK, the Accounting Standard Board (ASB) (1998, revised) in Statement of Standard Accounting Practice (SSAP) No. 2, (b) defines accruals as:

"The 'accruals' concept: revenue and costs are accrued (ie recognised as they are earned or incurred, not as money is received or paid), matched with one another so far as their relationship can be established or justifiably assumed, and dealt with in the profit and loss account of the period to which they relate. Where the accruals concept is inconsistent with the 'prudence' concept (see (d)), the latter prevails".

From the above definition, the accrual concept centres on two important accounting principles: (1) the **revenue recognition principle**; and (2) the **matching principle** (see GAAP, 2000) The revenue recognition principle requires revenue to be recognized when a firm has either performed all, or a substantial portion of services to be provided as well as cash receipt is reasonably certain. The matching principle requires cash outlays associated directly with revenues to be expensed in the period in which the firm recognizes the revenue. In the US, the FASB (1978) in SFAC No. 1, para. 44 pronounces that accruals will improve the ability of earnings to measure firm performance as follows:

"Information about enterprise earnings and its components measured by accrual accounting generally provides a better indication of enterprise performance than does information about current cash receipts and payments"

In Australia, the AASB (1999) in AASB No. 1001, para 7.2.1 recognizes that accrual accounting will provide information that is not available in the cash basis:

"Accrual accounting provides information about assets, liabilities, equity, revenues and expenses, and changes in them, that cannot be obtained by accounting only for cash receipts and payments...Accordingly, the accrual basis is the required accounting basis"

The HKSA (1997) in SSAPHK No. 2.01, para. 20 also considers that accrual accounting basis provides more information in evaluating economic decisions about a firm than the cash basis, as stated below:

"... Financial statements prepared on the accrual basis inform users not only of past transactions involving the payment and receipt of cash but also of obligations to pay cash in the future and of resources that represent cash to be received in the future. Hence, they provide the type of information about past transactions and other events that is most useful to users in making economic decisions".

The IASB (1989, para. 22) states that financial statements are to be prepared under the accrual basis, as they provide the type of information about past transactions and other events that is most useful to users in making economic decisions.

An analysis of the major standard setters indicates that accountants favour the accrual basis over the cash basis because they view that accrual is apparently superior to cash flows in financial reporting. This is hardly surprising considering that the preference of accruals over cash flows in the preparation of financial statements is recognized since the publication of the famous monograph "An Introduction to Corporate Accounting Standards" by Paton and Littleton in 1940. Proponents of accrual argue that the timing of cash flows recognition will be altered to better reflect firm performance. This notion is supported empirically: from a variety of studies shows that equity value is more closely related to accounting information, such as earnings than cash flows (Charitou and Clubb, 1999); that accrual accounting is a more reliable measure of firm performance than cash flows (Dechow, 1994); and that valuation errors are lower when using accrual earning rather than cash flow or dividend discounting techniques (Penman and Sougiannis, 1998). On the other hand, in practice, the use of accruals is problematic in view of the wide discretion over the manner in which accruals are treated by management of firms. This discretion can be used by management either to (1) signal their private information; or (2) manipulate earning figures to suit one's own purpose[6]. In addition, numerous studies have shown that cash flows are useful in explaining returns and they provide information in addition to accruals (eg McLeay et al., 1997; Charitou and Clubb, 2000) and cash flow is more persistent than accruals (Sloan, 1996). The above analyses indicate that both accrual and cash flow information are priced and that the inclusion of both accrual and cash flow variables in returns-earnings or valuation models helps to improve explanatory power.

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[6] Since management is a contractual party, where they are rewarded usually based on firm's reported performance, their personal motives may not be compatible with that of the firm.

Another important GAAP-concept is **Conservative Accounting**, also known as **Conservatism** or **Biased Accounting** or **Biased Recognition**. Conservative Accounting as defined in Ohlson (1995, p. 662) is *"the difference between book and market value"*. Under conservatism, the average Book-to-Market ratio (B/M)[7] is less than one because book value will persistently be below market value of equity (see Beaver, 1998, p. 79; Beaver and Ryan, 2000, p. 128). This should not be confused with a lag or delayed recognition as a lag means that the B/M will be temporary lower (higher) than its mean since the unexpected economic gains (losses) are recognized in book value over time rather than immediately, ie transitory (Beaver and Ryan, 2000, p. 128).

Conservatism occurs because accountants are conservative (prudent) when judging (assigning) a value to an item where its true or intrinsic value is not available. The major accounting standard setters recognize the importance of conservatism and the use of conservatism is contained in most major accounting standards of the world. For instance, FASB (1980), SFAC, No. 2, para. 95 states:

"... if two estimates of amounts to be received or paid in the future are about equally likely, conservatism dictates using the less optimistic estimate".

The above statement implies that accountants must be sceptical about future uncertainties before recognizing an item, and generally, more stringent requirements are imposed for recognizing Revenues and Gains than for recognizing Expenses and Losses (Basu, 1997, p. 9). This implies that in general, conservatism involves choosing lower rather than higher revenues, higher 'cost' or expenses rather than lower 'cost' or expenses, and recognizing unrealised losses but not unrealised gains. Conservatism can also be interpreted as the recognition of 'bad news' more quickly than 'good news' (Basu, 1997, p. 3). Therefore, in general, conservative accounting leads to lower income and lower rates of return, even with growing investments.

Conservatism can also arise in situations where firms systematically invest in positive NPV projects. The problem is the excess present value is not allowed to be recognized as value at the time of acquisition by the historical cost accounting concept even though the excess NPV is eventually reflected in the cash flow and earnings stream of the firm. The application of conservatism may be inconsistent with mandated accounting

[7] This is the inverse of Market-to-Book ratio (B/M). If M/B > 1 will imply conservatism. Depending on the preference of authors, the use of B/M and M/B should provide the same test results and inferences.

principles, eg the recognition of profits of incomplete contracts before completion. The problem with timing of recognition can give rise to conservatism, eg fully-expensing an item (eg research & development expenditure), say in the year of acquisition rather than over a longer period, will lead to lower net income in the year of acquisition but higher income in subsequent years. These imply that conservatism allows management (accountants) to manipulate accounting numbers to suit one's own purposes (eg Lev, 1989; Watts and Zimmerman, 1986; and Basu, 1997).

In the UK, the concept of conservatism (or prudence) is so important that it can even override the concept of accruals where the accruals concept is inconsistent with the prudence concept [ASB, 1998, SSAP No. 2, (c) and (d)]. In contrast to Japan, the principle of conservatism requires an enterprise to make prudent accounting choices and estimates when future events will make negative effects on its financial conditions, but, the principle, however, prohibits too prudent accounting choices and estimates (Kawamura, 2000).

Besides distorting the 'true' value of economic items and the likelihood of manipulating accounting numbers, another major problem with **conservatism is that it indicates growth but does not add value**. Thus, growth is problematic as it confuses investors because it may be due to conservatism or value added activities. This will have a deriding effect on the value of a firm when one uses a valuation model without controlling for conservatism. In Zhang (2000), using an equity valuation model, he hypothesizes and finds that **conservatism increases the valuation impact of book value**. In **section 2.4.1**, I will discuss about the empirical implications of conservatism on equity value.

In summary, despite the major accounting bodies' contention that accrual accounting is a better measure of income than cash flows, advocates of alternative methods of reporting, such as cash flows question the adequacy of accrual accounting, especially its unreliable measurement criteria, subjection to manipulation and presence of information asymmetry, many believe that there are good reasons for expecting both earnings and cash flow data to be useful in the assessment of corporate financial performance. The use of conservatism is contained in most major accounting standards, and as conservatism is persistent, in general, it causes the book values to be lower than market values, which indicates growth but does not add value. Thus, growth is problematic as it confuses investors because it may be due to conservatism or value added activities.

2.2.3 Decline in the Usefulness of Accounting Information and the Needs for the use of Non-Earnings and Non-Accounting Information

Financial information of a firm is viewed as a critical input for financial analysis, but over-reliance on financial statements, even the most naïve analyst will be aware that accounting reports are fallible (Rees, 1995, p. 55). A pertinent problem facing financial statements is its inability to satisfy the differing informational needs of a diverse group of users, who are often in conflict over how and what to use in their respective objectives. In essence, the very basic of the subject of accounting is theoretically weak as it relies on conceptual framework, rules, postulates, laws and even on management's opinions (Rees, 1995; Beaver, 1998).

The usefulness of accounting information in meeting the needs of investors has been questioned from academics and policymakers (accounting professions and regulators) in recent years. In the US, the AICPA (1994), Jenkins Report reviews the appropriateness of financial reporting which culminated with the publication of "Improving Business Reporting-A Customer Focus: Meeting the Needs of Investors and Creditors". It concludes that for the enhancement of users' ability to evaluate and predict firm's performance, financial reporting should focus more on the factors that create value, including nonfinancial measures indicating how key business processes are performing. Relatedly, one of the SEC Commissioners, Steven Wallman (1995, 1996) expresses concern that corporate financial reporting and disclosure is not keeping pace with a dynamic changing business world and recommend that nonfinancial performance measures be used to enhance users' ability to evaluate and predict firms' performance. In 1998 and 1999, the Chairman of the SEC, Arthur Levitt, Jr. expresses concern of the decline in the quality of accounting information, the erosion of investor confidence, the emerging of unethical culture to satisfy analysts rather than face the reality of business performance; and auditors are pressured not to 'rock the boat'. A follow-up project, FASB (2001), "Improving Business Reporting-Insights into Enhancing Voluntary Disclosures", identifies voluntary disclosures to include forward-looking information and intangible (such as company's people) in selected industries such as automobiles, chemicals and pharmaceuticals.

In the UK, a paper by Charles Leadbeater for the Institute of Chartered Accountants in England and Wales (ICAEW) (2000), "New Measures for the New Economy", (p. 2) states: *"Today, economic activity is increasingly intangible"*, and consider that intangible

assets are now more valuable than tangibles, and the traditional accounting system does not provide a reliable measure for intangibles. This is because assets used to produce goods are themselves immaterial, placing greater reliance upon information technology, software, design and personal skills. As a result, it is now more difficult to value firms and stock market values accurately, and in particular, high technology and service companies because their 'market values' are much higher than book values. The report highlights that the M/B has grown especially large for service and high-technology companies (p. 9). For example, in May 1997, the M/B for General Motors was 1.6, compared with 13.4 for Microsoft, and its stock market value of nearly US$1.5 billion was equivalent to that of Boeing, McDonald's, Texaco, Time-Warner and Anheuser-Busch combined. Only about 7% of Microsoft's stock market value was accounted for by traditional tangible assets recorded on its balance sheet while the rest (93%) made up of intangible assets-brands, research and development and human resources expenditures. At about the same time, CPA Australian (2000, July, p. 29) reports that *"The corporate regulator's interest in intangibles resurfaced during 1998, although there was concern within the ASIC*[8] *about non-compliance with amortisation rules for non-current assets, which include intangible assets, during 1996-97"*. This followed the statement made by the ASIC Chairman, Mr. Alan Cameron in March 2000 that:

"Our guiding principle is not that intangible assets are not in some sense real and are, therefore, to be ignored. It is that they must be recognized for what they are, and amortised, like every other asset, in the absence of some compelling reason not to do so".

Hence, the regulators in the US and the accounting professional bodies in the UK, US and Australia view that current accounting practice is not keeping pace with development, in particular with respect to value creation that uses nonfinancial measures and a more appropriate measurement of intangibles. Indeed, Business Week, (28th. August 2000) reports that for the 21st. Century Corporation, human capital is the only asset.

Historically, the focus of organisations was on manufacturing and operational processes, not research and development (*RD*), and the key to success was efficient manufacture of high-volume and low cost products. Today, in view of the more turbulent and competitive markets, many organisations survive, gain competitive advantage through a continued stream of innovative products and services, made possible only by heavy investment in *RD* expenditures, and more advertising (*AD*) and promotional expenditures

[8] Australian Securities and Investments Commission.

(Kaplan and Norton, 1996, p. 99). For example, Starbucks, a prominent coffee chain, much of its operating expenses, on the order of 32% of sales consistently consist of *AD* expenditure. In Easton (1999), both *HR* and *RD* are increasingly viewed as important variables that form part of the assets of a firm: the former is viewed as human capital while the later is considered intangibles. But, many of these companies' performance measurement system remain anchored to the traditional operational efficiencies rather than to the effectiveness and efficiency of *RD* process (p. 100). Under current GAAP (eg SFAS No. 2; SSAP 13; AAS13; and ASRB1011), *AD, HR* and *RD* costs are written off as expenses but they have the quality of assets because they may produce future profits and future earnings may suffer from reduction in these expenditures (see Penman, 2001).

Drawing literature from human resource management (HRM), Lahteenmaki et al. (1998) indicate that human resources are viewed as an asset rather than merely a cost to be minimised; and is increasingly viewed as a role central to organizational success. Similarly, Tyson (1999) states that HR contribute to organizational performance and this is evidenced in the considerable growth of investments in human resources and how management has used HR measures to evaluate company performance. Purcell (1995) indicates that people are valued as a strategic resource and are a critical investment in a firm's performance. The justification for HRM can be found in the contribution to organizational performance, for example, the notion that HR policies produce a unique inimitable combination of capability, organisational values and systems for recruiting, training and developing employees (Huselid, 1995). With this brief review in HRM literature, HR is increasingly viewed as performance enhancing resource that can contribute to an organizational success, a view shared by the accounting academics.

Faced with these difficulties, some measures of failure is experienced by the accounting reporting system as evidenced by numerous large firms' failure, even though the latest accounts of these firms' show an apparently healthy position. In UK, large and 'profitable' firms like BCCI, British and Commonwealth, Coloroll, Maxwell Communications, Mirror Group Newspapers, Poly Peck, Leading Leisure, Cray Electronics, Charterhall and many others have been liquidated in one form or another. Smith (1992) cites creative accounting (manipulation of accounts) for such massive failure by these firms. Jaffa (1998) reports financial scandals involving accounting or auditing failures that lead to massive losses (collapse) of many large corporations, eg Recruit

Scandal, the Guinness Affair, the collapse of Bank of Credit and Commerce International (BCCI), Baring Brothers, the American savings and loan (S&L) industry, and Sumitomo Corporation. More recent corporate failures such as Enron Corporation in 2001 and WorldCom in 2002 are attributed to audit failures, which led to the eventual collapse of their auditors, Arthur Anderson.

On the academic level, the low usefulness of financial information in MBAR were attributed to (1) manipulation of accounting numbers by management and fraud; (2) due to changes in the business and market environment; and (3) lack of nonfinancial performance measure contained in the current financial reporting system. Academics (eg Lev and Ohlson, 1982; Lev, 1989; Kothari, 2001) suggest that non-earnings and alternate data have not adequately researched in CMRA and hence, there was a need for a more explicit use of valuation approaches in market-based accounting research. More recently, the RIVM by Ohlson (1995); and Feltham and Ohlson (1995, 1996) have stimulated much interest in the academic community in using these models to explain and predict security prices by relating prices with accounting variables and other information.

2.2.4 Information in the form of 'Signals' to Investors

On a less structured theoretical basis, relying on the assumption of information asymmetry in the equity market, and the conditions for the establishment of the signalling effect, researchers formulated hypotheses that could assist investors and analysts in evaluating share prices, in which the dividend signalling hypothesis and the leverage (debt) signalling hypothesis are the most prominent. The hypotheses provide that dividends and debt provide a credible signal to the market about a firm value since an incremental increase in a firm's dividends or debt signal expected increases in the firm's future earnings whereas a decrease in dividends or debt signal decreases in future earnings.

For the signal to be established, two conditions must be satisfied (1) the signals must be unambiguous: and (2) managers must have incentive to always give the appropriate signal (see Ross, 1977; Myers and Majluf, 1984; Hands and Landsman, 1999). Presumably, these signals convey information about the value of the firm that cannot be fully communicated by other means, such as annual or interim financial statements or analysts' forecasts (Bhattachacharya, 1979).

2.3. Fundamental Valuation-based Models

Traditionally, investors and analysts tend to focus on the use of the income statements, particularly earnings figures to appraise the value of firms. Recently, the use of the balance sheet approach has gained momentum especially the valuation approach by Edwards and Bell (1961); Ohlson (1995); and Feltham and Ohlson (1995, 1996) in linking accounting and other information to prices. Ou and Penman (1989a, p. 296) indicate that by analysis of published financial statements, we can discover values that are not reflected in security prices. To Penman (2001, p. 11), valuation is the process of converting forecasts to values using an appropriate valuation model, such as the dividend valuation model or the residual income valuation model. Ball and Kothari (1994, p. 228) state that financial statements often are the starting point for investors and analysts in their formulation of forecast for investors and analysts. Financial analysts supplement the information in financial statements with other information, such as management plans and forecasts, industry and macroeconomic data in forming their expectations, and therefore, prices reflect a richer information set than in the current and past time-series of cash flows. As accounting information is not perfect, researchers should recognize the weaknesses of the accounting system, and therefore, the focus on CMRA is not on the quality of accounting information, but rather on the correct analysis of information (Ang and Liu, 1999).

2.3.1 The Residual Income Valuation Model (RIVM)

The conceptual framework of FASB's SFAC No. 1 (1978); AASB's SAC No. 1 (1990); SSAPHK's No. 2.01 (1997); and IAS's Conceptual Framework (1989) state that financial statements should assist investors in assessing the amounts, timing, and uncertainty of future cash flows. With regard to these pronouncements, given the state of a market is efficient, the intrinsic value of a firm is defined as the present value of expected future residual incomes (net cash flows or dividends), discounted at the appropriate risk-adjusted rate of return. The difference between the current price and the intrinsic value of a firm implies the expected reward for investing in its share. In order to have a valuation model in which accounting earnings play a role, it is necessary to consider the balance sheet as well as the income statement (Ohlson, 1991; Beaver, 1998). A recent approach in equity valuation in which both the balance sheet and the income statement are used is the **Residual Income Valuation Models (RIVM)**. There are two approaches taken for the RIVM where Brennan and Schwartz (1982a, 1982b) adopt the non-linear modelling

approach while Ohlson (1995), Feltham and Ohlson (1995, 1996) adopt the linear approach. Brennan and Schwartz (1982a, 1982b) develop a model where the market value of the firm's equity can be expressed in terms of book value and a market to book ratio that depend only on the return of equity:

$$E(V, BV) = \psi(X)BV \tag{2.1}$$

where:

- V = Market value of the firm
- BV = Book value (based on the clean surplus relation)
- X = Rate of return on equity.
- Ψ = Market-Book ratio (non-negative)

Equation (2.1) is non-linear and it is based on the assumptions of zero taxes and transactions costs and trading takes place continuously in an efficient market where the firm is a regulated firm financed entirely by equity funds in which a consistent regulatory policy determines the value maximization investment strategy, such as to set prices at which the output of the firm must be sold.

Motivated by the *RI* approach of Edwards and Bell (1961); and Peasnell (1982), Ohlson (1995) extends the RIVM based on the assumption that a single firm's market value is set in an efficient market with risk neutrality (risk free), no arbitrage, and no information asymmetry (ie homogeneous beliefs of players in the market). Formulating the valuation model relies on three general assumptions. Firstly, price is equal to the present value of expected dividends (PVED), which is actually the DDM:

$$P_t = \sum_{\tau=1}^{\infty} \frac{E_t[DIV_{t+\tau}]}{(1+r)^{\tau}} \qquad \text{(PVED)} \tag{2.2}$$

where:

- P_t = Market value (Price) of the firm's equity at time t
- DIV_t = Net Dividends paid at time t
- r = The assumed constant discount rate (risk-free rate)
- $E_t[\,]$ = Expected value operator conditioned on date t information

Preinreich (1938); Edwards and Bell (1961); and Peasnell (1982) theorise the Clean Surplus Relation (CSR) such that all changes in assets and liabilities unrelated to dividends must pass through the income statement and that non-earnings information must be reflected in earnings at some point. This means that the CSR reconciles the income statement and the balance sheet, and dividends are irrelevant in value creation[9], forming Ohlson's second assumption:

[9] Because dividends reduce current book value but not current earnings.

$$BV_{t-1} = BV_t + DIV_t - NI_t \tag{2.3}$$

where:

- $BV_{t,\,t\text{-}1}$ = Book value of equity at time t, t-1
- NI_t = Net income (Earnings) for the period from t-1 to t.

Next, 'Residual income' (*RI*) or 'Abnormal earnings' is defined as earnings for year t minus a charge for the use of capital (Ohlson, 1995, p. 662), which is expressed as:

$$RI_t \equiv NI_t - rBV_{t\text{-}1} \tag{2.4}$$

Substituting equation (2.4) into (2.3), then into equation (2.2), and assuming the final term to be zero produces the **Residual Income Valuation Model (RIVM)**:

$$P_t = BV_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}]}{(1+r)^{\tau}} \tag{2.5}$$

Equation (2.5) is a restatement of the DDM. Since *RI* is defined as the difference between market and book values, hence, the discounted expected future *RI* of a firm is **unrecorded goodwill (UG)** (see Peasnell, 1981), thus expressing (2.5) in the form of UG:

$$P_t = BV_t + UG_t \tag{2.6}$$

But *RI* in any period will not capture the expected changes in unrecorded goodwill and since this is an infinite series, testing for the RIVM is troublesome, very much like the problem one encounters using the DDM. Hence, to facilitate the operationalisation of the model, the third and final assumption specifies that an additional structure, known as the **linear information model/dynamics (LIM/LID)** is required to link observable variables and expected *RI*. In Ohlson (1995), it is assumed that two random variables: (1) residual income; and (2) other information (v_t) enter the information dynamics. v_t is included into the dynamics to capture other relevant information other than those information already contained in earnings, in future expected *RI*. However, v_t is not defined in any of Ohlson-Feltham papers, except that it is stated as other relevant information other than current or past earnings (Ohlson, 1995, p. 665). Under the assumptions of the dynamics, both LIM1 and LIM2 must satisfy the following autoregressive (AR(1)) process:

$$RI_{t+1} = \omega RI_t + v_t + \varepsilon_{1,t+1} \quad \text{[O(95)-LIM1]} \tag{2.7}$$

$$v_{t+1} = \gamma v_t + \varepsilon_{2,t+1} \quad \text{[O(95)-LIM2]} \tag{2.8}$$

where:

- v_t = A summarizing value that captures all nonaccounting information used in the prediction of future *RI*, independently of current and past *RI*, ie v_t is observable at end of period t. Realizations of v_t (or ε_{2t}) must pass through the income statements and these realizations must be fed into RI_{t+1}, RI_{t+2} … and so on and *RI* in turn updates the date t book value via the CSR.

- ω = Fixed persistence parameter for *RI* ($0 \leq \omega < 1$), which reflects the extent to which the current level of *RI* (monopoly rents) is likely to persist into the future, but market competition will force excessive earnings towards the cost of capital in the long run. The lower bound of this restriction is dictated by a firm's economic activities or its accounting principles or empirical observation while the upper bound is required to achieve stationarity. If $\omega = 1$, *RI* is expected to persist indefinitely.

- γ = Fixed persistence parameter ($0 \leq \gamma < 1$) for other information, which is assumed to persist in the beginning but will not have a long-term effect on future other information. Similar to ω, the lower bound of this restriction is dictated by economic reasoning or its accounting principles or empirical observation while the upper bound is required to achieve stationarity. v_t is expected to converge towards zero from its current level.

- $\varepsilon_{1t}\, \varepsilon_{2t}$ = Mean-zero disturbance term.

The effect of the LID can be readily verified by examining the varying values for the parameters for γ and ω by the introduction of a one time shock to v at $t = 1$.

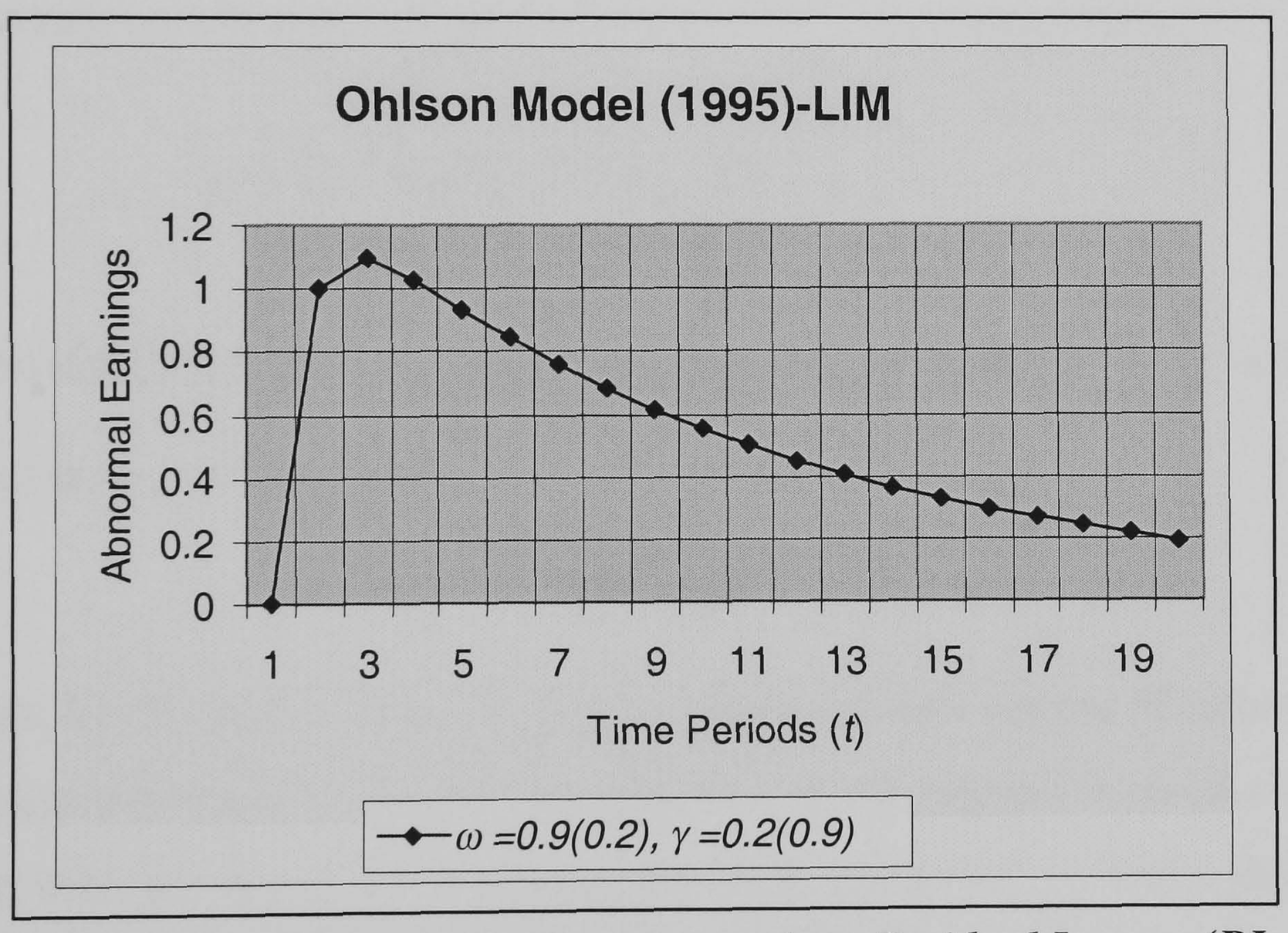


Figure 2.1 – Effect of a One unit shock to v at $t = 1$ on *Residual Income* (RI_{t+1}) (LIM1) where $\gamma = 0.9$ and $\omega = 0.2$ or $\gamma = 0.2$ and $\omega = 0.9$[10]

From the graph, if the assumed economic condition holds, expected *RI* is assumed to be zero over an infinite time period (ie $E(RI_t) = 0$ as $\tau \rightarrow \infty$). Under such condition, the expected *RI* dynamics is in the form of **unbiased accounting**. Thus, modelling of future *RI* is consistent with competitive advantage that allows for the initial superior earnings returns

[10] Numerous tests for various combinations of persistence for ω and γ for LIM1 & 2 were done, however, due to space constraint of this thesis, only a selection is shown.

(ie accounting earnings in excess of the cost of capital, k), but would diminish in subsequent years due to competition. An advantage of the LIM is that it is flexible and it can be modified to suit a particular methodology. For instance, Stark (1997) uses Ohlson (1989), assuming both the CSR and dividend irrelevancy holds to model the LID in which variables (earnings) can be partitioned. If the partition is to be useful (partition usefulness) in providing value-relevance information, the valuation coefficients for variables in any partition should be different (in terms of sign).

For equation (2.7), given a unit of current *RI* in year 0, *RI* in year 1 is expected to be ω, the *RI* in year 2 is expected to be ω^2, and so on, the present value of the series for use in equation (2.5)[11] is:

$$PV = \frac{\omega}{1+r} + \left(\frac{\omega}{1+r}\right)^2 + \left(\frac{\omega}{1+r}\right)^3 + \ldots \tag{2.9}$$

Multiplying both sides of equation (2.9) by $\frac{(1+r)}{\omega}$ and simplifying:

$$PV\left(\frac{1+r}{\omega}\right) = 1 + \left(\frac{\omega}{1+r}\right) + \left(\frac{\omega}{1+r}\right)^2 + \ldots \tag{2.10}$$

Subtracting (2.9) from (2.10) and exclude the last term $\left(\left(\frac{\omega}{1+r}\right)^{\infty} \to 0\right)$ in each equation and let α_1 = PV produces:

$$\alpha_1 = \frac{\omega}{(1+r-\omega)} \tag{2.11}$$

Thus, the *RI* multiplier (α_1) in Ohlson (1995) converts current *RI* information into the PV of expected future *RI*. Since v_t is modelled as an autoregressive process that links to *RI*, thus, v_t will have the effect of raising $E(RI_{t+1})$ thereafter by v_t. Hence, the change to $E(RI_{t+1})$ will change the value at t+1 of the firm's equity by:

$$\frac{1}{(1+r)}\left[1 + \frac{\omega}{(1+r-\omega)}\right] \tag{2.12}$$

Since v_t follows an AR(1) process, which means that $E(v_t) = \gamma v_t$, $E(v_{t+1}) = \gamma v^2{}_t$, etc., this will also affect *RI* in t+1, t+2, and so on. Thus, the total effect on the value of the firm's equity of v_t can be extended from equation (2.12):

---

[11] v is not required since it is directly fed from the v_{t+1} dynamics.

$$\left[\frac{\gamma}{(1+r)}+\frac{\gamma^2}{(1+r)^2}+\frac{\gamma^3}{(1+r)^3}+\ldots\right]\left[\frac{1+r}{\gamma(1+r-\omega)}\right] \tag{2.13}$$

Thus, the LHS of (2.13) is now in PV for a series of expected γ, which is similar to equation (2.9) and by following the same procedure as before generates:

$$PV=\frac{\gamma}{(1+r)}+\left(\frac{\gamma}{1+r}\right)^2+\left(\frac{\gamma}{1+r}\right)^3+\ldots \tag{2.14}$$

Multiplying both sides of equation (2.14) by $\frac{1+r}{\gamma}$ and simplifying:

$$PV\left(\frac{1+r}{\gamma}\right)=1+\left(\frac{\gamma}{1+r}\right)+\left(\frac{\gamma}{1+r}\right)^2+\ldots \tag{2.15}$$

Subtracting (2.14) from (2.15) and exclude the last term in each equation produces:

$$PV=\frac{\gamma}{(1+r-\gamma)} \tag{2.16}$$

Substitute (2.16) into the RHS of (2.13) and let α_2 = PV produces:

$$\alpha_2=\frac{1+r}{(1+r-g)(1+r-\omega)} \tag{2.17}$$

Hence, α_2 is the multiplier for the present value of the effect of other information (v_t) on *RI* in Ohlson (1995). The market value (price) of the firm can now be expressed as: (1) book value (BV_t); (2) the expectation of the PV of future *RI*, derived from the current level of *RI*; and (3) the expectation of the PV of future *RI*, derived from the current level of v_t that has not yet been captured in current *RI*:

$$P_t=V_t=BV_t+\alpha_1 RI_t+\alpha_2 v_t \tag{2.18}$$

Where:

- $\alpha_1=\frac{\omega}{(1+r-\omega)}$
- $\alpha_2=\frac{1+r}{(1+r-\omega)(1+r-\gamma)}$

The valuation model can also be viewed as a weighted average of an earnings model and a book value model instead of *RI*. By this restatement, abnormal earnings are replaced by accounting earnings in the valuation model. Replace abnormal earnings with earnings using the CSR equation of (2.3) in (2.18).

$$V_t = BV_t + \alpha_1\left[NI_t - r\left(BV_t + DIV_t - NI_t\right)\right] + \alpha_2 v_t$$
$$= BV_t - \alpha_1 rBV_t + \alpha_1 NI_t + \alpha_1 rNI_t - \alpha_1 rDIV_t + \alpha_2 v_t$$
$$= BV_t\left(1-\alpha_1 r\right) + \alpha_1 NI_t\left(1+r\right) - \alpha_1 rDIV_t + \alpha_2 v_t$$
$$= BV_t\left(1-k\right) + \frac{kNI_t\left(1+r\right)}{r} - kDIV_t + \alpha_t v_t \qquad (\text{Let } k = \alpha_1 r)$$
$$\therefore V_t = BV_t\left(1-k\right) + k\left(\varphi NI_t - DIV_t\right) + \alpha_2 v_t \qquad (2.19)$$

where:

- $\phi = \dfrac{1+r}{r}$
- $k = \dfrac{r\omega}{1+r-\omega}$ (since $\alpha_1 = \dfrac{\omega}{(1+r-\omega)}$)
- $\alpha_2 = \dfrac{1+r}{(1+r-\omega)(1+r-\gamma)}$

But, note:

- ϕ acts as earnings-multiplier for this model.
- k has a one-to-one relation with ω and α_1.
- Since $0 \leq \omega < 1$ and so k must be $0 \leq k < 1$
- But $k \neq \omega$.

When $\omega = k = 1$ and $v_t \equiv 0$, formula (2.19) reduces to a 'pure' earnings model:

$$V_t = \phi NI_t - DIV_t \qquad (2.20)$$

When $\omega = k = 0$ and $v_t \equiv 0$, formula (2.19) reduces to a 'pure' book values model:

$$V_t = BV_t \qquad (2.21)$$

Ohlson (1995) indicates that the 'earnings' valuation model in the form of the weighted-average of capitalized earnings and book value still provides the core of the valuation function in accounting because economic events are recognized only after a time delay and accounting data is an incomplete indicator of value (eg recognition of profits in long-term contracts). Both versions of Ohlson (1995) are modelled under unbiased accounting, ie there is no growth; zero NPV investment and there would be no understatement or overstatement of equity book values. Therefore, unrecorded (unconditional) goodwill is zero, ie $E_t[UG_{t+\tau}] = 0$ as $\tau \to \infty$. On the other hand, if unrecorded goodwill is greater than zero, ie $E_t[UG_{t+\tau}] > 0$ as $\tau \to \infty$, a firm's market value exceeds its book values. This means that there is an understatement of operating assets, and an understatement of earnings or an overstatement of expenses. The source of this understatement of operating assets/earnings is attributed to the use of accounting

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conventions for accrual, eg the use of accelerated depreciation will lower earnings/book values compared with straight-line depreciation, resulting in conservative accounting. Thus, conservative accounting affects both the net income and the book value components of *RI*, and hence, with conservative accounting, **earnings and book values are not sufficient for firm valuation; book values of operating assets are also required**.

Feltham and Ohlson (1995) extend the Ohlson (1995) model to examine how conservatism (accrual accounting) relates to the valuation of a firm's equity by segregating a firm's net assets into financial and operating assets, which are disclosed at each period. Further, separating accounting information in terms of financial and operating activities is more meaningful as it provides better disclosure because for financial assets, book and market values coincide, but not operating assets, because on average, the book values of operating assets are lower than market values. Since the value of financial activities = 0, and by separating activities into financial and operating activities, residual income equals operating residual income, ie $RI_t = ORI_t$. Thus, ORI_t can be inferred from the RI-equation (formula (2.5)) in the form of:

$$ORI_t \equiv OE_t - rOA_{t-1} \quad \text{(ORI)} \tag{2.22}$$

where:

- ORI_t = Operating residual income at time t
- OE_t = Operating Earnings at time t
- OA_{t-1} = Operating Assets at time t-1

The Feltham and Ohlson (1995) model makes use of the same DDM, CSR, RI and RIVM to base their LIM to relate accounting and other information variables with market values. By focusing on the operating activities, and the LIM as the basis for the prediction of future operating residual income (ORI_{t+1}) that depends on (1) current operating residual income (ORI_t); (2) current operating assets (OA_t); and (3) other information (v_t), and assuming that all information follows a linear AR(1) as in Ohlson (1995), the information dynamics can be represented as:

$$ORI_{t+1} = \omega_{11} ORI_t + \omega_{12} OA_t + v_{1t} + \varepsilon_{1t+1} \quad \text{[FO(95)–LIM1]} \tag{2.23}$$

$$OA_{t+1} = + \omega_{22} OA_t + v_{2t} + \varepsilon_{2t+1} \quad \text{[FO(95)–LIM2]} \tag{2.24}$$

$$v_{1t+1} = + \gamma_1 v_{1t} + \varepsilon_{3t+1} \quad \text{[FO(95)–LIM3]} \tag{2.25}$$

$$v_{2t+1} = + \gamma_2 v_{2t} + \varepsilon_{4t+1} \quad \text{[FO(95)–LIM4]} \tag{2.26}$$

where:

- Priori restrictions on the parameters are imposed to ensure that the convergence/divergence of these variables is appropriate as follows:

(i) $0 \leq |\gamma_h| < 1,\ h = 1,2$
(ii) $0 \leq \omega_{11} < 1$
(iii) $1 \leq \omega_{22} < (1 + r)$
(iv) $\omega_{12} \geq 0$

Condition (i) ensures that the random events influencing other information have no long run effect on future other information, ie $E_t[v_{ht+\tau}] \rightarrow 0$ as $\tau \rightarrow \infty$, h=1,2. The other information is needed in the prediction of abnormal earnings and operating assets, and their realizations must pass through the income statement (same as Ohlson, 1995).

Condition (ii) restricts the persistence in abnormal earnings, ie $\omega_{11} \geq 0$ (lower bound) eliminates implausible oscillating persistence while $\omega_{11} < 1$ (upper bound) permits positive (or zero) persistence, but implies the effect decays with time. This assumption is the same as Ohlson (1995). Thus, $\frac{\partial E_t[ORI_{t+\tau}]}{\partial ORI_t} \rightarrow 0$ as $\tau \rightarrow \infty$.

Condition (iii) restricts the long run growth in operating assets. The lower bound ($\omega_{22} \geq 1$) is necessary and sufficient to rule out $E_t[ORI_{t+\tau}] = E_t[OE_{t+\tau}] = 0$ as $\tau \rightarrow \infty$ to ensure that the firm's operations are a going concern context. The upper bound ($\omega_{22} < 1 + r$) eliminates growth paradoxes, which is necessary for absolute convergence in the present value calculations of expected operating residual income.

Condition (iv) is consistent with the definitions of unbiased and conservative accounting. If $\omega_{12} = 0$, unbiased accounting results but if $\omega_{12} > 0$, conservative accounting results. However, Feltham and Ohlson (1995, p. 703) rules out unbiased accounting as it is not consistent with real world accounting. For unbiased accounting ($\omega_{12} = 0$), $E_t[ORI_{t+\tau}] \rightarrow 0$ and $E_t[p_{t+\tau} - BV_{t+\tau}] \rightarrow 0$ as $\tau \rightarrow \infty$ irrespective of the values for ω_{11}, and there will be no asymptotic growth. The parameter, ω_{22} determines asymptotic growth:

- $\omega_{22} > 1$ is a growth setting; and
- $\omega_{22} = 1$ is a no growth setting

Hence, for the dynamics to hold under conservative accounting and asymptotic growth, $\omega_{12} > 0$ and $\omega_{22} > 1$, ie there will be growth in both $E_t[ORI_{t+\tau}] \rightarrow 0$ and $E_t[OA_{t+\tau}] \rightarrow 0$ as $\tau \rightarrow \infty$.

The behaviour of the LIM can be readily verified by examining the varying values for the parameters for the variables by the introduction of a one time shock to v at $t = 1$.

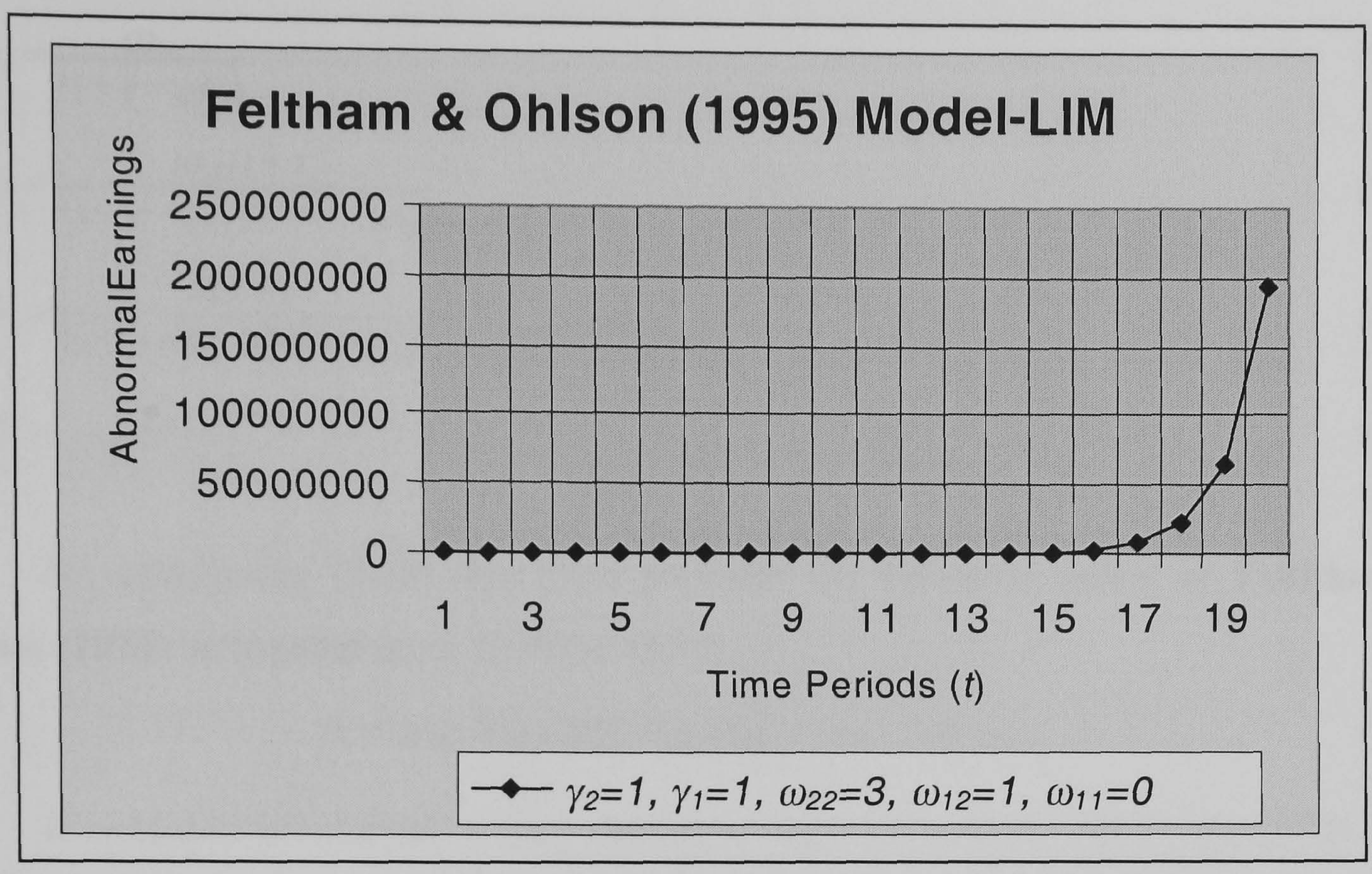


Figure 2.2 – Effect of a One unit shock to v at $t = 1$ on *Operating Residual Income* (ORI_{t+1}) (LIM1) where $\gamma_1 = 1$, $\gamma_2 = 1$, $\omega_{22} = 3$, $\omega_{12} = 1$, and $\omega_{11} = 0$

Since financial assets are assumed to reflect market value (see Feltham and Ohlson, 1995, p. 694-5; Lo and Lys, 2000a, p. 351), only operating assets are expected to generate residual income in the form of goodwill. By expressing equation (2.6) in the form of *ORI* and multiplying this equation with $(1 + r)$ on both sides, one derives:

$$(1+r)UG_t = E_t[UG_{t+1} + ORI_{t+1}] \tag{2.27}$$

Based on equation (2.6), valuation can be defined in terms of unrecorded goodwill and using FO(95)-LIM1 (equation (2.23)), one can conjecture a linear closed-form solution:

$$UG_t = \alpha_1 ORI_t + \alpha_2 OA_t + \beta_1 v_t + \beta_2 v_t \tag{2.28}$$

Substituting equation (2.28) and equation (2.23) into equation (2.27):

$$(1+r)(\alpha_1 ORI_t + \alpha_2 OA_t + \beta_1 v_t + \beta_2 v_t) = (\alpha_1 ORI_{t+1} + \alpha_2 OA_{t+1} + \beta_1 v_{t+1} + \beta_2 v_{t+1}) + (\omega_{11} ORI_t + \omega_{12} OA_t + v_{1t}) \tag{2.29}$$

Substituting ORI_{t+1}, OA_{t+1}, v_{1t+1} and v_{2t+1} but ignoring the error terms, ε_{1t+1} to ε_{2t+1} from FO(95)-LIM1 to LIM4 (equation (2.23) to (2.26)) into (2.29):

$$(1+r)\alpha_1 ORI_t + (1+r)\alpha_2 OA_t + (1+r)\beta_1 v_t + (1+r)\beta_2 v_t = \left[\alpha_1(\omega_{11} ORI_t + \omega_{12} OA_t + v_{1t}) + \alpha_2(\omega_{22} OA_t + v_{2t}) + \beta_1(\gamma_1 v_{1t}) + \beta_2(\gamma_2 v_{2t})\right] + (\omega_{11} ORI_t + \omega_{12} OA_t + v_{1t})$$

Since the equation must hold for all values of ORI_t, OA_t, v_{1t} and v_{2t}, rearranging the equation will produce:

- $\alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})}$ (2.30)
- $\alpha_2 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})}$ (2.31)
- $\beta_1 = \frac{(1+r)}{(1+r-\omega_{11})(1+r-\gamma_1)}$ (2.32)
- $\beta_2 = \frac{\alpha_2}{(1+r-\gamma_2)}$ (2.33)

By substituting (2.28) into (2.6) produces the valuation model of **Feltham and Ohlson (1995)** with parameters (2.30) to (2.33).

$$P_t = BV_t + \alpha_1 ORI_t + \alpha_2 OA_t + \beta_1 v_{1t} + \beta_2 v_{2t} \quad (2.34)$$

If unbiased accounting is such that $\alpha_2 = \omega_{12} = \beta_2 = 0$, the model simplifies to the Ohlson (1995) model. For more discussion of FO (1995), see Clubb (1996).

Feltham and Ohlson (1996) went one step further by examining more closely the constituents of conservative accounting. They theorise conservative accounting is the result when either (1) depreciation policy is conservative; or (2) the firm undertakes positive NPV investments. (1) occurs when a firm chooses an accelerated depreciation policy as against a straight-line method. If either (1) or (2) or both are present, growth (conservative accounting) results and a firm's market and book values will differ. As in all previous OFF, they begin with the assumption that a firm's market value is the DDM. Next, they assume that operating cash receipts (CR_{t+1}) and investments in operating assets (CI_{t+1}) are specified in terms of an autoregressive time-series **cash-flow dynamics (CFD)** process as:

$$CR_{t+1} = \gamma CR_t + kCI_t + \tilde{\varepsilon}_{1,t+1} \quad \text{[FO(96)-LIM1]} \quad (2.35)$$

$$CI_{t+1} = \omega CI_t + \tilde{\varepsilon}_{2,t+1} \quad \text{[FO(96)-LIM2]} \quad (2.36)$$

where:

- γ = Fixed persistence parameter for operating cash receipts. $0 \leq \gamma < 1$. γ is particularly important for depreciation policies.
- $k > 0$ = Impact of date t investment on date $t+1$ cash receipts.
- ω = Expected growth in cash investments. $0 \leq \omega < (1 + r)$ where $(1 + r)$ is 1 + growth rate in investments. $0 \leq \omega < 1$ implies an expected decline in investments. $\omega = 1$ = no expected growth, $\omega > 1$ = positive expected growth in cash investments.
- $\omega = \varepsilon_{1,2t+1}$, k=1,2 = Mean-zero disturbance terms, ie $E_t[e_{kt+1}] = 0$ for all $\tau \geq 1$.

Feltham and Ohlson (1996, p. 212) indicate that the model implies that investments [FO(96)-LIM2] have 'infinite lives' but future cash receipts [FO(96)-LIM1] are expected to decay at a constant rate $1 - \gamma$. Based on O (1995); and FO (1995), Ahmed et al. (2000) infer the LIM for *ORI* as:

$$ORI_{t+1} = \omega_{11} ORI_t + \omega_{12} OA_{t-1} + \omega_{13} CI_t + \varepsilon_{1t+1} \tag{2.37}$$

This effect can be readily verified by examining the varying values for the parameters for operating cash investments (ω), operating cash receipts (γ) and impact of cash investments *(k)* by the introduction of a one time shock to *CI* at $t = 1$.

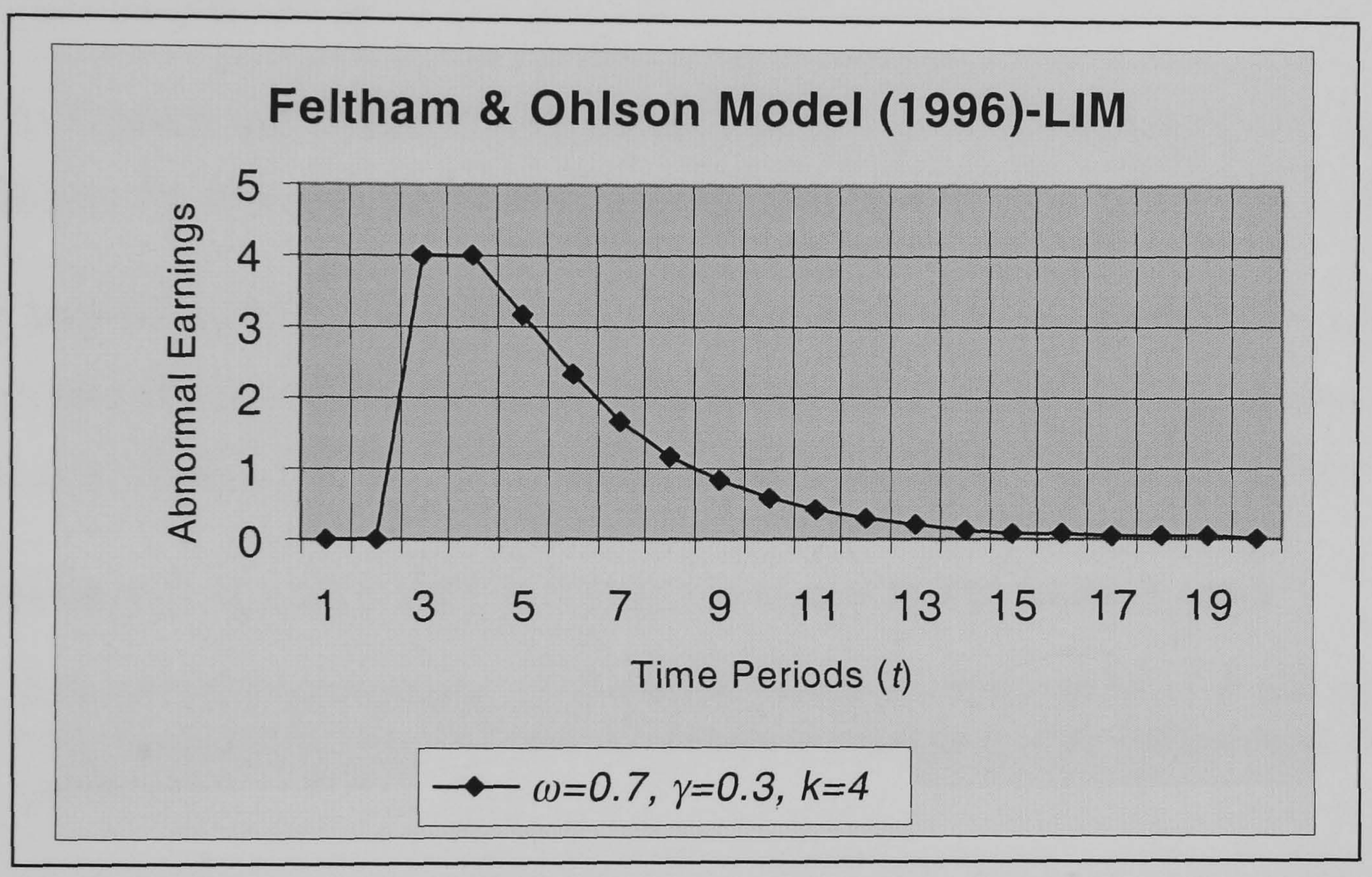


Figure 2.3 – Effect of a One unit shock to ω at $t = 1$ on *Operating Cash Receipts* (CR_{t+1}) (LIM1) where $\omega = 0.7$, $\gamma = 0.3$, $k = 4$

Feltham and Ohlson (1996) assume that operating assets (OA_t) follow the CSR:

$$OA_{t+1} = OA_t + CI_{t+1} - Dep_{t+1} \tag{2.38}$$

where Dep_t is the depreciation expense for period t:

$$Dep_t \equiv (1-\delta) OA_{t-1} \tag{2.39}$$

where

- $0 \leq \delta < 1$ = A simple declining balance depreciation policy (method) which determines the depreciation rate $(1 - \delta)$

Using the cash flow and investment dynamics [FO(96)–LIM1&2], the CSR, the definitions of operating earnings and operating residual income, the relation between market value (V_t) and accounting numbers can be expressed as a linear function of

operating assets (OA_t), operating residual income (ORI_t), beginning-of-period operating assets (OA_{t-1}), and current investments in operating assets (CI_t):

$$V_t = OA_t + \alpha_1 ORI_t + \alpha_2 OA_{t-1} + \alpha_3 CI_t \quad (2.40)$$

where:

- $\alpha_1 = \dfrac{\gamma}{(1+r-\gamma)}$
- $\alpha_2 = \dfrac{(1+r)(\gamma-\delta)}{(1+r-\gamma)}$
- $\alpha_3 = \dfrac{1+r(k-1+r+\gamma)}{(1+r-\omega)(1+r-\gamma)}$

In Feltham and Ohlson (1996), depreciation policy and current (economic) events can influence the difference between market value and book value resulting in (p. 220):

1. **No growth** ($E_t[UG_{t+\tau}] \to 0$, $E_t[V_{t+\tau}] \to 0$ as $\tau \to \infty$, $\omega = 1$). Depreciation policy is irrelevant ($\delta = \gamma$) since economic earnings always = accounting earnings, accounting is unbiased ($E_t[V_{t+\tau}] \to 0$ as $\tau \to \infty$) and the model is consistent with Ohlson (1995).

2. **Growth** ($E_t[UG_{t+\tau}] > 0$, $E_t[V_{t+\tau}] > 0$ as $\tau \to \infty$, $\omega > 1$). The source is either:

   - **Conservative accounting**. Depreciation policy is irrelevant ($\delta = \gamma$) and positive NPV investments ($\phi k > 1$) and the model is consistent with Feltham and Ohlson (1995); or

   - **Depreciation policy is conservative** ($\delta < \gamma$)[12] and zero NPV investments ($\phi k = 1$).

Feltham and Ohlson (1996) also introduce other information to form a more general setting. This other information influences market values because current residual income does not suffice to determine current goodwill unless the accruals (ie the depreciation) expense appropriately reflects the other information (p. 220). They extend the CFD models via two random variables, v_{1t} and v_{2t}, which represent additional date t information concerning subsequent cash flows **(CFD-E)**, thus:

$$CR_{t+1} = \gamma CR_t + kCI_t + v_{1t} + \varepsilon_{1,t+1} \quad \text{[FO(96)-CFD-E1]} \quad (2.41)$$

$$CI_{t+1} = \omega CI_t + v_{2t} + \varepsilon_{2,t+1} \quad \text{[FO(96)-CFD-E2]} \quad (2.42)$$

where:

- $E_t[v_{kt+\tau}] = 0$ for all $\tau \geq 1$ and, as before, $E_t[\varepsilon_{kt+\tau}] = 0$, all $\tau \geq 1$, $k = 1, 2$.

[12] The depreciation parameter (δ) is less than the cash receipts parameter (γ).

In CFD-E, the expectation $E_t[CR_{t+\tau}]$ depends on v_{1t} as well as (CR_t, CI_t) and are more intricate than CFD (without other information) due to more uncertainty. As usual, based on the CSR for depreciation policy with parameters (δ_1, δ_2, δ_3) and combining DDM (equation (2.6)) with CFD-E yields a valuation model such that V_t depends on CR_t, CI_t, v_{1t} and v_{2t} linearity:

$$V_t = OA_t + \alpha_1 ORI_t + \alpha_2 OA_{t-1} + \alpha_3 CI_t + \beta_1 v_{1t} + \beta_2 v_{2t} + \beta_3 \varepsilon_{1t} \qquad (2.43)$$

where:

- $\alpha_1 = \Phi\gamma$
- $\alpha_2 = \Phi(1+r)(\gamma-\delta)$
- $\alpha_3 = (\Phi k - 1)\dfrac{1+r}{(1+r-\omega)}$
- $\beta_1 = \Phi r \delta_2$
- $\beta_2 = \Phi(\Phi k - 1)\dfrac{1}{(1+r-\omega)}$
- $\beta_3 = -\Phi(1+r)\delta_3$

With investment = zero NPV ($\Phi k = 1$) and a depreciation policy (δ_1, δ_2, δ_3) and $= (\gamma, \dfrac{1}{1+r}, 0)$, all items but the first two vanish in V_t.

It is the work of Ohlson that receives the most attention as an alternative to the DDM (Palepu et al., 1996). The development of the OFF shows the **relevance of residual income as a variable that influences a firm's value**. This makes the OFF the first formal model that uses accounting variables instead of other surrogates in relating a firm's value.

In summary, this section has presented the valuation approach of the RIVM focusing on the models of Ohlson (1995) and Feltham and Ohlson (1995, 1996), which are referred to as the Ohlson-Feltham Framework (OFF) in this thesis. The OFF uses the concepts of CSR and residual income to express price (value) as the sum of book value and the present value of future residual income. Since the valuation model is an infinite series, Ohlson (1995) overcomes this problem by using an information dynamics in linking observable variables with expected residual income. Their contribution to CMRA constitutes a breakthrough as they use accounting fundamentals instead of other surrogates in modeling market values for the first time.

2.4. Testing for the Relevance of Accounting and other Information in the Capital Market

Traditionally, the choice of information used by investors/analysts to explain/forecast future security prices is very much based on accounting earnings. Increasingly, cash flow data is used in conjunction with earnings to form assessment of security prices and firms' performance. However, both accounting earnings and cash flow suffer from imperfection of measurement of financial numbers, giving rise to the problems of conservatism, and timing and matching problems respectively. The usefulness of earnings and cash flows in meeting the needs of investors and creditors has been questioned in many quarters in recent years, notably in the US, UK, Australia and even New Zealand, and hence, the use of non-earnings and nonfinancial measures have surfaced in recent CMRA literature.

2.4.1 Effect of Accounting Conservatism on Security Returns and Equity Values

Based on FO (1995), Stober (1996) investigates the extent to which accounting book values are **conservative** relative to market values, by documenting the behaviour of M/B value ratios over the 30 year period 1964-1993 using nonfinancial firms totalling 74,392 firm-year observations obtained from Compustat. If heteroscedasticity is present, specifications with an intercept where the number of shares is used as a deflator, White's standard errors can severely understate the true standard errors. Hence, the estimating equations are expressed in per share basis without an intercept for the valuation models:

$$P_{it} = BV_t + \alpha_1 ORI_{it} + \alpha_2 OA_{it} + e_{it} \quad (2.44)$$

$$P_t = \alpha_1 ORI_{it} + \alpha_{2'} BV_{it} + e_{it} \quad (2.45)$$

In estimating the coefficients α_1 and α_2 in (2.44) and (2.45), Stober treats the coefficients as if they are the same across all firms within each year instead of the closed-form approach adopted by the OFF. Estimates of α_{1t} are statistically significantly positive in both (2.44) and (2.45). Positive estimates of α_{1t} are consistent with FO (1995) model and indicate that excess abnormal operating earnings are valued positively by the market (p. 13). However, only the last 21 years out of the total 30-year sample period meet the theoretical restriction of the upper bound of 1 on the parameter ω_{11} (*ORI*) in the LID. The estimates of $\alpha_{2'}$, which is the conservatism parameter of book value in equation (2.45) is >

1.0 and significant in all years except for 1973-79 and 1981, a total of 22 years of 30 years. This is consistent with the evidence that the median M/B > 1.0 in all years except for 1973-77 and 1979. He did not explain why the period 1973-1977 and 1979 of the sample were inconsistent to conservatism. This evidence quite strongly indicates that M/B is a good approximates of conservatism, and that α_2, captures conservatism. Thus, the restrictions on the parameters of the LIDs and the valuation model based on unbiased accounting by Ohlson (1995) would be rejected (Stober, 1996, p. 14). In (2.44), the conservatism parameter of operating assets, α_2, > 1.0 and significant in all years except for 1973-79, where they are negatives and significant (except for 1981 where it is insignificant), a total of 22 years of 30. This is consistent with the evidence for both the median of M/B, and α_2, of (2.45). The result on M/B and the cross-sectional estimation of both (2.44) and (2.45) supports the notion that *MV* differs from *BV* because *BV* is conservative, except for the period 1973-1979. To test whether the coefficients of (2.44) and (2.45) vary across firms using the parameters in the LID estimated from time-series, on a firm-by-firm basis, Stober (1996) formulate the following equations (the first two are for the LID for (2.44)):

$$RI_t = \omega_{11} RI_{t-1} + \omega_{12} BV_{t-1} + \varepsilon_{1t} \quad (2.46)$$

$$BV_t = \omega_{22} BV_{t-1} + \varepsilon_{2t} \quad (2.47)$$

$$RI_t = \omega_{11} RI_{t-1} + \omega_{12} OA_{t-1} + \varepsilon_{1t} \quad (2.48)$$

$$OA_t = \omega_{22} OA_{t-1} + \varepsilon_{2t} \quad (2.49)$$

Consistent with the theoretical assumption of the LID in FO (1995), the above equations are estimated in total, not per share basis. Estimation results for both LIDs are similar. Most estimates of the persistence parameter, ω_{11} lie between 0 and 1, which is within the plausible bounds set by FO (1995). The median for both is approximately 0.4. The results of the estimates of the growth parameter, ω_{22} show that more than half of these estimates are < 1.0, the theoretical lower bound of the LID in FO (1995), but most of them are within the upper bound of ρ (ie $r + R_f$ [13]). This indicates that the parameters estimated are not consistent with the theoretical assumption of the LID in FO (1995), or that the parameters are estimated with errors, which is likely to result in downward bias (Stober, 1996, p. 16). The estimated parameter, ω_{12} representing either unbiased ($\omega_{12} = 0$) or conservative ($\omega_{12} > 0$) accounting for both models have similar values and patterns.

[13] In the LIM of Feltham and Ohlson (1995), the upper bound is less than $(1 + r)$.

Almost 75% of these estimates are less than 0, which are largely inconsistent to the theory of the LID in FO (1995).

Basu (1997) compares the effect of good and 'bad news' on conservatism by testing the timeliness of earnings announcement with regard to good and 'bad news'. He finds that both the coefficient and R^2 for negative returns (proxy for 'bad news') and positive returns (proxy for 'good news') are generally higher for 'bad news' than 'good news' (slope coefficient of 'bad news' is 4.66 times that of 'good news') and R^2 for negative returns is 6.64% for 17,790 firms vs. 2.09% for 25,531 firms for positive returns. Thus, he concludes that the recognition of 'bad news' is more quickly than 'good news'. Following Basu (1997), Pope and Walker (1999) develop a formal analysis to 'measure' the different speed of recognition of good and 'bad' news in order to capture two distinct consequences of conservative accounting: (1) delay in reporting 'good' news; and (2) early recognition of 'bad' news. The model based on 'reverse regression' to determine how quickly accounting data is captured in stock prices:

$$\frac{NI_t}{P_{t-4}} = \gamma_0 + \gamma_1 D_1 + \sum_{t=0}^{3} \lambda_t R_{t-\tau} + \sum_{t=0}^{3} \theta_\tau R_{t-\tau} D_{t-\tau} + \mu_t \qquad (2.50)$$

where:

- NI_t = Net income (Earnings) at time t
- P_t = Share price at time t
- $R_{t-\tau}$= $R_{t-\tau} = \dfrac{P_{t-\tau} - P_{t-(\tau-1)}}{P_{t-4}}$
- $D_{t-\tau}$= Dummy variable for year $t-\tau$ where 1 = bad news (ie $R_{t-\tau} < 0$)
  0 = otherwise
- λ_τ = Coefficient of good news
- θ_τ = Coefficient of bad news

Equation (2.50) is subjected to the condition that stock prices are not likely to anticipate events incorporated in future earnings more than three years ahead. They hypothesize that λ_τ should increase and θ_τ should decrease as the lag increases. Using a sample of US and UK nonfinancial firms totalled 18,380 and 7,189 firm-year observations drawn from Compustat and DataStream respectively, over the period 1976-96, they find that λ_τ are statistically significant and increase from lag zero to lag one, suggesting that most good news is delayed in earnings with a one-year lag; and θ_τ are also statistically significant and decrease until lag two, suggesting that bad news is anticipated in earnings by up to two years.

RESIDUAL INCOME INFOMATION DYNAMICS & EQUITY VALUATION

Myers (1999) investigates unbiased accounting, conservatism, capital investments and other information using modified form of Ohlson (1995); Feltham and Ohlson (1995, 1996) independently. The modified form of LID and valuation models are:

Ohlson (1995) model:

LID: $$RI_{t+1} = \omega_{10} + \omega_{11} RI_t + \varepsilon_{t+1} \quad (2.51)$$

Valuation model: $$V_t = bv_t + \alpha_0 + \alpha_1 RI_t \quad (2.52)$$

Where:

- $\alpha_0 = \frac{\omega_{10}}{r}\left(\frac{1+r}{(1+r-\omega_{11})}\right)$
- $\alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})}$

Feltham and Ohlson (1995) model:

LID: $$RI_{t+1} = \omega_{10} + \omega_{11} RI_t + \omega_{12} bv_t + \varepsilon_{1t+1} \quad (2.53)$$

$$bv_{t+1} = \omega_{22} bv_t + \varepsilon_{2t+1} \quad (2.54)$$

Valuation model: $$V_t = \alpha_0 + \alpha_1 RI_t + (1+\alpha_2) bv_t \quad (2.55)$$

Where:

- $\alpha_0 = \frac{\omega_{10}}{r}\left(\frac{1+r}{(1+r-\omega_{11})}\right)$
- $\alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})}$
- $\alpha_2 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})}$

He uses order backlog ($Bklog_t$) to proxy for v since it is readily available, and on average, order backlog should indicate increased residual income in the following period, and thus, is value-relevant for valuation (Myers, 1999, p. 11).

$$RI_{t+1} = \omega_{10} + \omega_{11} RI_t + \omega_{12} bv_t + \omega_{13} bklog_t + \varepsilon_{1t+1} \quad (2.56)$$

$$bv_{t+1} = \omega_{22} bv_t + \varepsilon_{2t+1} \quad (2.57)$$

$$bklog_{t+1} = \omega_{33} bklog_t + \varepsilon_{3t+1} \quad (2.58)$$

Feltham and Ohlson (1996) model:

LID: $$RI_{t+1} = \omega_{10} + \omega_{11} RI_t + \omega_{12} bv_t + \omega_{13} capx_t + \varepsilon_{1t+1} \quad (2.59)$$

$$bv_{t+1} = \omega_{22} bv_t + \omega_{23} capx_t + \varepsilon_{2t+1} \quad (2.60)$$

$$capx_{t+1} = \omega_{33} capx_t + \varepsilon_{3t+1} \quad (2.61)$$

Valuation model: $$V_t = \alpha_0 + \alpha_1 RI_t + (1+\alpha_2) bv_t + \alpha_3 capx_t \quad (2.62)$$

Where:

- $\alpha_0 = \frac{\omega_{10}}{r}\left(\frac{1+r}{(1+r-\omega_{11})}\right)$
- $\alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})}$
- $\alpha_2 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})}$
- $\alpha_3 = \frac{(1+r)\left[\omega_{13}(1+r)-\omega_{13}\omega_{23}+\omega_{12}\omega_{23}\right]}{(1+r-\omega_{11})(1+r-\omega_{22})(1+r-\omega_{33})}$

Myers (1999) tests four versions of LID using time-series against the theoretical assumptions, *V/P* (the correlation of *V* with Price) and the coefficients estimated in the LID with those estimated in the valuation model (VM). He uses book values and market value of equity as deflators for the VM. Data for the sample consists of all nonfinancial firms covering the period 1975 and 1996 drawn from Compustat and CRSP. The full-sample consists of 44,980 firm-years observations while tests for conservatism are the 25% of firms with the smallest average B/M ratio, which totalled 10,420 firm-years observations. The results for unbiased accounting shows that more than 60% of the intercepts are negative because the average cost of capital, *r* is higher than the average ROE (ROE < *r)* which he considers as bad news because it implies that the firm earns regularly below its cost of capital. On the other hand, a potential investor should not invest in a firm merely that the ROE > *r* because conservative accounting can induce a higher ROA.

The results for conservatism under FO (1995) show that more than 60% of the intercepts are positive as against negative for unbiased accounting. The median autoregressive parameter (ω_{11}) is 0.036, which supports the OFF but is much smaller than the estimates for unbiased accounting. Conversely, more than 60% of the conservative *bv* parameter (ω_{12}) are negative. This indicates that the LID does not capture the effect of conservatism as assumed by FO (1995). The $\frac{V}{P} = 0.644$, which is significantly different from 1 (better than the 0.411 under unbiased accounting). The median firm-specific valuation coefficients of bv_t and RI_t fed by the time-series LID are 0.909 and 0.033 respectively as compared with the estimated coefficients in the cross-sectional valuation model of 0.543 and 0.481. This indicates that the coefficients estimated from the LID do not provide the best estimates of firm price.

The results for conservatism under FO (1996) show that more than 60% of the intercepts are positive (similar to FO, 1995 but not under unbiased accounting). The median autoregressive parameter (ω_{11}) is 0.167, is much smaller than the estimates for unbiased accounting (0.234) and –0.048 for *capx* (ω_{13}) (as expected). Conversely, the conservative *bv* parameter (ω_{12}) are negative (-0.062). Thus, the results of the estimates for the LID under FO (1996) fail to supports the OFF. The median $\frac{V}{P} = 0.924$, which is close to 1, conforms to theory. The parameters estimated from the LID are noisy as evidenced by the low R^2 of 0.335 (FO, 1996) and 0.392 under FO (1995). The median firm-specific valuation coefficients of bv_t, RI_t and $capx_t$ fed by the time-series LID are 0.798, 0.176 and –3.766 respectively as compared with the estimated coefficients in the cross-sectional valuation model of 0.975, 0.926 and 0.007. This indicates that the coefficients estimated from the LID do not provide the best estimates of firm price. In all cases, *P* is correlated with *V*, indicates that *P* can be used to proxy for *V* under the OFF.

Beaver and Ryan (2000) demonstrate the effects of bias on the relation between B/M and three proxies for accounting conservatism:

(1) $\frac{Acc.\ Dep}{Gross\ property,\ plant\ \&\ equipment}$ *(ACCELDEPN)* to measure the depreciation choice due to the accumulation of depreciation;

(2) $\frac{R\ \&\ D + Advertising\ expense}{Sales}$ *(RNDADN)* to proxy for unrecorded intangible assets; and

(3) $\frac{LIFO\ Reserves}{Total\ Assets}$ *(LIFORES)* to capture the magnitude of the effect of the choice of LIFO.

As expected, they find that the coefficients on *ACCELDEPN* and *RNDADV* = significantly negatives, ie they reflect conservatism but unexpectedly, the coefficients on *LIFORES* = significantly positive suggesting that it cannot be used to measure conservatism.

Ahmed et al. (2000) test two hypotheses on conservatism using the FO (1996) valuation model and the operating abnormal earnings linear dynamics (OED) derived in Myers (1999). They use a sample of 1,074 firms with a minimum 15 years of contiguous data available, excluding financial firms because these firms have a minimum level of operating assets and are subject to additional regulatory requirements that potentially affect the relation between their accounting numbers and stock market values. Per share basis is

used because they argue that this may not likely affect their estimation since they use time-series firm-specific regressions (p. 276). They estimate the OED as:

$$ORI_{i,t+1} = \omega_{10} + \omega_{11} ORI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \varepsilon_{it} \quad \text{(OED)} \qquad (2.63)$$

The cross-sectional mean estimated parameter for abnormal operating earnings, ω_{11} is 0.467; operating assets, ω_{12} is –0.041; and capital investment, ω_{13} is –0.064. These signs and magnitudes of ω_{11} and ω_{12} are consistent with prior empirical studies: Stober (1996); Dechow et al. (1999); and Myers (1999); but ω_{12} is inconsistent with theory or the OFF. Only 463 out of 1,074 firms have positive signs, ie app. 43% of the firms conforms to conservatism. Further investigation suggests that the difference of the sign is due to the profitability of firms (p. 280-281). Thus, the LID conservatism parameter, ω_{12} appears to capture only certain types of conservatism, especially for firms with high profitability.

They next test the firm-specific estimation of valuation parameters using cross-sectional data. Consistent with the theoretical reasoning of Ohlson (2000); and the empirical work of Hand and Landsman (1999), they investigate the value-relevance of FO (1996) valuation model using two models, one without other information (v_t) and the other with other information, proxied by the one-year-ahead operating residual income (ORI_t). The valuation model in the form of unrecorded goodwill (UG) model is:

$$UG_{it} = \alpha_{0i} + \alpha_{1i} ORI_{it} + \alpha_{2i} OA_{it-1} + \alpha_{3i} CI_{it} + \beta_i ORI_{it+1} + \varepsilon_{it} \qquad (2.64)$$

By adding the other information to the UG model, as expected, the coefficients on abnormal earnings (α_1) is positive and highly significant; and on operating assets (α_2) is also positive and significant but declines slightly as compared with the model without other information, but α_1 and α_2 are still positively related, which corresponds to prior research (Hand and Landsman, 1999), and suggests that observed market prices reflect both abnormal earnings persistence and the implications of conservatively reported operating assets for future abnormal earnings. The biggest impact of including the one-year ahead operating abnormal earnings is that the capital expenditures coefficient increases from 0.072 to 0.262 and becomes statistically significant. With the positive signs and the statistically significant coefficient for capital expenditures suggest that this expenditure represent positive NPV investments (Ahmed, et al., 2000, p. 284). The coefficient on one-year-ahead operating abnormal earnings (β) is also positive and statistically significant, consistent with the findings in Hand and Landsman (1999).

The main test is based on a modified FO (1996) valuation framework in which firm-specific parameters, ω_{11} (*ORI*) and ω_{12} (*OA*) estimated from the LID and persistence **accounting-based conservatism measures**: (1) estimate of a firm-specific depreciation rate proxied by $\frac{\left[1 - \text{depreciation (or amortization) expense}\right]_t}{\left[\text{Property, plant and equipment, and intangible assets}\right]_{t-1}}$; (2) *RD*; (3) *AD*; (4) LIFO; and (5) firm size to test for their effects on operating assets. Size is proxied by the log of equity market value, is included for two reasons: (1) prior research suggests that large firms tend to be more conservative (Zmijewski and Hagerman, 1981); and (2) size is a commonly-used control variable for other firm characteristics (eg risk) that potentially affect the valuation weights (eg Collins et al., 1997; Brown et al., 1999). Two new cross-sectional regression equations are estimated, one excluding other information (v_t) and the other with other information:

$$\alpha_{2i} = b_0 + b_1\omega_{11i} + b_2\delta_i + b_3RD_i + b_4ADV_i + b_5LIFO_i + b_6\omega_{12i} + b_7SIZE_i + e_i \quad (2.65)$$

The result from estimating the model that includes v_t shows that *ORI, OA, RD, AD,* LIFO and firm-size are all positive and of the correct sign and only depreciation is negative. When other information is not included, all the coefficient, except for LIFO are of the correct sign, but only the coefficients of *RD* and *AD* are significant. When LID conservatism parameter, ω_{12} (*OA*) is added to (2.65) its coefficient, b_6 on the time-series conservatism (from the LID) is significant, but the persistence on abnormal earnings (ie ω_{11}) losses significance which is expected since ω_{12} is positively related to ω_{11}. This test shows that accounting-based conservatism proxies, with the exception of depreciation can capture conservatism. This result is consistent with the positive relation between conservatism and operating assets valuation prescribed in FO (1996); and with the findings of Beaver and Ryan (2000).

Discussion and summary, Basu (1997) treats conservatism by testing the timeliness of earnings announcement with regard to good and 'bad' news and concludes that the recognition of 'bad' news is more quickly than 'good news'. Following Basu (1997), Pope and Walker (1999) find that most 'good' news is delayed in earnings with a one-year lag, and that 'bad news' is anticipated in earnings by up to two years. Evidence on studies using returns and valuation models show that on average, the B/M < 1 suggesting the presence of conservative accounting. These studies show that the choice of

the depreciation method, *AD* and *RD* expenses are influenced by conservatism. The evidence of Stober (1996) shows that accounting book values are largely conservative relative to market values, and is consistent to the M/B, and the conservatism theory of FO (1995). Tests on conservatism parameter in Myers (1999) show that O (1995) performed poorly as compared with FO (1995, 1996). Ahmed et al. (2000) provides evidence of a positive relation between the four chosen accounting-based conservatism measures (depreciation methods, *RD, AD* and LIFO) and the valuation weight on operating assets, ω_{12}. Their evidence supports FO (1996) prediction that conservative financial reporting affects the market valuation of operating assets. However, the finding for the LID conservatism parameter, ω_{12} appears to be mixed because it is only able to capture conservatism in the valuation model but not the LID (consistent with Stober, 1996), and also it tends to better capture conservatism for firms with high profitability. A problem with conservatism is that it reflects growth where there may be no value creation.

2.4.2 Tests for the Decline in the Value-relevance of Earnings and Book Values

Recent studies examining the value-relevance of earnings and book values of equity support that both earnings and book value are relevant for valuation, and the omission of either one of them would potentially lead to model misspecification (Easton and Harris, 1991; Barth at al., 1993, 1996; Kothari and Zimmerman, 1995; Berger at al., 1996; Francis and Schipper, 1996; Burgstahler and Dichev, 1997; Collins et al., 1997; and Lev and Zarowin, 1999). Empirical studies in modelling book values and stock prices are carried out independently, with varying approach and methodologies, and all of them use US data. Collins et al. (1997); Francis and Schipper (1999); and Lev and Zarowin (1999) investigate the general decline in the usefulness of accounting earnings and the value-relevance of earnings and book values over time. Burgstahler and Dichev (1997); and Penman (1998) developed and test valuation models and predict that the equity is a non-linear function of both book value and earnings.

Collins et al. (1997) investigate the value-relevance of earnings and book values over time using the Ohlson (1995) valuation model. They decompose the combined explanatory power of book values and earnings into three components: (1) the increased explanatory power of earnings; (2) the increased explanatory power of book values; and (3) the explanatory power common to both book values and earnings.

$$P_{it} = \beta_0 + \beta_1 EPS_{it} + \varepsilon_{it} \quad (2.66)$$

$$P_{it} = \gamma_0 + \gamma_1 BVPS_{it} + \varepsilon_{it} \quad (2.67)$$

$$P_{it} = \alpha_0 + \alpha_1 EPS_{it} + \alpha_2 BVPS_{it} + \varepsilon_{it} \quad (2.68)$$

where:

- P_{it} = Price (cum-Dividends) of a share of firm i, after fiscal year-end t
- EPS_{it} = Earnings per share of firm i during year t
- $BVPS_{it}$ = Book value per share of firm i at end of year t
- ε_{it} = Other value-relevance information of firm i for year t, orthogonal to earnings and book value

They estimate yearly cross-sectional regressions for a 41-year period, from 1953 to 1993, using a total sample of 115,153 firm-year observations, after omitting outliers, and use $\bar{R}^2$ as the primary metric to measure value-relevance of accounting information has changed over time. Let $\bar{R}_2^2$, $\bar{R}_3^2$ and $\bar{R}_T^2$ denote equations (2.66) to (2.68) respectively. Then,

- $\bar{R}_{BV}^2 = \bar{R}_T^2 - \bar{R}_2^2$ = Incremental explanatory power of book value (incr *BV*)
- $\bar{R}_E^2 = \bar{R}_T^2 - \bar{R}_3^2$ = Incremental explanatory power of earnings (incr *EARN*)
- $\bar{R}_C^2 = \bar{R}_T^2 - \bar{R}_E^2 - \bar{R}_{BV}^2$ = Explanatory power common to book earnings + book value *(COMMON)*

Lev and Zarowin (1999) examine changes over time in the informativeness of earnings, cash flows and book value using (1) returns model; and (2) Ohlson (1995):

$$R_{it} = \alpha_0 + \alpha_1 NI_{it} + \alpha_2 \Delta NI_{it} + \varepsilon_{it} \quad (2.69)$$

where:

- R_{it} = Firm *i's* cumulative stock return for fiscal year t
- NI_{it} = Reported earnings before extraordinary items of firm i in fiscal year t
- ΔNI_{it} = Annual change in earnings: $\Delta NI_{it} = \Delta NI_{it} - NI_{it-1}$, proxying for the surprise element in reported earnings

Both NI_{it} and ΔNI_{it} are scaled by firm *i's* total market value of equity at the beginning of year t.

$$P_{it} = \alpha_0 + \alpha_1 EPS_{it} + \alpha_2 BVPS_{it} + \varepsilon_{it} \quad (2.70)$$

where:

- P_{it} = Firm *i's* share price for firm i, at the end of the year t
- NI_{it} = Earnings per share of firm i, at end of year t
- BV_{it} = Equity book value per share of firm i at end of year t
- ε_{it} = Other value-relevance information of firm i of year t, independent of earnings and book value

The above equations are estimated cross-sectionally on per share basis. The sample data covering the period 1977-97 (20 years) is obtained from the 1996 versions of Compustat (both current and Research Files) and CSRP databases with a total sample between 3,700 to 6,800 firms year with a constant sample of 1,300 firms.

Collins et al. (1997) find that the combined value-relevance of book values and earnings has not declined over the past 40 years, in fact, appears to have increased slightly (p. 41). The adj. R^2 for the pooled cross-sectional time-series regression shows that earnings + book values jointly explain about 54% of the cross-sectional variation in security prices (p. 48). This finding is consistent with Francis and Schipper (1999) who report a stable association over the 44-year period (1951-93). However, Collins et al. (1997) do find that the value-relevance of earnings has declined over the sample period, which means that book values are responsible for maintaining the combined value-relevance of book values and earnings. Similarly, Brief and Zarowin (1999) find that for dividend-paying firms, book value is the most relevant variables, having the highest $\overline{R}^2$ and incremental $\overline{R}^2$ as compared with book values or reported earnings while dividends + book value and earnings + book value have almost identifiable explanatory power. This indicates that book values have become more value-relevance than earnings over the sampled periods in these studies, implying that book values compensate for the largely irrelevant transitory earnings.

The result of Lev and Zarowin (1999) shows that the association between security returns and earnings, as measured by R^2 has been declining from 1977-1996 period, ie $\overline{R}^2 s$ of 6% to 12% in the first ten years of the sample to $\overline{R}^2 s$ of 4% - 8% in the next ten years, and these decreases are significant (p. 356). The result for the ERCs in Lev and Zarowin (1999) shows that it has been declining from 1977-1996 period, ie from a range of 0.75 to 0.90 in the first five years of the sample to 0.60 to 0.80 in the next five years, and these decreases are statistically significant (p. 356). The decline in both the $\overline{R}^2$ and ERC indicates the deterioration in the value-relevance of earnings to investors, irrespective of the effects of other information sources (p. 358). The result of the value relevance for book value and earnings shows that $\overline{R}^2$ declined from 0.90 in the late 1970s to 0.80 in the 1980s, and to 0.50-0.60 in the 1990s for the two samples (total and constant) for the sample period and these decreases are statistically significant. This finding is consistent with their previous findings of returns/earnings relationships (p. 362).

Following prior empirical studies that imply that the declining usefulness of earnings may be due to the increasing incidence of reported losses and non-recurring items (Hayn, 1995). Collins et al. (1997) find that firms with negative earnings (losses) have lower incremental explanatory power of earnings and earnings coefficient compared with

those with positive earnings. The reverse is true for book values, as the incremental explanatory power for firms with negative earnings and earnings coefficient are higher than firms with positive-earnings. With this evidence, Collins et al. (1997) conclude that the combination of negative-earnings and one-time items produces the biggest shift to book values (p.54). In contrast, Lev and Zarowin (1999) did not find that the estimated coefficients to be statistically significance, and argue that the decline in the usefulness of earnings is not the result of losses, rather, it is the underlying failure of the current accounting system to meaningfully account for change (p.370). They then propose that the reported efficiencies can be improved by capitalizing intangible investments or firm restructuring, and a systematic restatement of past financial reports.

Burgstahler and Dichev (1997) developed and test an option-style valuation model and predicted that the equity is a convex (ie non-linear) function of both book value and earnings. They hypothesize that the combination of recursive value (capitalized expected earnings when the firm recursively applies its resources) and adaptation value (value of the firm's resources adapted to an alternate use) reflect market value. Thus, the market value as a function of adaptation value, holding recursive value constant is:

$$MV(NI|AV) = \int_{-\infty}^{AV/C} AVf(NI|AV)dNI + \int_{AV/C}^{\infty} cNIf(NI|AV)dNI \qquad (2.71)$$

where:

- MV = Market value of equity
- NI = Expected future earnings using the firm's current business resources
- c = Capitalization factor for earnings (constant)
- AV = Adaptation value

They use a sample consists of nonfinancial firms, pooling a total of 45,748 firm-year observations drawn on Compustat for the period 1976 to 1994. In their model, they correctly predicted when the earnings/book value ratio is high ($NI > AV/c$), the firm is likely to continue using resources in the normal way, and earnings (rather than book value) are the more important determinant of equity value. When earnings/book value is low ($NI < AV/c$), the firm is more likely to exercise the option to adapt its resources to a superior (more productive) alternate use and book value (rather than earnings) becomes the more important determinant of equity value. The convex-shaped curve (Figure 2.4) suggests that ERC increase with the level of earnings to book value. The model of Burgstahler and Dichev (1997) contrasts with models which incorporate one or the other (eg Barth and Landsman, 1995); and OFF which assume that book value and earnings are linear (ie additive).

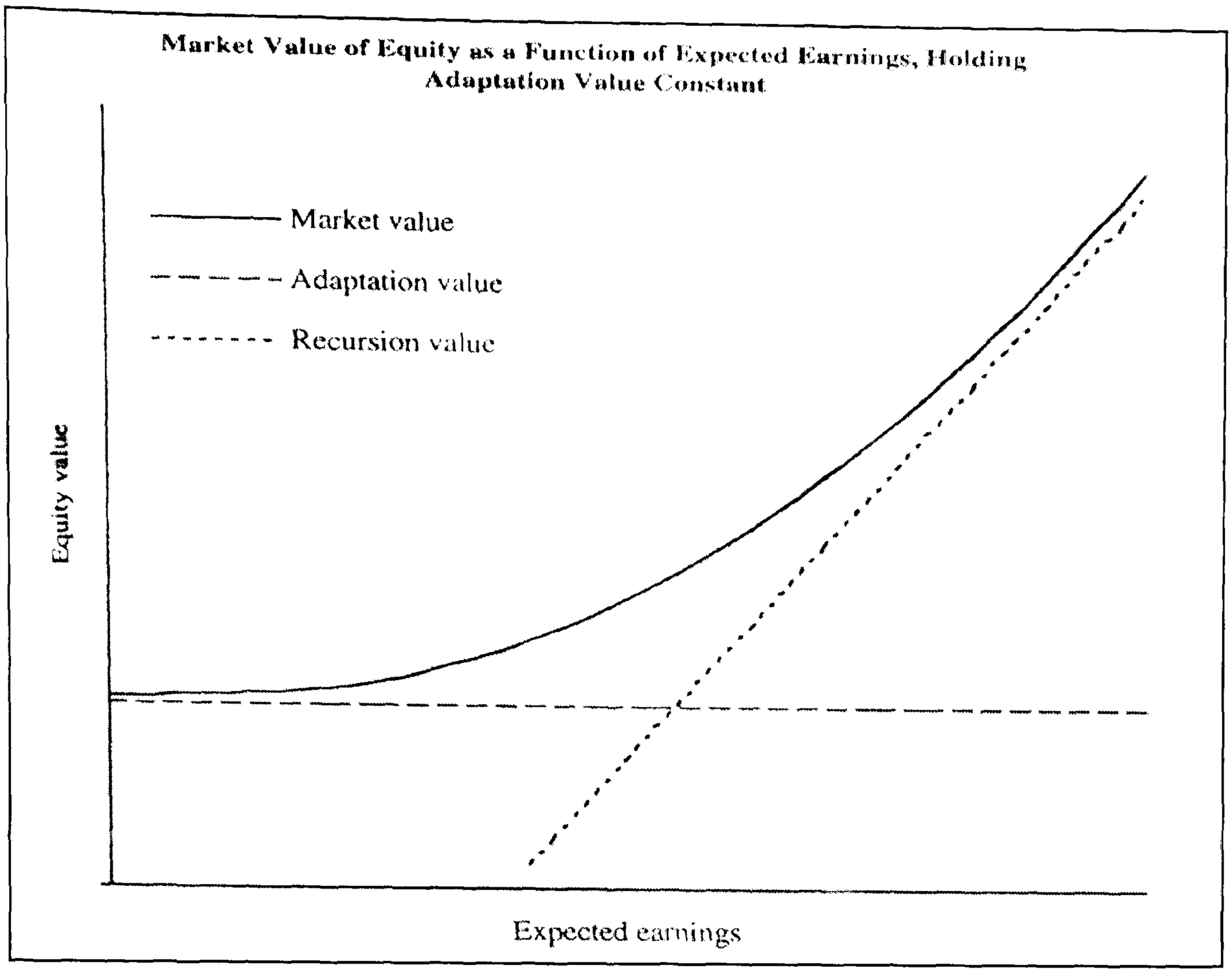


Figure 2.4 – Market Value of Equity as a Function of Expected Earnings, holding Adaptation Value Constant (Source: Burgstahler and Dichev, 1997, p.191, Figure 1)

Penman (1998) provides an approximate benchmark valuation that combines earnings and book value together without considering any other information in the form of weights to predict prices. They demonstrated that the weights of their equity valuation model vary in a nonlinear way over the amount of earnings relative to book value and do so systematically over time (p. 295). Without other information, they argue that earnings will grow at the cost of capital (ie through the reinvestment of dividends), and given only the book value, future earnings are assumed to be forecasted by applying the cost of capital to the book value and in the long-run, return on current equity will equal the cost of capital. Penman's analysis differs from the OFF as he considers the OFF, which combines earnings, book value, and other information additively into price is underidentified impractical. In Penman's model, other information is incorporated in the weights and by averaging over firms' weights that reflect changing earnings and book value over time rather than being firm parameters that are applied irrespective of the level of earnings relative to book value in the OFF. But Burgstahler (1998) considers the functional form examined by Penman (1998) is underidentified since price is a function of earnings and book value, and that earnings and book value are in turn jointly determined, and this problem can only be resolved by the introduction of additional restrictions on the relation.

Barth et al. (1998) predict and find the coefficients and incremental explanatory power associated with equity book value and net income are inversely (positively) related to financial health. Barth et al. (1999) claim that value-relevance of earnings + book values differ across industries, due to factors such as risk, growth, earnings persistence, and accounting practices.

Since the measurement of the value-relevance of earnings and book values used in the various studies reviewed is usually R^2 or $\bar{R}^2$, one must be cautious when inferring to the various conclusions made by these authors. Chang (1998) raises concerns about the use of R^2 as a measure of value-relevance, in particular, he finds that the results of Collins et al. (1997); and Francis and Schipper (1999) were influenced by heteroscedasticity and suggests that correcting for heteroscedasticity reverses the conclusions on value-relevance over time for these two studies. But Brown et al. (1999) disagree with Chang's (1998) conclusion that the differences in R^2 is the result of heteroscedasticity because the former found that R^2 increased even if errors were homoscedastic and the increase in R^2 is the result of the scale effect, rather than on heteroscedasticity. Brown et al. (1999) replicated the analysis of Collins et al. (1997) and find that the latter's conclusion is affected by the scale (size) effect, in which the combined value-relevance of book values + earnings appears to have increased slightly instead of book values and earnings has not declined over the past 40 years as concluded by Collins et al. Hence, Brown et al. (1999) caution researchers on the over-reliance on the use of R^2 criterion, without adjusting the size differences of observations as this may lead to incorrect conclusion.

Aboody and Lev (1998); Easton (1998); Brown et al. (1999) question the validity of regression models where per share basis and firm size are among the independent variables such as Collins et al. (1997); Barth and Clinch (1998) because scale is not fully controlled for. Aboody and Lev (1998, p. 172) suggest that the most effective remedy to control for the scale is to include a scale proxy as an independent variable and report inferences based on White standard errors.

Discussion and summary, Collins et al. (1997) find that the value-relevance of earnings has declined over the sampled period, but find no evidence of deterioration in the combined value-relevance of earnings and book values across 41 years, once they control for transitory change agents (ie intangible intensity, losses, nonrecurring items, firm size).

Their finding is consistent with Francis and Schipper's (1999) reported stable association of earnings + book values and equity value over the 44 years period (1951-93). Conversely, Lev and Zarowin (1999); and Chang (1998) conclude that the value-relevance of book value + earnings has declined over the past 40 years. Lev and Zarowin (1999) identified the major reason for the usefulness of financial statement's decline is due to the increase in the rate and impact of business change, and the inadequate accounting treatment of change. They then propose that the reported efficiencies can be improved by capitalizing intangible investments or firm restructuring, and a systematic restatement of past financial reports. These studies indicate that book values have become more value-relevance than earnings over the sampled periods. Burgstahler and Dichev (1997) develop and test an option-style valuation model and predicted that the equity is a convex (ie non-linear) function of both book value and earnings. Penman (1998) provides an approximate benchmark valuation that combines earnings and book value together, without considering any other information, in the form of weights to predict prices. They demonstrate that the weights of their equity valuation model vary in a nonlinear way over the amount of earnings relative to book value and do so systematically over time. Barth et al. (1998) predicted and found the coefficients and incremental explanatory power associated with equity book value and net income are inversely (positively) related to financial health.

The combination of earnings and book value in equity valuation models in these studies suggest that both equity book value and net income are priced, and the omission of either one of them would potentially lead to model misspecification. These results cast doubt of the findings of many valuation models which fail to include both the book value + earnings as explanatory variables. However, Brown et al. (1999) are sceptical of the over reliance of R^2 and the use of per share basis in relating earnings + book values with share prices as some of these studies have not controlled for scale effect or heteroscedasticity, and hence the inferences drawn is questionable, eg Collins et al. (1997); Francis and Schipper (1999).

2.4.3 Tests for the Value-relevance of Other Information

The usefulness of accounting information, particularly accounting earnings in relating to stock prices (returns) have not been satisfactory since the seminar work of Ball and Brown (1968). Since then, the MBAR literature has produced numerous returns/earnings studies using varying methodologies and size of windows. To measure the

usefulness of returns/earnings correlation, researchers use R^2 but the reported R^2 has been remarkably low for the past thirty-five years of accounting research (see Roll, 1988; Lev, 1989; Bao and Bao, 1998). On the whole, R^2 for returns/earnings models across windows rarely exceed 10% (Lev, 1989; Lev and Zarowin, 1999).

In view of these developments, several empirical studies have investigated the use of non-earnings, nonfinancial and alternate information in CMRA. Researches use various methodologies, sample size and different approaches (ie returns and valuation models) in their investigation on the usefulness of this information in relating to share prices. Since the literature in CMRA is proliferated with different terms to describe either the same or different information used in relating stock prices (returns), clarification must be made before proceeding to discuss the use of this information. The term 'nonfinancial' information and non-GAAP information are clear as they refer to any information that is not found in the present accounting system, and hence they are synonymous. Non-traditional information implies non-earnings variable as earnings has been mentioned frequently as the traditional information used in CMRA (see Kothari, 2001). However, the terms 'alternate' information as used in Ou and Penman (1989a, 1989b); and Lipe (1990); and other information as used in various Ohlson and Feltham papers are ambiguous. 'Alternative' information in Ou and Penman (1989a, p. 301) is defined as *"any information other than current and past accounting earnings"*. Similarly, Lipe (1990, p. 53) defines 'alternate' information as *"noise ... that represents all information other than current and past accounting earnings"*. Ohlson (1995, p. 668) defines other information as *"any information other than abnormal earnings"*. These definitions remain ambiguous, however, I am attempting to resolve this definitional issue because one of the focuses for this research is on the use of other information in equity valuation. Firstly, from their respective definitions, both 'alternate' and other information imply non-earnings and non-book value variables because past earnings are part of book values and one of the components of residual income is earnings, hence they can be considered synonymous, and since I am using the OFF, I shall use the term 'other' information to describe either of them. Secondly, to be prudent, I will adopt a broad but explicit definition for 'other' information. Thus, 'other' information as defined for the **purpose of this thesis** is:

"any information that is other than earnings and book values, and it could mean 'alternate information', nonaccounting/financial information, non-GAAP information, and also include fundamental ratios, fundamental signals and fundamental variables".

Lee (1987) studies how the security market responds to the characteristics of fundamental analysis using Alan Abelson's weekly column, 'Up and Down Wall Street' in Wall Street Journal for the period from July 1978 to December 1981. Lee examines the performance of 'buy' or 'sell' recommendations in which a buy decision is generally, a favorable analysis of the stocks and a sell decision is an unfavorable analysis. To measure the market responses to fundamental analysis for the Abelson's column, the daily excess returns (ER_{jt}) of stocks is used, which is expressed as:

$$\tilde{E}R_{jt} = \tilde{R}_{it} - \tilde{R}_{pt} \quad \text{For 'favorable' stocks} \tag{2.72}$$

$$\tilde{E}R_{jt} = \tilde{R}_{pt} - \tilde{R}_{it} \quad \text{For 'unfavorable' stocks} \tag{2.73}$$

where:

- R_{it} = Realized return (including dividends, if any) of the stock i on time t; and
- R_{pt} = Realized return of the portfolio of stocks with similar risk.

Cumulative Excess Return (CER) is calculated using:

$$CER_{i,t1,t2} = \sum_{t1}^{t2} ER_{it} - 30 \quad \leq t_1 < 0 \quad < t_2 \leq 29 \tag{2.74}$$

where t_1, t_2 = period which the market reactions are assumed to take place. If the market is response is instantaneous and complete, $t_1 = t_2 = 0$. Lee classifies all sampled stocks into four categories, A, B, C and D in accordance with the fundamental analysis as:

A : Stocks which are listed on NYSE and were 'favorable' stocks in Abelson's nonaccounting analysis.

B : Stocks which are listed on NYSE and were 'unfavorable' stocks in Abelson's accounting analysis.

C : Stocks which are listed on AMEX and were 'unfavorable' stocks in Abelson's nonaccounting analysis.

D : Stocks which are listed on AMEX and were 'unfavorable' stocks in Abelson's accounting analysis.

The findings on the excess returns with respect to (1) 2.77% (2) 0.59% (3) 7.78% and (4) 5.24% respectively. This indicates that the excess returns with respect to the use of nonaccounting analysis are higher than accounting. By comparing the $C\hat{E}R$ of time intervals (0, 4)[14] and (0, 29) and t-tests, most of the market responses take place on day 0 (date of publication of Abelson's analyses). Tests using ANOVA F-tests reveal that the security markets reacts significantly to Abelson's analyses and the reactions are not independent of the content of the analyses. Given that the one-way transactions cost for

[14] (0, 4) = between day 0 (publication date) and day +4 (4 days from date of publication).

small and large investors are 2% and 0.8% respectively, Lee's (1987) results indicates that small investors suffer losses (ie negative net excess returns) from Abelson's analyses and no investors (large or small) can expect any gain (ie positive net excess returns) from Abelson's accounting analyses.

Amir and Lev (1996) examine the value-relevance to investors of financial accounting and nonfinancial accounting information of a high-growth industry-independent cellular companies by regressing security returns and prices on quarterly financial information of 14 independent cellular companies for a 10-year period from 1984-93 based on Kothari and Zimmerman's (1995, p. 34) model. They use the event study approach in their investigation:

The return model is: $$R_{jt} = a_0 + a_1 EPS_{jt} + a_2 \Delta EPS_{jt} + m_{jt} \quad (2.75)$$

The price model is: $$P_{jt} = \beta_0 + \beta_1 BV_{jt} + \beta_2 EPS_{jt} + \nu_{jt} \quad (2.76)$$

where:

- R_{jt} = Cumulative market-adjusted return (raw return minus the corresponding value-weighted CRSP return) over three alternative periods using a two-day, seven-day and quarterly return windows.
- P_{jt} = Stock price of firm just the end of the second month following quarter t
- EPS_{jt}, ΔEPS_{jt} = Quarter t *earnings per share (EPS)* (before extraordinary items) and the change in *EPS* (from the same quarter a year earlier) respectively; variables in return models are deflated by beginning of quarter t stock price; in some regressions, *EPS* are replaced by operating cash flows per share.
- BV_{jt} = Book value per share of firm j at end of quarter t.

The finding of Amir and Lev (1996, p. 33) shows that, neither level nor change in earnings variables exhibits significant regression coefficients in two-day, seven-day and quarterly return windows. Thus, Amir and Lev conclude, on a stand-alone basis, financial information, such as earnings, book values, cash flows, etc. are largely irrelevant for security valuation while nonfinancial information such as *POPS* (total population in the licensed service area, a growth proxy) and Market Penetration (an operating performance measure) are highly value-relevant. They state that the overwhelming value-relevance of nonfinancial information over that of financial information, to the cellular industry, at least, indicates the importance in both practice and research of nonaccounting information and that, researchers should therefore, include them in fundamental variables to be examined (p. 5). Since the cellular industry is a high-growth industry, as such, this industry

appears to represent other high-growth industries like biotechnology. With this finding, they argue that current GAAP is not capable of providing relevant information in emerging high-tech industries, like wireless communications (p. 17-8) and suggest that the deficiency of GAAP could be improved by incorporating nonfinancial variables into the reporting system (p. 22-3).

Behn and Riley (1999) incorporate nonfinancial fundamental metrics[15] in two linear regression models to (1) test whether nonfinancial airline information is contemporaneously associated with quarterly financial performance and (2) predict quarterly financial performance, such as revenues, expenses, and operating income. They identify four nonfinancial fundamental metrics: (1) load factor; (2) market share; (3) capacity; and (4) customer satisfaction. The first three are readily available from public sources, and to overcome the problem of obtaining the last variable, an instrumental variable is created for customer satisfaction (*CMPLNT*). *CMPLNT* is based on the percentage change in the quarterly number of complaints per 100,000 passengers, and is based on four independent variables: (1) *ONTIME* to measure on-time performance; (2) *MISBAGS* to measure mishandled baggage; (3) *OVERSALE* to measure ticket 'oversale' (ie involuntarily 'bumped' passengers); and (4) *INFLIGHT* (same as *LOADCTR*) to measure in-flight service levels, viz:

$$CMPLNT = \alpha_0 + \alpha_1 ONTIME + \alpha_2 MISBAGS + \alpha_3 OVERSALE + \alpha_4 INFLIGHT + \sum_{yr=1}^{8} \alpha_{yr+4} YR89 - YR96 + \sum_{n=1}^{6} \alpha_{n+12} AIRLINE + \varepsilon \quad (2.77)$$

The fitted (predicted) values from regressing *CMPLNT*, known as *CMPLNTFT*, along with the other identified nonfinancial fundamental metrics, are then incorporated into the contemporaneous model:

$$DV = \beta_0 + \beta_1 CMPLNTFT + \beta_2 LOADFCTR + \beta_3 MKTSHR + \beta_4 AVLMILES + \sum_{yr=1}^{8} \beta_{yr+4} YR89 - YR96_{yr+4} + \sum_{n=1}^{6} \beta_{n+12} AIRLINE + \varepsilon \quad (2.78)$$

where:

- *DV (Dependent Variable)* = Operating income (*OPINC*); or Operating revenues (*OPREV*); or Operating expenses (*OPEXP*).
- *LOADCTR* = To measure pricing and marketing (same as *INLIGHT*)
- *MKSHR* = To measure market share
- *AVLMILES* = To measure capacity to service passengers

[15] Also known as 'Signals' by Lev and Thiagarajan (1993).

Sample data are obtained from (1) Air Travel Consumer Report (monthly); and (2) Air Carrier Traffic Statistics (monthly). The final sample consists of 213 quarterly observations. Result from estimating equation (2.78) for the predictive power between nonfinancial information and financial performance show that all four nonfinancial variables are statistically significant and of the correct signs with adjusted R^2 ranging from 0.35, 0.65 and 0.71 for *OPINC, OPREV* and *OPEXP* respectively, but for the contemporaneous association, load factor (*LOADFCTR*) and market share (*MKSHR*) have no statistical significance when regressed on operating expenses (*OPEXP*), and they argue that a probable explanation for this is economic rather than econometric (p. 48). However, Behn and Riley realized the limitations of using nonfinancial measures in CMRA as such studies lack a solid theoretical or an analytical modelling foundation, and that the inexhaustiveness of nonfinancial performance variables that could be used would impair the motivation of researchers. Moreover, industry-based research is usually adversely impacted by small sample size and this may result in incorrect inferences. But, concern for the small sample size in industry based studies is not shared by Amir and Lev (1996) who claimed that industry based studies are often more explicit than cross-sectional ones.

Ittner and Larcker (1998) examine the extent of aggregated nonfinancial measure, in the form of customer satisfaction scores (*ACSI*) in association with market value for equity using a cross-sectional Edwards-Bell-Ohlson (EBO) model:

$$MVE_i = \beta_0 + \beta_1 ASSETS_i + \beta_2 LIAB_i + \beta_3 ACSI_i + \varepsilon_i \qquad (2.79)$$

where:

- MVE_i = Market value of equity for firm i
- $ASSETS_i$ = Book value of assets for firm i
- $LIAB_i$ = Book value of liabilities for firm i

Data of *ACSI* scores is obtained from Fortune for the period 1994 and 1995 comprising of 121 and 124 firms respectively, and accounting data is collected from Compustat. Results from regressing (2.79) shows that *ACSI* are positive and significant using either 1994 or 1995 scores, implying that customer satisfaction measures are value-relevant (ie not reflected in current accounting book values) (p. 23). They augment the results obtained from testing (2.79) with analysis based on the EBO characterized as:

$$MVE_i = \beta_0 + \beta_1 ASSETS_i + \beta_2 LIAB_i + \beta_3 FUTURE_i + \varepsilon_i \qquad (2.80)$$

where:

- $FUTURE_i$ = Discounted value of future earnings in excess of capital charge based on the opportunity cost of capital for firm i

If current customer satisfaction levels are incorporated into forecasts of future cash flows, *ACSI* should be positively associated with the variable, *FUTURE*. Following Frankel and Lee (1998), they use consensus analysts' forecasts of earnings from year +1 to +5, discounted using the equity cost of capital (0.06 + 0.074) to proxy for forecasted *RI*. They then regressed *ACSI* and current earnings on *RI*, and results from this test indicates that *ACSI* measures are positively associated with forecasted *RI*, suggesting that at least some of the expected benefits from customer satisfaction are already impounded into earnings forecasts, and also, it imply that *ACSI* scores are predictors of future *RI*.

But Lambert (1998, p. 45) comments that it is difficult to recognize customer satisfaction in the financial statements because the 'transacted costs' for customer satisfaction is not traceable even though there are many costs that would affect customer satisfaction, such as research and development, marketing, customer support and product design and innovations. Currently, there is no appropriate measure of such costs and even if such costs can be determined at a fair value, then, should these costs be capitalized or matched to revenue? He considers the results of Ittner and Larcker (1998) offer qualified support for recent and growing moves to add value-relevance to accounting information by the inclusion of nonfinancial indicators, such as customer satisfaction, and Lambert suggests that customer satisfaction is measured 'properly' it can be a leading indicator of financial performance.

Black et al. (1999) examine the value-relevance of firm reputation using the annual Fortune Rankings as proxy for nonfinancial information. Following Brown and Perry (1994) finding that there is a financial performance halo which heavily influences the firms in Fortune's most admired companies, Black et al. (1999) split the nonfinancial measures, such as customer service, product quality and intellectual capital from the financial variables, such as return on assets (*ROA*), market-to-book value (*MKTBV*), *SIZE, RISK,* and *GROWTH*. The financial factors must either be removed or controlled before employing the Ohlson (1995) model:

$$SCORE_t = a_0 + DMY_y + a_1 ROA_t + a_2 MKTBV_t + a_3 SIZE_t + a_4 BETA_t + a_5 GROWTH_t + \varepsilon_t \quad (2.81)$$

where:

- $SCORE_t$ = Firm Reputation Score in year t taken from Fortune magazine annual reputation survey
- DMY_t = Dummy variable for the year
- ROA_t = Income before Extraordinary Items deflated by Total Assets*100 in year t

- $MKTBV_t$ = Market value of Common equity deflated by Book Value of Common Equity at the end of year t
- $SIZE_t$ = Natural log of the Market Value of Common Equity in year t
- $BETA_t$ = Market Model Beta computed as 5-year (60-month) time period, ending at the end of the year t (as computed by Compustat)
- $GROWTH_t = \dfrac{Sales_{t-5} - Sales_t}{Sales_t}$

The residuals from estimating equation (2.81) represent the intangible assets related to firm reputation. The estimated coefficients are used to calculate a predicted reputation score which measure the financial aspect of the Fortune ranking score. Black et al. (1999) adopt Ohlson's (1995) to control for annual effects and to allow for the measure of intangible assets, including the nonfinancial factors estimated form equation (2.81) yields:

$$MV_t = b_0 + DMY_y + b_1 BV_t + b_2 NI_t + b_3 NonFREP_{t-1} + v_t \qquad (2.82)$$

where:

- MV_t = Market value of common equity at year t.
- DMY_t = Annual year Dummy variable set equal for 1 if $t = y$; 0 otherwise
- BV_t = Book value of common equity at year t
- NI_t = Net Income before extraordinary items at year t
- $NonFREP_{t-1}$ = Nonfinancial component of firm reputation, derived by taking the residual value from the estimation of firm reputation in equation (2.81)

Sample data is obtained from all firms rated by Fortune from 1982-96 (yearly) and from Compustat, resulting in 2,905 firm-year observations for equation (2.81) and 2,881 firm-year observations for equation (2.82). Their result shows that the nonfinancial components (*NonFREP*) of the Fortune reputation score are incrementally value-relevant as well as book value and income, and are also highly correlated with market value of equity. According to them, the results indicate there is value-relevant information provided by the Fortune's most admired companies that cannot be explained by financial information. Like the result of Ittner and Larcker (1998), there is no appropriate measure of customer reputation, and even if there is, current GAAP does not recognize it as a summarized nonaccounting measure and as such, Black et al. suggest the inclusion of firm reputation as an intangible asset in the financial statement.

Docking and Dowen (1999) investigate whether attaining International Standards Organization (ISO) 9000 certification affects firm value by examining abnormal returns to firms that announced their certification from Jan-Sept 1994. They use event studies applied cross-sectionally using a sample of 252 firms from the CRSP tapes for NYSE and AMEX, and the single-index market model to obtain estimates of abnormal security returns around

the event date and their corresponding *t*-statistics. Their results show that the market reacts favorably to ISO 9000 registration for the smallest firms in the sample but has no reaction for the largest firms. They cite two probable reasons for this effect. First, larger firms are well known and they do not need an external signal of quality, eg Microsoft or IBM. However, ISO 9000 certification is perceived by the smaller, unknown firms as a form of external validation of firm quality that signals positive information to the market regarding management's long-term commitment to quality and the business. Secondly, larger firms are not willing to incur costs for ISO registration because they believe the cost-benefit is expected to be zero while smaller firms expect long-term benefits from certification. They also find that with the passage of time, each new ISO 9000 registration could be less newsworthy to the market and that being the first in an industry to be registered does not appear to be related to market reaction. This suggests that the benefits of ISO registration are 'perceived benefits' rather than tangible benefits.

Myers (1999) uses order backlogs to proxy for v into FO (1995) since it is readily available, and on average, order backlog should indicate increased *RI* in the following period. Order backlogs are caused by shortages, such as inventory, capacity or labour, or due to increased demand. This will depress current RI but as shortages ease, future RI should increase but should decrease over time. This implies that $\omega_{13} > 0$. Thus:

$$\begin{aligned} RI_{t+1} &= \omega_{10} + \omega_{11} RI_t + \omega_{12} BV_t + \omega_{13} BKLOG_t + \varepsilon_{1t+1} \\ BV_{t+1} &= \omega_{22} BV_t + \varepsilon_{2t+1} \\ BKLOG_{t+1} &= \omega_{33} BKLOG_t + \varepsilon_{3t+1} \end{aligned} \tag{2.83}$$

where:

- RI_t = Residual Income at time t
- BV_t = Book value at time t
- $BKLOG_t$ = Order backlog at time t

He estimates the above using equations with an intercept in time-series because he considers that the parameters of LID must be a function of the firm's economic pressures, production technology and accounting policies; and adding conditioning variables to control for these factors in cross-sectional data is difficult. The test shows that the inclusion of order backlog does not improve residual income in the following year, suggesting that it is not a useful variable for other information.

Dechow et al. (1999) evaluate the empirical implications of Ohlson (1995) and other competing RIVM models. They examine the RI information dynamics using models

which include or exclude v and their different assumptions about ω (persistence parameter of *RI*) and γ (persistence parameter of other information). As v is not specified, Dechow et al. imply that v can be the difference between the conditional expectation of abnormal earnings for period t+1, based on all available information and the expectation of abnormal earnings based only on current period abnormal earnings, such that:

$$v_t = E_t[RI_{t+1}] - \omega RI_t \tag{2.84}$$

Using the consensus analyst forecast of period t+1 earnings (f_t), the conditional expectation of earnings at t+1 is:

$$E_t[RI_{t+1}] = f_t^a = f_t - rBV_t \tag{2.85}$$

The other information (v_t) can then be measured as:

$$v_t = f_t^a - \omega RI_t \tag{2.86}$$

Using equation (2.86) and consensus analysts' forecasts for earnings to proxy for v_t, the tests for the LID and valuation models are estimated using the following equations:

$$RI_{t+1} = \omega_0 + \omega_1 RI_t + \varepsilon_{1t+1} \qquad \text{LID1}$$

$$v_{t+1} = \gamma_0 + \gamma_1 v_t + \varepsilon_{2t+1} \qquad \text{LID2}$$

$$P_t = \alpha + \beta_1 BV_t + \beta_2 NI_t + \beta_3 f_t + \varepsilon_{1t+1}$$

$$P_t = BV_t + \frac{\omega}{1+r-\omega} RI_t + \frac{1+r}{(1+r-\omega)(1+r-\gamma)} v_t$$

Sample data consists of nonfinancial firms totalled 50,133 firm-year observations from 1976 to 1995 were drawn from Compustat, CRSP and I/B/E/S. The test is conducted using a discount rate = 12% in which the LID are deflated by *MVE* at end of year *t*, and the valuation model is based on per-share data. Earnings are measured before extraordinary items. The results of Dechow et al. (1999) indicate that, on average, firms fell slightly short of achieving a return on equity equal to the assumed cost of capital of 12%. The AR(1) coefficients for LID1 and LID2 are within the range specified by Ohlson (1995) where ω and γ were estimated to be 0.62 and 0.32 respectively. Tests indicate that models incorporating analysts' forecasts in the form of other information have lower forecast errors than the models using historical data, which implies that analysts' forecasts of *RI* are much more accurate than the forecasts generated by the historical time-series models. This highlights the important role of the v_t incorporated in analysts' forecasts in predicting future *RI*. Overall, their results show only modest improvements in explanatory power over

past empirical researches using analysts' earnings forecasts using the traditional DDM. In addition, they found the valuation models to be downward biased and inaccurate to some degree. However, Lo and Lys (2000a) criticize Dechow et al. for using per share basis and not controlling for scale-effect and heteroscedasticity in their cross-sectional regressions, and suggest the use of firm-specific rate on the return on equity would improve results.

Hand and Landsman (1999) use Ohlson (1995) to structure an empirical assessment of the pricing of dividends in stock prices to (1) test at what extend does the model conform to the Miller and Modigliani's (M&M) (1961) dividend irrelevancy proposition and (2) what explains the direction and magnitude of any divergence from dividend displacement? Hand and Landsman express the RI dynamics as:

$$CORENI_{i,t+1} = \omega_{0t} + \omega_{1t} ACORENI_{it} + \omega_{2t} ACORENI_{it} + \omega_{3t} v_{3t} + \omega_{4t} DIV_{it} + \omega_{5t} BV_{it} + \varepsilon_{it} \quad (2.87)$$

Where:

- $CORENI_t$ = Net income before extraordinary items at time t
- $ACORENI_t$= Abnormal Core Earnings before extraordinary items at time t
- v_t = Other Information proxied by analysts' forecast of earnings at time t
- DIV_t = (net) Dividends declared = common dividends + purchase of common + preferred stocks – sale of common + preferred stocks during time t
- BV_t = Book Value of Equity at time t

They test on the pricing of dividends into the *MV* using two estimating equations based on the valuation model in the form of a weighted average of an earnings model and a book value model equations, in which one includes v_t while the other ignores it.

$$MV_{it} = a_{0t} + a_{1t} BV_{it} + a_{2t} CORENI_{it} + a_{3t} DIV_{it} + a_{4t} NETCAP_{it} + e_{it} \quad (2.88)$$

$$MV_{it} = c_{0t} + c_{1t} BV_{it} + c_{2t} CORENI_{it} + c_{3t} DIV_{it} + c_{4t} NETCAP_{it} + c_{5t} E[NI+1]_{it} + e_{it} \quad (2.89)$$

Data for the sample period 1974-96 were extracted from Compustat and I/B/E/S consists of 103,932 firm-year observations, a cost of capital of 12% as in Dechow et al. (1999), and their main regressions are run with undeflated variables. Hand and Landsman's (1999) results indicate that dividends are positively correlated with v_t (proxied by analysts' forecast of earnings) and that dividends help predict future *RI*, incremental to current and lagged abnormal earnings in contrast to the assumption of O (1995); and FO (1995) where $\frac{dv}{dDIV} = 0$ and the M&M's dividend displacement theory. They find the inclusion of dividends and v_t improve the explanatory power of their models, and suggest that v_t cannot be simply set to zero, consistent with Ohlson (1998). The usefulness of dividends is consistent with Rees (1997) where the inclusion of dividends in the valuation model

improves its R^2 from 54% to 60%. With this evidence, Hand and Landsman conclude that dividends are a component of, and rich proxy for, other information about future *RI* that is reflected in price but is not yet captured by current financial statements, and argue that excluding dividends is both informationally restrictive as well as potentially econometrically risky. Also, the positive pricing of dividends is at least three times larger for loss firms than for profit firms, which they conclude is consistent with the profitability-signalling hypothesis, ie dividends signal future profitability more for loss firms.

However, the findings of Hand and Landsman (1999), particularly that dividends provides a signal about future prospects of the firm is disputed by Lo and Lys (2000a). They suspect that the results obtained from their cross-sectional regression estimation are bias in terms of both coefficients and R^2 because Hand and Landsman did not control for the scale effect and mitigate heteroscedasticity as no scaling of the variables or the employment of heteroscedasticity test were carried out. Lo and Lys (2000a) re-estimated the variables of Hand and Landsman (1999) by deflating all variables by the lagged value market of owner's equity. Interestingly, the coefficient on dividends reverses in sign (previously the sign was positive) when the variables are deflated by MV_{t-1} and the R^2 reduces to a mere 41% against an exceptionally high of 95% in Hand and Landsman. With this evidence, Lo and Lys (2000a) argue that firm size and dividends are correlated.

Discussions and summary, the few studies examining the use of nonfinancial information in relating share prices are innovative and are interesting and should provide the motivation for future research in equity valuation using nonfinancial information in CMRA. However, one of the greatest problems in using nonfinancial variables (eg customer satisfaction, firm reputation) in CMRA is that there is a lack of a theoretical foundation for such variables (these studies are done purely on empirical ground) and there is no provision under GAAP to include them in the financial statements. Besides there are methodological issues concerning these studies, such as a basis for the selection of the nonfinancial variables that are used in modelling equity values, and some of the findings relate to 'perceived benefits' rather than tangible benefits (eg benefits of ISO registration), and the approach used in the estimations (eg returns vs. valuation models). Another problem relating to research in nonfinancial data is that some of the studies tend to focus on industry-level and the favourable results obtained may not be used to infer the usefulness of this information in explaining share prices for the market as a whole.

Except for Myers (1999), tests of other information (v_t) using the OFF are consistent with Ohlson (1998) that v_t cannot be simply set to zero but Dechow et al. (1999) find only modest improvements in explanatory power over past empirical researches using analysts' earnings forecasts using the traditional DDM. Both Rees (1997); and Hand and Landsman (1999) find that dividends are able to explain market value, and the former find capital expenditures are also value relevant. However, there is no cohesive use of methodologies and selection of variables and researchers either use analyst' forecast or non-earnings data to proxy for v_t used in these studies, eg uses of per share basis and no deflation in cross-sectional estimations. Interestingly, when Lo and Lys (2000a) re-estimated the variables of Hand and Landsman (1999) by deflating all variables by MV_{t-1}, the coefficient on dividends reverse in sign and the R^2 reduces by more than half.

2.4.4 Tests for Value-relevance of Intangibles (*Research & Developments, Advertising and Human Resource*) Costs

Many critics of GAAP, eg Lev (1989); Amir and Lev (1996); and Edvinsson and Malone (1997) have reported the failure of GAAP to value many assets (particularly intangible assets) and liabilities objectively. These criticisms are valid considering that firms in the US practice extreme conservatism where brand names and the revaluation of non-current assets are not permitted (see Penman, 2001; and Wyatt, 2002). For example, Coca-Cola with an *ROA* of approximately 35% has no brand names on the balance sheet. In contrast, more liberal accounting policies in the UK, Australia and Hong Kong, China allow firms to put brand-name assets in the balance sheets, eg Cadbury-Schweppes in the UK. In addition, these countries allow firms to write up assets, also known as revaluation.

Empirical research on the usefulness of intangible assets in equity valuation assume that the immediate expensing of investments in *RD*, *AD* or other internally generated intangibles may distort financial reporting (Ryan, 2000, p. 297). Research on *RD* and *AD* expenditures started in the US in the 1980s, mostly adopt the valuation approach using cross-sectional data. UK-based empiricism only began after 1989 following the release of disclosure requirements concerning *RD* costs. *AD* costs are not disclosed in UK.

Grabowski and Muellar (1978) is probably the first to investigate *RD* costs and found that it has a large and consistent positive effect on firm profit rates. Hirschey (1982) investigates the value-relevance of intangibles using *RD* and *AD* through the use of a market valuation model. He considers *RD* and *AD* constitute important determinants of

firm market value (MV) to the extent that such expenditures result in the creation of an economically relevant amount of intangible capital. He bases his valuation model on to '**Tobin's *q*** ratio. Tobin's q is defined as the market value of the firm divided by the replacement cost (RC) of total assets, in effect, a scaled market value, thus:

$$q = \frac{MV}{RC} \tag{2.90}$$

According to Tobin, when $q > 1$, firms will expand total investment in order to increase the total economic residual earned by stockholders. When $q < 1$, firms will contract investment. Since $BV(T) + BV(I) = MV$, where $BV(T)$ and $BV(I)$ are the capitalized values of profits attributable to tangible and intangible assets respectively; hence, $RC = BV(T) + e$, equation (2.90) can be formulated as:

$$\begin{aligned} q &= 1 + \frac{BV(I)}{BV(T)} + e \\ &= f_1(AD, RD, X) + e \end{aligned} \tag{2.91}$$

where:

- X = Vector of additional factors which influence q

Since the model is estimated cross-sectionally, the variables are deflated by book value to mitigate the firm-size-effect, multicollinearity and heteroscedasticity, thus:

$$\frac{MV}{BV} = \beta_0 + \beta_1 \frac{1}{BV} + \beta_2 \frac{\pi}{BV} + \beta_3 CR + \beta_4 GR + \beta_5 R + \beta_6 \frac{RD}{BV} + \sum_{i=1}^{n} \beta_i \frac{AD_i}{BV} + e \tag{2.92}$$

where:

- $\frac{MV}{BV}$ = Market value of common + book value of debt divided by the book value of total assets
- $\frac{\pi}{BV}$ = Profitability calculated as net income + interest expense divided by the book value of total assets
- CR = Concentration calculated at the four-firm level and weighted to reflect firm involvement in various four-digit census industries
- GR = Growth in terms of sales calculated as $\sqrt[5]{\frac{S_{1977}}{S_{1972}}} - 1$
- R = Risk as reflected by the scaled earnings and dividend stability
- $\frac{RD}{BV}$ = Research and development expenditures deflated by book value of total assets
- $\frac{AD}{BV}$ = Advertising expenditures is total national media advertising costs divided by the book value of total assets

GR is also used to reduce measurement errors relating to the use of accounting data in controlling for the differences among firms due to the impact of inflation on accounting book values. He expects $\beta_2, \beta_3, \beta_6, \beta_i > 0$; $\beta_5 < 0$ while β_1 and β_4 are uncertain.

Hirschey and Weygandt (1985) adopt a slightly different approach. They regress Tobin-s q on AD intensity (the ratio of current annual AD expenditures to annual sales), RD intensity (the ratio of current annual RD expenditures to annual sales), industry concentration, growth and risk cross-sectionally as:

$$Q = \alpha_0 + \alpha_1 \frac{AD}{S} + \alpha_2 \frac{RD}{S} + \alpha_3 CR + \alpha_4 GR + \alpha_5 B + e \qquad (2.93)$$

where:

- $Q = \frac{MV}{RC}$ = Market value to replacement costs as in (2.90)
- $\frac{AD}{S}$ = Advertising intensity where S = sales
- $\frac{RD}{S}$ = RD intensity
- B = Stock price beta measure of risk

Following the findings that RD has a dramatic and consistent effect on the market values, but inversely with firm sizes in the 16-year sample of Hirschey and Spencer (1992), Chauvin and Hirschey (1993) extend their valuation model based on Tobin's q ratio to test the valuation relevance of RD intensity according to industry type and firm size. Using the same methodology of earlier papers, they isolate the influences of the effects caused by other factors that might affect current market value, by using growth, risk, cash flow, and market share as controls in their estimating equations:

$$Q = \alpha_0 + \alpha_1 CF + \alpha_2 GR + \alpha_3 PR + \alpha_4 MS + \alpha_5 \frac{AD}{S} + \alpha_6 \frac{RD}{S} + e \qquad (2.94)$$

where:

- CF = Cash flow, as measured by operating income before depreciation – Interest expense, taxes, preferred dividends and common dividends
- PR = $log\left(\frac{High\ stock\ price}{Low\ stock\ price}\right)$, based on 52-week period
- MS = Market share, defined as total revenue in the firm's primary product four-digit SIC industry expressed as a percentage of industry sales

In exception to the valuation approach used in previous studies, Bublitz and Ettredge (1989) use a MBAR method based on Lipe (1986) to investigate the longevity of AD and RD expenditures in which any change in the share price of the firm at end of time t is influenced by the shock in time t. Hence, if AD and RD expenditures constitute expenses, negative coefficients of their forecast errors with cumulative abnormal returns (CAR) should be observed. If these expenditures are long-lived, the association of their

forecast errors' coefficients with the CAR should be less negative and ideally towards 0. Thus, the estimating equation deflated by $P_{i,\,t-1}$ with pooled data for the 10-year period is:

$$CAR_{i,t} = A_0 SHARE + B_1 SFEPS_{i,t} + B_2 ADFEPS_{i,t} + B_3 RDFEPS_{i,t} + B_4 OEXFEPS_{i,t} + e_{i,t} \quad (2.95)$$

To investigate whether the benefits of current advertising and research & development expenditures persist into next period, a leading variable ($NEXT_{i,t+1}$) is included into (2.95):

$$CAR_{i,t} = A_0 SHARE + B_1 SFEPS_{i,t} + B_2 ADFEPS_{i,t} + B_3 RDFEPS_{i,t} + B_4 OEXFEPS_{i,t} + B_5 NEXT_{i,t+1} + e_{i,t} \quad (2.96)$$

where:

- $SHARE = \dfrac{1}{P_{i,t-1}}$
- $SFEPS_{i\,t}$ = Per-share sales forecast error (unexpected cash inflow) at time t
- $ADFEPS_{i\,t}$ = Per-share advertising forecast error at time t
- $RDFEPS_{i\,t}$ = Per-share research & development forecast error at time t
- $OEXFEPS_{i\,t}$ = Per-share other expense forecast error at time t

Following the works of Hirschey (1982); Hirschey and Weygandt (1985), among others, but using a different approach, in part, from the different focus, Sougiannis (1994) examines the impact of current advertising and lagged research & development expenditures on earnings and market value of a firm using cross-sectional data. He formulated the earnings equation as:

$$NI_t = \alpha_1 NC_t + \alpha_2 AD_t + \sum_{l}^{n} \alpha_{3,l} RD_{t-l} \quad (2.97)$$

where:

- NI_t = Net income before extraordinary items, after tax but before *AD* and *RD* expenditures at time t
- NC_t = Net capital stock at time t. It consists of fixed assets, inventories, recorded intangibles, and other investments, all inflation-adjusted.

Motivated by Ohlson (1989), and in conformity with the US GAAP on *RD* expenditures, ie FASB (1974), SFAS No. 2, Sougiannis (1994) investigates the value-relevance of *RD* expenditures by including both current and lagged *RD* expenditures in a valuation model:

$$MV_t = BV_t + \beta_1 \left[NI_t^B (1-\tau_t) - rBV_{t-1} \right] + \beta_2 \left[RD_t \tau_t \right] + \sum_{i=0}^{n} \beta_{3,l} RD_{t-l} \quad (2.98)$$

where:

- NI_t^B = Net income before *RD* expenditures at time t
- τ_t = (Effective) Tax rate at time t
- r = Risk-free rate

Equations (2.97) and (2.98) are linked in the sense that the indirect effect of *RD* on share price through earnings, $\frac{d\left[NI_t^B\left(1-\tau_t\right)\right]}{dV}$ in (2.98) is taken from (2.97). The term, $\sum_{i=0}^{n}\beta_{3,l}$ in (2.98) is the direct effect of *RD* on share price, which is treated as 'other information' in the valuation model, which applies to expected *RD* benefits (less costs) not reflected in earnings, and thus, captured directly by the *RD* variable itself. To mitigate the effect of heteroscedasticity, the earnings equation of (2.97) is scaled by net capital stock (*NC*) and the valuation equation of (2.98) is scaled by the book value of equity (*BV*). Thus, the empirical equations to be estimated are:

$$\frac{NI_t}{NC_{it}}=\alpha_0\frac{1}{NC_{it}}+\alpha_1\frac{NC_{it}}{NC_{it}}+\alpha_2\frac{AD_t}{NC_{it}}+\sum_{l}^{n}\alpha_{3,l}\frac{RD_{it-l}}{NC_{it}}+e_{it} \tag{2.99}$$

$$Ln\frac{P_{it}}{BV_{it}}=a\frac{1}{BV_t}+\beta_0\frac{BV_{it}}{BV_{it}}+\beta_1\frac{\left[NI_{it}^B\left(1-\tau_{it}\right)-rBV_{it-1}\right]}{BV_{it}}+\beta_2\frac{\left[RD_{it}\tau_{it}\right]}{BV_{it}}+\sum_{i=0}^{n}\beta_{3,l}\frac{RD_{it-l}}{BV_{it}}+\mu_{it} \tag{2.100}$$

Based on the concept of residual income, the RIVM and Sougiannis (1994), Green, Stark and Thomas (1996) modelled the market value of *RD* expenditures that are yet to have an impact (time lag) on earnings. Following past studies that include control variables in the estimating models to assist researchers in making tighter inferences about the magnitude of β (coefficient of *RI*) and γ (coefficient of *RD*), Green et al. employ four measures: (1) debt-to-equity ratio for individual firm; (2) average debt-to-equity ratio for the industry to which the firm belongs; (3) squared value of the difference between the firm debt-to-equity ratio and that of the industry; and (4) variance of the firm's stock market returns to measure the volatility of the firm's stock market returns. To control the size effect and heteroscedasticity in their cross-sectional regressions, the equations are deflated by closing book values, and by rearranging the RIVM in terms of the excess of market value over book value for a firm's assets produce:

$$\frac{MV_{it}-BV_{it}}{BV_{it}}=\alpha_0+\alpha_1\frac{1}{BV_{it}}+\beta\frac{RI_{it}}{BV_{it}}+\gamma\frac{RD_{it}}{BV_{it}}+\sum_{j=1}^{6}\lambda_j Z_{ijt}+e_{it} \tag{2.101}$$

where:

- $\beta \quad =\frac{1-\delta}{k+\delta}$ (2.102)

- $\gamma = \dfrac{\left(\dfrac{1+r}{1-g}\right)^{n} - 1}{\left(\dfrac{1+r}{1-g}\right) - 1}$ (2.103) is used to estimate the lag between incurring *RD* expenditures and their eventual effects on profits.
- $Z_{i,1,t}$ = Market share for firm *i* in year *t*
- $Z_{i,2,t}$ = Concentration for firm *i* in year *t*
- $Z_{i,3,t}$ = Debt-to-equity ratio for firm *i* in year *t*
- $Z_{i,4,t}$ = Average debt-to-equity ratio for firm *i's* industry in year *t*
- $Z_{i,5,t}$ = Square of the difference between the debt-to-equity ratio for firm *i* and that of its industry in year *t*
- $Z_{i,6,tt}$ = Annual variability of stock market returns for firm *i* in year *t*

The constant term, α_0 is included to capture the effect of deflated valuation-relevant variables not included in the valuation model to be estimated. The variable $\frac{1}{BV_{it}}$, which can be thought of as the inverse of size, is included to capture the effects of unscaled valuation relevant variables not included in the valuation model to be estimated.

Motivated by previous studies and Ohlson (1989), Stark and Thomas (1998) empirically investigate the relationship between market value and accounting data, such as RI, earnings, book values, and *RD* expenditures using a number of different models. As in prior studies using cross-sectional data, and in particular, to ensure comparability with the study of Green et al. (1996), each equation is estimated in deflated form using closing book value as the deflator in order to control for size and in mitigating heteroscedasticity in cross-sectional regressions. The deflated estimating equations are:

$$\frac{MV_t}{BV_t} = \alpha_0 \frac{1}{BV_t} + \alpha_1 \frac{NI_t}{BV_t} + e \qquad (1) \quad (2.104)$$

$$\frac{MV_t}{BV_t} = \alpha_0 \frac{1}{BV_t} + \alpha_1^1 \frac{NI_t + RD_t}{BV_t} + \alpha_2 \frac{RD_t}{BV_t} + e \qquad (2) \quad (2.105)$$

$$\frac{MV_t}{BV_t} = \alpha_0 \frac{1}{BV_t} + \alpha_1^1 \frac{NI_t + RD_t}{BV_t} + \alpha_2 \frac{RD_t}{BV_t} + \alpha_3 + e \qquad (3) \quad (2.106)$$

$$\frac{MV_t}{BV_t} = \alpha_0 \frac{1}{BV_t} + \alpha_1^1 \frac{NI_t + RD_t}{BV_t} + \alpha_2 \frac{RD_t}{BV_t} + \alpha_3 BV_t + \alpha_4 \frac{BV_{t-1}}{BV_t} + e \qquad (4) \quad (2.107)$$

where:

- MV_t (BV_t) = Market value (Book value) at time *t*
- $\alpha_2 RD$ = To capture *RD* capital. If $\alpha_2 = -\alpha_1^1$, *RD* is treated as an expense (2.108)
- e = (generic) error term

Fama and French (1998) use a wide range of past, current and future factors, such as earnings, investment, *RD* expenditures, etc. which serve as independent control variables in cross-sectional regressions of firm value under the assumption that as a group, these variables represent an unbiased proxy for expected net cash-flows of the firm.

The sample data and estimating techniques for the various studies are as follows. All studies use US data except for Green et al. (1996); and Stark and Thomas (1998) use UK data. In Hirschey (1982), sample data for *AD*, net income, sales, book value of total assets were taken from Fortune 500 for 1977. Interest expense was taken from Standard and Poor's Compustat tapes. Four-firm concentration ratios weighted to reflect firm sales in various four-digit census industries were taken from Economic Information Systems (EIS) for 1972 (latest available). *RD* expenditures were obtained from Business Week. The total sample size is 390. Hirschey and Weygandt (1985) use OLS to estimate their models over a 390-firm sample, using sources and methodology similar to Hirschey (1982).

Bublitz and Ettredge (1989) use annual data from 4-digit standard industry classification (SIC) industries 2000 through 3999; for firms to have both *AD* and *RD*. The sample is obtained from Compustat annual industrial tape for the period 1973-1983, and on the daily CSRP tape for the period 1969-1984. The test period is 1974-1983 with the maximum (minimum) observations are 2,832 (1,325). They also analyse the effect of *AD* and *RD* on durable (eg manufacturing) and nondurable (eg retail) firms.

Hirschey and Spencer (1992) use data from Compustat tapes for the 16-year period 1975-90. The overall sample is limited to those firms having a market value of at least US$100 million to ensure data comparability over time and to minimize any problems caused by reporting errors and lack of liquidity among very small firms. Chauvin and Hirschey (1993) use cross-sectional samples of Compustat firms over the 3-year period from 1988-1990, for an average of about 1,500 firms per year. They also analysed the industry characteristics to see whether they influence the valuation effects of *RD* by segmenting the samples into manufacturing and non-manufacturing firms.

In Sougiannis (1994), the sample data needed to estimate equation (2.99) were taken from the NBER RND-PANEL data set, which include *RD*. The accounting data needed to estimate the valuation equation (2.100) were obtained from the 1989 Compustat files and CRSP monthly files are used to extract per share prices, adjusted for stock splits

and dividends three months after the end of the fiscal year. The three-month lag is used so that prices should reflect the information included in the financial statements since US firms must publish their accounts within three months of fiscal year end. The one-year T-bill is used to approximate the risk-free rate, r in the calculation of RI. Sample firms were dropped when both the numerator and the denominator ≤ 0, and when the numerator > 0 and the denominator ≤ 0. After removing outliers, the sample size consists of 573 firms.

UK data for the sample in Green et al. (1996) were collected from DataStream, and beta and annual variability of stock market returns, $Z_{i,6,t}$ is obtained from the London Risk Measurement Service for each calendar year t. Market value (MV_t) is calculated for calendar year t as the market value of the firm, measured 6 months after the financial year ending in calendar year t. Six months after the financial year-end is used to ensure that the information in the latest financial statements is reflected in the market price because listed firms in UK have up to 6 months to submit their annual accounts. The samples taken are from 1990 to 1992, with yearly cross-sectional estimation for each of these three years. In each year cross-section regressions, the firms must satisfy:

(1) RD expenditures > 0 for the year because firms with positive and negative RD costs are economically different (Green et al., 1996, p. 214, Footnote 15).

(2) Book value at the end of the year must exceed £5 million. This is to ensure that the firms included are not in financial distress, because of (1) role of closing book value as a deflator in the valuation equation; (2) to reduce the risk of extreme values of the dependent variable, and the deflated RI and deflated RD variables.

In view of this selection criterion, the sample size is reduced to 190 firms in 1990, 232 firms in 1991, and 240 firms in 1992. To mitigate the effect of extreme values on the model parameter estimation, these equations are re-estimated on reduced yearly samples and pooled sample by deleting all observations where: (1) $\frac{MV_{it}}{BV_{it}} > 10$; and (2) $\frac{RD_{it}}{BV_{it}} > 1$. When these extreme values are removed (in brackets), the sample size is reduced to 189 (–1) firms in 1990, 224 (–8) firms in 1991, and 237 (–4) firms in 1992. Heteroscedasticity-consistent standard errors are also estimated using White's (1980) test.

Data for Stark and Thomas (1998) are collected for UK listed nonfinancial firms for financial years ending 1990-1994 from DataStream. The samples taken with yearly cross-sectional estimation for each of these three years are subjected to similar conditions in Green et al. (1996). Under these conditions, the sample sizes range from 696 firms in

1990, 734 firms in 1991, 711 firms in 1992, 710 firms in 1993, and 725 firms in 1994. When the data is pooled, 3,576 observations are available. Heteroscedasticity-consistent standard errors are also estimated using White's (1980) test.

The results for the various studies employing *RD* and *AD* are analysed as follows. Estimating results for the valuation model of Hirschey (1982) indicates significant explanatory power (R^2 = 0.501 and significant *F*-value of 54.79 at the 0.01 level). Statistical significant coefficients and of the correct signs were obtained for β_2, β_5, β_6 and β_i indicating that profitability, risk, *RD* and *AD* are important determinants of the market value of a firm. In particular, the results for *RD* and *AD* support his hypothesis that they should be treated as intangible capital since each has a highly significant positive influence on market value (p. 386). However, Hirschey (1982, p. 384) expresses caution in interpreting these results as they could reflect measurement and collinearity problems.

Consistent to Hirschey (1982), Hirschey and Weygandt (1985) find that *AD* and *RD* have a positive effect on the market value of the firm, thereby suggesting these expenditures should be capitalized and then amortized rather than treated as an expense as incurred. Their results indicate a 1-5 year 'life' for *AD* and a 5-10 year life for *RD*, but suggest that further research on these estimates be made before sufficient information is available to develop an appropriate accounting policy (p. 333).

Subsequent studies by Hirschey and Spencer (1992); and Chauvin and Hirschey (1993) confirm the findings that the coefficient of *AD* and *RD* variables are significantly positive in cross-sectional valuation models for the years 1975-91. Hirschey and Spencer (1992) find that *RD* has a dramatic and consistent effect (as measured by its coefficient) on the market values of all firm sizes but its effect is greater for smaller and medium sized firms than large firms for the 16-year sample period of 1975-90. Additionally, they find *AD* has only valuation relevance for large firms but *RD* expenditures affect *MV* of all firms. Chauvin and Hirschey (1993) find that the coefficient of *RD* is different for manufacturing and non-manufacturing firms, and also different according to firm size. There are differences in the patterns of value-relevance in some industries for *RD* and *AD*, suggesting that the valuation implications of *AD* and *RD* may be different. They find that the consistent significant positive influence of *RD* on market values of all sizes and industries suggests that it is a proxy useful for the favorable influence of intangible

benefits, such as brands, patents, good customer relations, good management, firm reputation and recognition, among others.

The evaluation for *AD* and *RD* expenditures in terms of expenses or intangible assets of Bublitz and Ettredge (1989) is shown in the table below.

Expenditures	*Research & Develoment (RD)*	*Advertsing (AD)*
All firms	Assets	Expense
Durable firms	Assets	Expense
Nondurable firms	Mixed, more towards asset	Mixed, more towards expense

Table 2.1 – Summary of Results for Models (2.95) and (2.96) of Bublitz and Ettredge (1989)

From the evidence, they conclude that *RD* = long-lived while advertising = expense. The result for advertising is inconsistent to results of Hirschey (1982); and Hirschey and Weygandt (1985). Bublitz and Ettredge (1989) did not provide a convincing explanation of the behaviour for *AD* and *RD* in their study.

The results from the estimation of the earnings model (equation (2.99)) of Sougiannis (1994) from 1975 to 1985 indicate a strong relationship between *NI* and all the independent variables: *NC, AD* and *RD*. The adjusted R^2s range from 35% in 1979 to 88% in 1977, with a mean value of 63%. Using Polynomials fitted to estimate the lagged *RD* coefficients shows that the overall mean is 3.4 years, indicating that *RD* benefits last, on average, for approximately 7 years (2 X 3.4). Increments in $\bar{R}^2$s due to *RD* lags show a mean value of 2.083, implying that a $1 outlay in *RD* leads to a $2 increase in earnings of the sample firms over a 7-year period; or approximately 26% when discounted over the same period (p. 59).

The results from the estimation of the valuation model (equation (2.100)) from 1975 to 1985 show that $\tilde{a}$ is either positive, negative or zeros, implying the effect of omitted variables in the regression equation. Contrary to expectation, $\hat{\beta}_0$ (book value parameter) = 0 only in 1980 and its mean value of –0.055 is not significantly different from zero. $\hat{\beta}_1$ is always positive (as expected) and highly significant in each yearly regression (11 years), but declines in later years (after 1981), implying that earnings are less persistence (permanent) than in earlier years. The mean value of $\hat{\beta}_1 = 2.757$ indicates that, on average, a $1 increase in earnings leads to an increase in the market value of nearly $3 for the

sampled firms. $\hat{\beta}_2$ is statistically > 1 in every year except 1984, implying that a $1 of taxes saved induces greater than $1 increase in market value. Sougiannis finds that only current *RD* expenditures are valuation relevant in most years of his sample. He attributes this result to one or more of three possible explanations but only one appears reasonable in that, the current value of *RD* expenditures captures both its own valuation relevance and that of lagged values (Green et al., 1996, p. 195). The results of the direct effect of *RD* variables can be informative in the short-run, but in the long run, *RD* information contained in earnings is more value relevant (Sougiannis, 1994, p. 60). Also, in all years, the indirect effect is much greater than the direct effect, which implies that the earnings numbers convey more information about the firm's *RD* than do the *RD* numbers themselves. Despite the domineering influence of the indirect effect (ie effect on market values), there is a strong similarity in the two patterns (see below).

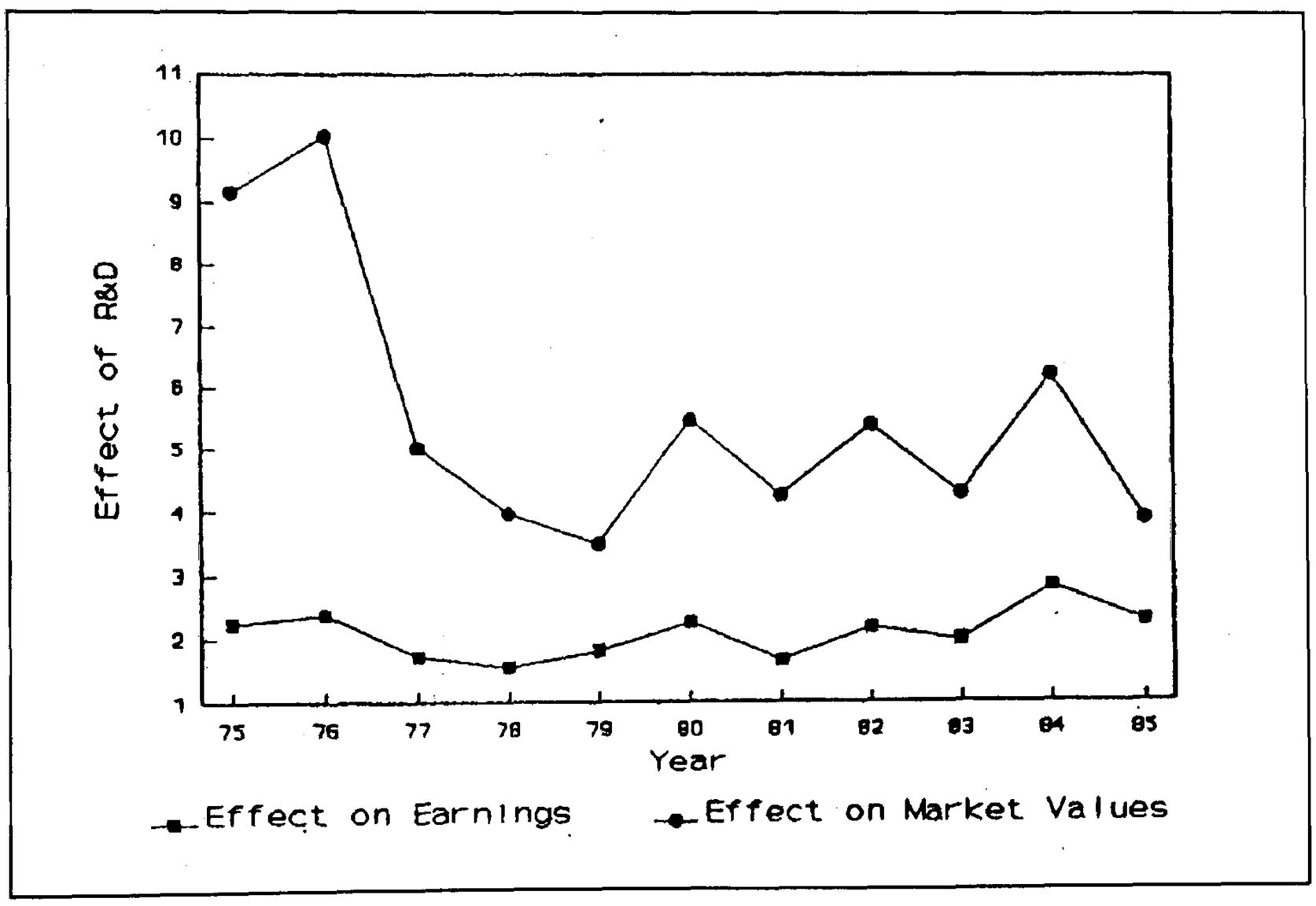


Figure 2.5 – The effects of Research & Development (*RD*) investment on Earnings and Market values for the period 1975-85 (Source: Sougiannis, 1994, Figure 1, p. 65)

The results of the OLS estimation for both yearly and pooled samples of Green et al. (1996) show that the coefficients of *RD* are consistently positive (> 1), and possess *t*-statistics > 2 using OLS standard errors, but the *t*-statistics is much lower using White's heteroscedasticity-consistent errors (< 2 for *RD* in 3 out of 8 estimated equations). The R^2 have reasonable degrees of explanatory power, particularly in 1991 when $R^2 > 0.93$. Both the coefficients are still statistically significant when extreme values (M/B > 10 and/or RD/BV > 1) are removed but R^2 decline and ranges from 0.257 in 1991 to 0.381 in 1990.

If the estimated coefficients for the pooled sample for *RD* expenditures are inserted into the fixed *RD* parameter (equation (2.103)), and taking $g = 0$, $r = 19\%$, $n = 3$, the realization into earnings, $\gamma \sqcup 3.31$ or a lag between 3 and 4 years. When the estimated coefficients from the equations with the controlled variables are inserted the same equation, the lag between incurring *RD* is again between 3 and 4 years. Results for the samples when extreme values are removed indicate that at best, the estimated coefficient of *RD* is significant at the 10% or not at all. Overall, these results suggest that the value-relevance of *RD* is mixed but the capitalization of *RD* expenditures rather than the current accounting treatment of full expensing may still be valid, and the addition of the control variables have little effect to alter inferences regarding *RD* expenditures in the valuation model. Due to the mixed findings, they indicate that there might be more sophisticated methods in estimating the coefficients of variables in cross-sectional valuation models.

In Stark and Thomas (1998), for all years and in the pooled sample, earnings (Model 1) is able to explain market value, and its explanation power is reasonable at around 0.4 and is comparable even when other variables are added to other models. However, the explanatory power in all years and in the pooled sample increases when partitioning the measure of earnings into two components-$(NI_t - RD_t) + RD_t$ (Model 2). From this evidence, the hypothesis that $\alpha_2 = -\alpha_1^1$ (equation (2.108)) is rejected, as $\alpha_2 > 0$, suggesting that *RD* constitutes a capital component (instead of an expense) of market value and this value is maintained in subsequent estimated equations (p. 454). The addition of (closing) book value term (Model 3) also improves the explanatory power in all years, and in the pooled sample. Thus, using both balance sheet and income statement measures results in an improvement in explaining market value as from the use of either of them (p. 454). Further, adding in an opening book value term (Model 4) further improves the ability to explain market value. Finally, the coefficients are all negative, which is as expected, suggests that this term is able to capture the capital charge element of *RI*.

Collins et al. (1997) investigate the combined value-relevance of earnings + book values in intangible-intensive firms and non-intangible-intensive firms. They conclude that the small difference in reported adj. R^2 for these two categories of firms does not imply that unreported intangibles cause the traditional historical accounting system to be less informative with respect to security prices (p. 51). Francis and Schipper (1999) use market-to-book ratios (M/B) to proxy for unrecognized intangible assets, and *RD* spending as a

percentage of total assets, to capture unrecorded intangible assets. The across-year average M/B is 3.18 for high-technology firms, whereas the average M/B is 1.57 for low-technology firms. In all years, the M/B of high-technology firms exceeds those of the low-technology firms. In addition, the across-year results show that on average, high-technology firms invest 9.2% of total assets in *RD*, compared to 0.8% for those in low-technology sector and this result is statistically significant at 0.0001 level. Thus, they conclude that the *RD* ratio is value relevant in explaining intangibles in the US. Lev and Zarowin (1999) find that increasing intensity of *RD* (ie amount of *RD* spending to sales) is associated with a decline in the informativeness of reported earnings (p. 372). With this evidence, they propose two proposals aimed at enhancing the usefulness of financial information: (1) capitalization of intangible investments; and (2) restated financial statements. However, whether the proposal to capitalize intangibles is acceptable remains a question considering that the US adopts a conservative accounting system, and one would expect there is a general reluctance of firms to accept the capitalization of intangible investments. Even in countries with liberal accounting system, eg Australia, the number of firms voluntarily capitalizing intangibles, such as *RD* expenditures is rather low (Wyatt, 2002). Using a large sample of Australian Stock Exchange (ASX) listed companies except for the publishing and media industry firms for the five years 1993-97, few firms capitalize their intangibles.

Ahmed et al. (2000) investigate the impact of conservatism on their models using the ratio of *RD* expense to sales as one of the independent variables. Using FO (1996), they find that the coefficients of *RD* are significant in explaining equity value. Similarly, capitalized *RD* values on Australian companies' balance sheets are significantly associated with market values (Abrahams and Sidhu in 1998).

In view of changing business climate, the FASB, ICAEW, CPA Australia and business press (Business Week) consider human resource (*HR*) as vital to the success of an organization. Due to the lack of CMRA literature on *HR*, this research is forced to rely on HRM literature on the empirical implications of *HR* as a performance measure that may create value of a firm. In Itami (1987), a properly developed HR system is an 'invisible asset' that creates value and enhances the firm's capabilities. This focus is similar to the emphasis on 'core competencies' developed by Prahalad and Hamel (1990) that people embodied skills are considered 'core' competences just like economic rents. According to

Barney (1991, 1995); Collins and Montgomery (1995), firms can develop sustained competitive advantage only by creating value in a way that is rare and difficult for competitors to imitate and indicate that HR strategies are those that are difficult to imitate. Huselid and Becker (1996) report that reasonable changes in an HR system can affect a firm's market value by $15,000-$45,000 per employee, and Welbourne and Andrews (1996) indicate that the changes in HR policies can affect the probability of survival for a new firm by as much as 22%. Becker and Gerhart (1996) indicate that HR should be viewed as a strategic lever that can create value rather than contemporaneous accounting based measures such as profit, which is subjective. Thus, the HR literature reviewed suggests that stock performance is the predominant measure used by most studies in linking HR and performance. This view is consistent with equity valuation as used in finance and accounting research.

Discussion and summary, empirical investigation using market valuation models to model *RD* expenditures were motivated by the 'Tobin's *q* ratio. Findings in US show that *RD* expenditures are long-lived and consistent influences on the market value (reaction) of these expenditures on firms, whereas in the UK, the findings of the value-relevance of *RD* are mixed. Studies in the US found that the coefficient of RD varies with (1) firm size (2) between manufacturing and non-manufacturing firms (3) between durable and non-durable firms, and (4) the current value of *RD* captures both the current and past values. In UK, evidence of *RD* as an intangible is weak, especially in the early years (before 90s) probably due to too few firms reporting RD expenditures, however, *RD* used in conjunction with other independent variables (eg *RI, BV*) has a stronger association with *MV*. Studies using the EBO model suggest that *RD* is value-relevant in explaining intangibles in the US. Early US studies find advertising costs may be long-lived, but a later study finds it short-lived that has no characteristics as an intangible, but nevertheless, they are also different from other expenses. Empirical studies by HR academics support the notion that HR is linked to performance of the firm, and HR decisions do influence value creation, a view shared by academics in accounting and finance. Research in HR is increasingly empirical, and most of these papers look directly at the impact of HR decisions on performance outcomes that have clear meaning and relevance to managers, and stock (capital market) performance is the predominant measure used by most studies in linking HR and performance This view of using capital market performance in evaluating the usefulness of HR is consistent with equity valuation as used in finance and accounting.

2.4.5 Tests for Dividends and External Debt as a form of Signal to the Capital Market

Theoretical concept in general and evidence in particular indicate that, investors gain little benefit from historical accounting information because they contain past information but no new information (Copeland and Weston, 1992). Various evidence points to more recent information, such as dividend announcements are more forward looking and therefore more relevant to investors in predicting future security prices, ie such information is viewed as a **signal** of firm value.

The first empirical research to determine whether or not, dividends is a signal of value is Lintner (1956). To model the dividend behaviour, Lintner hypothesizes that firms always stick to its target payout ratio *(TPR)* Then the dividend payment in the coming year (DIV_1) would equal a constant proportion of earnings per share (EPS_1):

$$DIV_1 = Target\ dividend = TPR\ X\ EPS_1$$

Even if there are sufficient reasons for a large dividend increase, managers are reluctant to change their dividend payout ratio because they believe that shareholders prefer a steady progression in dividends than fluctuating dividends. Therefore, their dividend changes will be:

$$\begin{aligned} DIV_1 - DIV_0 &= Adjustment\ rate\ X\ Target\ change \\ &= a\ X\ (tEPS_1 - DIV_0) \end{aligned} \qquad (2.109)$$

Equation (2.109) can be expressed more generally indefinitely in terms of dividends per share in time *t* produces:

$$DIV_t = at\left(EPS_t\right) + at\left(1-a\right)EPS_{t-1} + at\left(1-a\right)^2 EPS_{t-2} + \ldots + at\left(1-a\right)^n EPS_{t-n} \qquad (2.110)$$

Using data for the corporate sector in the US from 1918-1941, Lintner obtains the following regression result:

$$\hat{DIV}_t = 352.3 + 0.15EPS_t + 0.7DIV_{t-1}$$

The coefficients are significant at the 1% level of significance. Lintner finds that the model explains 85% of the changes in dividends for his sample of firms, the average speed of adjustment is approximately 30% per year, and the target payout ration is 50% of earnings. He also find that mature companies with stable earnings exhibited high payout ratios whereas growth (younger) companies, either do not pay or pay less frequent dividends, and, usually in a smaller proportions to earnings. With this evidence, he

concludes that management believe that dividend policy affects share price, but not dividend per se, and management is prepared to comprise the firm's dividend policy in favor of the 'perceived' interest of investors.

Early empirical studies on dividends announcements indicate that dividends is a signal of value for stock splits (Fama et al. 1969), changes in dividends (Pettit, 1972; Aharony and Swary, 1980, Handjiinicolaou and Kalay, 1984), initial dividend payout (Asquith and Mullins, 1983) but Watts (1973) finds no information content in announcements of dividends. Miller and Rock (1985) develop a formal **signalling model** that links the announcements effects of earnings surprises, unexpected dividend changes and unexpected external financing with equity values. In their model, an optimum level is attained when the expected and actual investment decisions are equal. Therefore, the difference between the actual and net dividends is:

$$\begin{aligned} Div_1 - \Delta B_1 - m_1 P_1 - E_0\left(Div_1 - \Delta B_1 - m_1 P_1\right) &= NOI_1 - I_1 - \left[E\left(NOI_1\right) - I_1\right] \\ &= NOI_1 - E\left(NOI_1\right) \end{aligned} \tag{2.111}$$

where:

- Div_1 = Dividends (current)
- ΔB_1 = Proceeds from new debt
- $m_1 P_1$ = (Number of new shares X price per share), which is the proceeds from an issue of external equity
- NOI_1 = Firm's net operating income
- I_1 = Current investment

The model demonstrates that earnings, dividends and financing announcements are closely related. The equation posits that earnings surprise and the net dividend surprise convey the same information since dividends and earnings are closely related. Consequently, dividends and financing are posited to be negatively related, hence, the financing announcement effect is merely the dividends or earnings announcement effect with the sign reversed. This relation can be interpreted to mean, an unexpected increase in dividends (or earnings) will increase shareholders' wealth, and an unexpected issue of new equity or debt will be interpreted as bad news relating to the future prospects of the firm.

Lobo et al. (1986) investigate the signalling effect of dividends by examining whether models utilizing past dividends and earnings information provide more accurate forecasts of earnings than models which utilize only earnings information. The sample consists of 115 randomly selected firms of NYSE for the period 1975-1979. The results

strongly support that past dividend payout or dividends per share information are useful for forecasting annual earnings, and are consistent with the profitability signalling-hypothesis (PSH) (eg Lintner, 1956; Fama et al., 1969; Kalay, 1980). Anthony and Ramesh (1992) observe that high dividend payout signal to the market that these firms are usually low-growth mature firms, and a low (or reduced) dividend payout signals either high growth opportunities or cash flow problems. This signal is perceived to be important because they tell investors something about the true measures of corporate prosperity, like cash flow and the extent of positive NPV investment opportunities. (p. 205).

In the UK, Rees (1997) examines the signalling effect of capital investments, dividend payout, and debt levels (all proxies for other information) using the EBO approach. He did not implement the linear information dynamics and instead of residual income, he uses retained earnings. The basic and extended valuation models are:

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 NI_{it} + e_{it} \quad \text{(basic model)} \tag{2.112}$$

$$P_{it} = b_0 + b_1 DIV_{it} + b_2 RE_{it} + b_3 (BVE_{it} + TD_{it}) - b_4 TD_{it} + b_5 CE_{it} + e_{it} \tag{2.113}$$

where:

- DIV_{it}=Ordinary Dividends for firm i, year t
- RE_{it} =Retained Earnings for firm i, year t
- BV_{it} =Book value of ordinary equity for firm i, year t
- TD_{it} =Total book value of Debt including non-ordinary equity capital, such as preference shares for firm i, year t
- CE_{it} =Capital Expenditure for firm i, year t
- NI_{it} =Earnings for ordinary per share for firm i, year t
- e_{it} =Random error term

Where $b_1 = b_2$, $b_3 = b_4$ and $b_5 = 0$, equation (2.113) reduces to (2.112). The sample is drawn from Extel database containing nonfinancial UK firms totalling 8,287 firm-year observations for the period 1987-95. The basic model was found to be robust with R^2 of 0.54 with statistically significant but with some instability in estimated coefficients for both earnings and book values. The extended model with dividend, debt and capital investment shows that capital expenditure is positively related to value but not on the amount of debt and earnings distributed as dividends have a bigger impact on value than does earnings retained within the firm. The inclusion of dividends in the valuation model improves the explanatory power of the model from 54% to 60%.

Using Ohlson (1995), Hand and Landsman (1999) regress book values, net earnings and dividends to proxy for other information, find robust evidence that dividends are materially positively priced, consistent with the profitability signalling hypothesis and

that dividends help predict future *RI*, incremental to current and lagged *RI*. However, using the same data, Lo and Lys (2000a) find that dividends have low signalling value.

There is few empirical research in the accounting and finance literature on the analysis of the usefulness of leverage. Evidence on optimal capital structure is few and inconclusive, probably due to the difficulty of selecting an observable proxy. Ross (1977) conducted the first empirical study of debt signalling in the equity market. He suggests that more leverage can be used by managers to signal an optimistic perception for the firm. Myers and Majluf (1984) presents a signalling model where managers possess private information that they are assumed to act in the interest of 'old' shareholders ie those who hold shares in the firm at the time a decision is made, for example, managers issue debt when they believe the security is overvalued (bad news is coming). Hence, more profitable firms will tend to use less external financing as external debt is considered bad news. McConnell and Muscarella (1985) examine the reaction of share prices to announcements of capital expenditures, and find that increased in capital expenditures are associated with increases in share prices and reductions are associated with falls, thus supporting the signalling effect for capital investment.

Making use of the firm debt-to-equity ratio to determine the 'optimal' level of a firm's capital structure, Green et al. (1996) found that departure from this ratio in either direction will not be rewarded by the market. This finding is consistent with the 'good' news signal effect of debt, Rees (1997) using *TD* as a signalling device find that the sign for TD is negative. Consequently, Fama and French (1998) conclude that debt has no net benefit, and hence, high leverage is 'bad' news about a firm's value (p. 841).

Giner and Reverte (2001) analyse the informative value of the firm capital structure, and adopt a contextual approach to analyse the signalling and optimal debt structure effect of debt. They use price-to-book ratio (*P/B*) at year-end to proxy for earnings growth, ie a high *P/B* signals 'good' news and a low *P/B* signals 'bad' news, and Ohlson (1995) to model the signalling effect of debt:

$$\frac{P_t}{B_t} = 1 + \frac{(ROE_{t+1} - r_E)}{(1+r_E)} + \frac{(ROE_{t+2} - r_E)}{(1+r_E)^2} * \frac{BV_{t+1}}{BV_t} + \frac{(ROE_{t+3} - r_E)}{(1+r_E)^3} + * \frac{BV_{t+2}}{BV_t} + \ldots \quad (2.114)$$

where:

- ROE_t = Return on equity at time t
- r_E = Cost of equity capital

The sample consists of all nonfinancial Spanish firms listed in the Madrid Stock Exchange during the period 1991-97 comprising of 599 industrial and commercial firms. They use per share basis to mitigate heteroscedasticity, and also employ the White (1980) heteroscedasticity-consistent covariance to further alleviate the same problem. The models are estimated using annual cross-section and pooled regression. Their evidence is consistent with the debt signalling hypothesis as debt seems to be a positive signal for firms facing good earnings prospects (as measured by the *P/B* ratio). They also find that departures from the target debt ratio (proxy for optimal leverage) are negatively valued by the market, which is consistent to the optimal capital theory.

Discussion and summary, the information content of dividends in the form of signal that provide a credible but costly signal to the equity market has been researched extensively in the past. However, the interest in dividend research declined in the mid-1980s but recently, there is a resurgent of interests in dividend signalling in UK and US. Most studies reviewed confirm to the signalling hypothesis and this signal is perceived to be important because they tell investors something about the true measures of corporate prosperity, like cash flow and the extent of positive NPV investment opportunities. Most researches testing the dividend signalling effect use event studies to calculate abnormal returns in relating stock returns and dividends except for Lobo et al. (1986) that focus on information contents of retained earnings and dividends; while Green et al. (1996); Rees (1997); and Hand and Landsman (1999) use valuation models. The few literature on the use of debts report conflicting results and are difficult to form a general consensus regarding the signs of external debt financing. Evidence in Ross (1977), Green et al. (1996) and Giner and Reverte (2001) supports the debt signalling hypothesis while Myers and Majluf (1984); Rees (1997); Fama and French (1998) conclude that the issue of external debts generate bad news to the market. Thus, it appears that the debt signalling hypothesis is weak, which is in contrast with that of dividends.

2.4.6 Tests for Fundamental Signals obtained from Financial Analysts in Predicting Future Abnormal Earnings/Returns

The pioneer of using **non-earnings fundamental signals** derived from professional financial analysts' literature and financial press for fundamental analysis is Lev and Thiagarajan (1993) (L). They identify twelve non-earnings fundamental signals from searches such as Wall Street Journal (WSJ), Value Line, publications such as Quality

Earnings and newsletters of major securities firms. Subsequent works by Abarbanell and Bushee (1997, 1998) (A); and Al-Debie and Walker (1999) (D) largely adopted these fundamental signals. The fundamental signals identified by these researchers are:

#	Fundamental signals	Measurement	By
1	Inventory (*INV*)	Δ Inventory – Δ Sales	L,A
2	Finished Goods (*FG*)	%Δ *FG* – %Δ Sales	D
3	Accounts Receivables (*AR*)	Δ *AR* – Δ Sales	L,A
4	Debtors (*DEB*)	%Δ Debtors – %Δ Sales	D
5	Gross Margins (*GM*)	Δ Sales – Δ Gross margin %Δ Sales – %Δ Gross margin	L,A D
6	Order Backlog (*OB*)	Δ Sales – Δ Order Backlog	L
7	Provision for Doubtful Receivables (*PDR*)	Δ Gross receivables – Δ Doubtful Receivables	L
8	Capital expenditures (*CAPX*)	Δ Industry *CAPX* – Δ Firm *CAPX* %Δ Industry *CAPX* – %Δ Firm *CAPX*	L,A D
9	*R&D* expenditures (*R&D*)	Δ Industry *R&D* – Δ Firm *R&D* %Δ Industry *R&D* – %Δ Firm *R&D*	L D
10	Selling & Administrative Expenses (*S&A*)	Δ *S&A* – Δ Sales	L,A
11	Distribution & Administrative Expenses (*D&A*)	%Δ *D&A* – %Δ Sales	D
12	Effective Tax Rates (*ETR*)	$PTE_t\left(ETR_{t-1} - ETR_t\right)$ where PTE_t = *Pretax earnings at t, deflated by begining price* $\left[\left(\frac{1}{3}\sum_{\tau=1}^{3} ETR_{t-\tau}\right) - ETR_t\right] X\ CHGEPS_t$ where $ETR_t = \frac{Tax\ Expense}{EBT}$ $CHGEPS_t$ = *change in EPS bet. t & t -1*	L A
13	Inventory Methods (*IM*)	0 = LIFO, 1 = FIFO	L
14	Audit Qualifications (*AQ*)	0 = Unqualified, 1 = Qualified or other	L,A
15	Labor Force (*LF*)	$\frac{Sales_{t-1}}{No.\ of\ Employees_{t-1}} - \frac{Sales_t}{No.\ of\ Employees_t}$ $\frac{Sales_{t-1}}{No.\ of\ Employees_{t-1}}$ $\frac{Sales\ per\ employee_{jt-1} - Sales\ per\ employee_{jt}}{Sales\ per\ employee_{jt-1}}$	L,A D
12	Earnings Quality (*EQ*) (Earnings Persistence)	0 = LIFO, 1 = FIFO or other	A

Table 2.2 – Definitions of Fundamental Signals

The fundamental signals and data description for the various studies are:

L	Lev and Thiagarajan (1993)	Data to compute the fundamental signals are taken from Compustat, and returns data are taken from CSRP for the sample period 1974-88 with an annual observations ranging between 140-180 for full sample and 500-600 when *RD*, debt and order backlogs are removed.
A	Abarbanell and Bushee (1997)	Data to compute the fundamental signals are taken from Compustat, and data of analysts' forecasts are taken from IBES for the sample period 1983-90 with a total of 4,180 firm-years observations.
D	Al-Debie and Walker (1999)	Data to compute the fundamental signals are taken from DataStream, and stock returns from the London Stock Price Database (LSPD returns) for the sample period 1983-92 with a total of 1,910 observations.

While Lev and Thiagarajan (1993) use twelve fundamental signals, Abarbanell and Bushee (1997, 1998); and Al-Debie and Walker (1999) focus only nine and seven of these signals respectively. Lev and Thiagarajan (1993) use before-tax earnings whereas Abarbanell and Bushee (1997) use after-tax earnings. Abarbanell and Bushee (1997) use a **direct approach** to study fundamental signals in predicting future earnings changes using a one year and five year time frame whereas Lev and Thiagarajan (1993) use an **indirect approach** by examining the relations between the fundamental signals and contemporaneous returns. To examine the incremental relevance over earnings, Lev and Thiagarajan (1993) ran two returns/earnings regressions, where equation (2.115) is used as a benchmark against which equation (2.116) is evaluated. They conjure that some of the fundamental signals may be affected by economic conditions, and hence, they chose three economic variables: (1) annual change in the Consumers' Price Index (CPI); (2) annual change in real GNP; and (3) annual change in the level of Business Inventories for the contextual analysis.

$$R_{it} = a + b\frac{\Delta EPS_{it}}{P_{it-1}} + \varepsilon_{1it} \qquad (2.115)$$

$$R_{it} = a + b_0 \Delta PTE_{it} + \sum_{j=1}^{12} b_j S_{jit} + \varepsilon_{2it} \qquad (2.116)$$

where:

- R_{it} = 12 months excess stock return of firm *i* at time *t*
- ΔEPS_{it} = Annual change in *EPS* (primary, excluding extraordinary items) deflated by beginning-of-year share price.
- ΔPTE_{it} = Annual change in pretax earnings *X* 1– *t ETR*
- S_{ji} = Fundamental signals per Table 2.2.

Adopting the fundamental signals in Lev and Thiagarajan (1993), Abarbanell and Bushee (1997) examine the ability of the fundamental signals to predict future earnings;

and whether these signals are affected by firm-specific earnings news, industry and macroeconomic factors. In examining the relation between fundamental signals and future earnings, regression model is used while contextual analysis is used for firm-specific phenomenon.

$$\Delta EPS_{t+\tau,i} = a + \beta_0 CHGEPS_i + \sum_{j=1}^{9} \beta_{ij} S_{ji} + \varepsilon_i \qquad (2.117)$$

where:

- ΔEPS_i = One-year ahead earnings change and five-year earnings growth ie $\frac{EPS_{t+1} - EPS_t}{P_{t-1}}$ or 5-year GM earnings growth.
- $CHGEPS_i$ = Change in *EPS* between t-1 and t (contemporaneous with fundamental signals) deflated by share price at the end of year t-1.

Al-Debie and Walker (1999) extend from the fundamental information analysis of Lev and Thiagarajan (1993), but unlike the work of the later, the former use UK data and their response parameters of non-earnings fundamental signals is conditioned by both industry and macro-economic state variables (as in Lev and Thiagarajan, 1993). They adopt the following model in estimating their data in which the time and industry variation in the parameters is done using a dummy variable approach:

$$ER_{jt} = \alpha_{It} + \beta_{1,It} \frac{EPS_{jt}}{P_{jt\text{-}1}} + \beta_{2,It} \frac{\Delta EPS_{jt}}{P_{jt\text{-}1}} + \sum_{k=1}^{K} \left(\gamma_{kI} + \gamma_{km(t)} \right) + S_{kjt} + \varepsilon_{jt} \qquad (2.118)$$

where:

- ER_{jt} = Cumulative monthly excess return on a share of firm j for period t
- EPS_{jt} = *EPS* of firm j for period t
- $P_{jt\text{-}1}$ = Adjusted share price for firm j for period t
- ΔEPS_{jt} = First difference in *EPS*
- $m(t)$ = State of the business cycle associated with year t
- α_{It} = Industry (I) and time, t varying intercept parameters
- β_{1It}, β_{2It} = Industry and time varying response parameters
- γ_{ki} = Industry I specific parameter associated with non-earnings signal k
- $\gamma_{km(t)}$ = State of the business cycle specific parameter associated with non-earnings signal k in state $m(t)$
- S_{kjt} = Value of the $k^{th.}$ non-earnings signal for firm j in period t
- ε_{jt} = Mean zero, and constant variance disturbance term.

The findings of Lev and Thiagarajan (1993) support the incremental valuation-relevance of most of the identified fundamentals. Only three fundamentals-*AQ*, *RD* and *PDR* produced mixed results. For the 1980s, the fundamentals add approximately 70% on average, to the explanatory power of earnings with respect to excess returns and that the returns-fundamentals relation is considerably strengthened when the fundamentals are under specific economic conditions (ie during high inflation). They also identify that

fundamental signals are used by investors to assess the persistence ('quality') and growth of reported earnings and that the aggregate fundamental score ('quality of earnings' or persistence of earnings) is inversely related to the ERCs. Finally, they find that the fundamental score is more effective in capturing the permanent component of earnings (persistence of earnings) than the time-series-based persistence measure.

The findings of Al-Debie and Walker (1999) on UK data are by and large consistent with that of Lev and Thiagarajan (1993). The overall increase in the adjusted R^2 due to the inclusion of the industry signal and macro-state varying parameter is 8.7%. The *GM, D&G, LF* signals are frequently significant and the valuation-relevance of these signals stems primarily from their ability to provide additional information relating to the future operating costs of firms (pp. 274) and as a result, these signals have contributed to the increased explanatory power of the regression. Consequently, they did not find any evidence of an inverse relation between ERCs and the aggregate fundamental score as in Lev and Thiagarajan (1993), implying that aggregate score may not be a good measure of earnings quality. Thus, the evidence from a UK context led Al-Debie and Walker (1999) to suggest that researchers should focus on the information content of signals for future operating margins rather than to measure ERCs using fundamental scores.

The findings of Abarbanell and Bushee's (1997) are as follows. For the one-year ahead forecast sample, as anticipated, the results (p. 6) reveal that the coefficients of *INV, GM, ETR, EQ* (Earnings Quality) and *LF* (Labor Force) signals are statistically significantly related to one-year-ahead earnings at the 5% level (one-tailed test); but *S&A* (Selling & Administrative Expenses) and *AQ* (Audit Qualification) are not, which is consistent to Ou and Penman (1989b). Unexpectedly, both the coefficients of *CAPX* and *AR* are positives, suggesting that these variables are not consistent with the theoretical hypotheses of Lev and Thiagarajan (1993). The result for the five-year earnings growth shows that *ETR* and *LF* signals are strongly negatively associated with long-term earnings growth. They also discover that some signals are more informative for some industries but macroeconomic trends have little effect on the informativeness of the fundamental signals for future earnings, with the exception of the *GM* and *AR* variables (p. 22). With this evidence, Abarbanell and Bushee (1997) suggest that not all of the signals used by Lev and Thiagarajan (1993) are useful in predicting (forecasting) earnings.

Discussion and summary, both the findings of Lev and Thiagarajan (1993) and Al-Debie and Walker (1999) support the incremental value-relevance of most of the identified fundamentals and that the returns-fundamentals relation is considerably strengthened when the fundamentals are under specific economic conditions (eg high interest rates or inflation). Abarbanell and Bushee (1997) provide evidence that the relations between some of the fundamental signals and security returns are affected by economic growth and inflation but overall, macroeconomic trends to have little effect (or lack thereof) on the informativeness of the fundamental signals for future earnings, with the exception of the *GM* and *AR* variables. While the evidence in the US suggests that aggregate fundamental score is more effective in measuring the persistence of earnings than time-series models, evidence in the UK does not. The evidence of Abarbanell and Bushee (1997) suggests that not all of the twelve signals used by Lev and Thiagarajan (1993) are useful in predicting (forecasting) both short-term and long-term earnings or superior to analysts' information.

2.5. Return Models vs. Valuation Models

Models in which share prices, market value of equity, the ratio of market to book value or the price-earnings ratio are regressed on either deflated or undeflated explanatory variable (s) are known as **price or valuation model** whereas models in which stock returns are regressed on scaled (deflated) explanatory variable (s) are known as **returns/earnings** or **returns** models. More commonly, returns may be expressed as the percentage return on a firm's common stock, which is expressed as:

$$\frac{P_t - P_{t-1} + D_t}{P_{t-1}}$$

Both the returns/earnings models and the valuation models are aimed to achieve the same thing-to determine value creation. Identifying investments with positive NPV will add value to a firm and is the same as identifying expected abnormal returns (Penman, 2001). The former terminology is used for internal-generating investments while the later applies to external investors trading in securities.

Research into the usefulness of various accounting items contained in the financial statements and other fundamentals usually employ a returns/earnings modeling framework (Rees, 1997, p. 1111; Kothari, 2001; Beaver, 2002), as opposed to the value modeling approach. As analysis in the number of valuation and return models and their capabilities are voluminous, I will have to rely on the literature[16] to provide a commentary on both types of models. The merits and demerits of either models for measuring the valuation relevance of accounting variables and fundamentals has been an ongoing debates for nearly forty years. Early researchers, eg Gonedes and Dopuch (1974) tends to favor the returns model, which is the model of choice in the entire literature on MBAR, but ever since the revitalization of the valuation approach by Feltham and Ohlson, recent CMRA has largely adopted the OFF valuation approach.

Gonedes and Dopuch (1974) believe that the theoretical superiority of return analysis to fundamental valuation may be behind the reason for the popularity of the returns models over valuation models. Their argument is valid as in those days, there is no well-formulated accounting-based valuation model that can be used to value equity, and

[16] For a good review of the various returns and valuation models used in CMRA, see Kothari (2001) and for cash flows models, see Charitou and Clubb (2000).

researchers relied on DDM. Ryan et al. (1992) believe that the weakness of the valuation models is due to the difficulty of determining future cash flows, and so, research into security price reaction to different types of accounting information become the most popular research in finance since the 1970s.

But, Lev and Ohlson (1982) believe that valuation models could be superior to returns models because the explanatory power of returns models is rather low and that these models ignore fundamental accounting variables. They state (p. 304): "*…why has MBAR been almost exclusively concerned with the association between financial data and stock price changes (returns), while ignoring the more basic question of asset valuation by fundamental accounting variable? Empirical evidence suggests that unexpected accounting information (particularly earnings) is associated with excess returns, but it is also clear that the explanatory power of the examined data with respect to the distributions of stock returns is rather low. There is therefore a good reason to consider alternative methods of relating stock price characteristics in financial markets to accounting signals…*" further , "*…the information content of any set of (accounting) variables must manifest itself on a valuation level as well as that of value changes. The basic question therefore remains. Why has so much effort been devoted to explaining returns (value changes) rather than values? …*"

Relatedly, using levels regressions avoids empirical issue like measuring the performance of the model using R^2 will not be affected by the length of the window. Empirical studies of returns models have shown that the performance as measured in R^2 is affected by the length of the window because contemporary relation between aggregated earnings and prices become closer (or 'stronger') over increasingly wider windows while the returns/earnings relation is low over narrow windows (quarter or annual) (see Collins and Kothari, 1989; Lev, 1989; Easton, et al. 1992; Warfield and Wild, 1992; Charitou and Clubb, 1999; Dumontier and Labelle, 1998; and Dumontier and Raffournier, 2002).

Lev (1989) in reviewing MBAR for the past 20 years of research do not consider the earnings/returns approach to be satisfactory since most return models can only explain up to 5% of the variation in stock returns, and calls for alternative specifications. Later studies by Strong and Walker (1993); and Bao and Bao (1998) indicate that at best, the R^2 produced by returns/earnings studies, regardless of the length of the windows used hardly exceed 10%. In contrast, Rees (1997, p. 1113-4) indicates that the explanatory power of

valuation models (eg Ohlson-Feltham models) is relatively high – usually more than 50%, implying that the parameters estimated using valuation models are reasonably close to those expected from theory. But the comment by Rees should be interpreted with caution as the difference in the R^2 between returns and valuation models could be attributed to differences in the dependent variables used rather than as a test of superiority.

Beaver and Landsman (1983) is equivocal on either approach. They state: *"...we do not view a return approach and a cross-sectional approach valuation to be mutually exclusive. They represent two ways of extracting information from the data. In general we would expect each approach to provide information not provided by the other. There is no reason to suspect dominance of either a return or a cross-sectional valuation approach."*

Christie (1987) argues that economically, both the valuation and returns models are equivalent since the same cash flow valuation underpins both approaches; one is just a transformation of the other, but returns models are less problematic econometrically, and researchers should choose the model based purely on the basis of the research objective. Consequently, Landsman and Magliolo (1988) argue that returns approach do not generalize across all sets of assumptions regarding asset pricing relations and the econometric properties of the data used in the research, and hence, valuation are superior in some ways. Similarly, Lev (1989) indicates that the coefficients of return models are considerably smaller than expected, and also exhibit considerable instability over time, which has yet to be explained. Kothari and Zimmerman (1995); Strong (1997) and Kothari (2001) theorize that return models to be inferior to the price (levels) models on econometric grounds because in levels models, only current information is needed in relating current prices to information, and hence, the estimated slope coefficient appear to be unbiased. The estimated slope coefficient will still be unbiased even in an imperfectly specified valuation model, except that the explanatory power of the model will be reduced due to an uncorrelated omitted variable. The contention that the estimated slope coefficient is unbiased in valuation models is consistent with the theoretical argument of Maddala (1992). Consequently, in return models, only a portion of the information is a surprise to the market because the major portion is stale (anticipated) information which is irrelevant in explaining contemporaneous returns. This informationally irrelevant portion contributes to a standard errors-in-variables problem which biases downward the ERC and since the lag is potentially negatively correlated with earnings, it reduces the explanatory power of

the returns-earnings regression (see Maddala, 1992, Chapter 11). A common issue in returns/earnings modeling is that in general, these models include earnings or earnings-related variables (eg EPS) that capture only the short-run relationships of the firm ('market myopic') (Woolridge, 1988) while ignoring the longer-term benefits derived from valuations in longer horizons (Finger,1994)

Kothari and Zimmerman (1995) empirically compare the returns, change-in-price and price models. They find that the price models have unbiased ERC and higher R^2 than return and change-in-price models. However, return models exhibit less serious heteroscedasticity and specification problems than the price models. Also, return models better capture information over a designated period (eg the testing window) than the price models. This is consistent with market efficiency where prices reflect past information (ie information is reflected in prices with a lag). With this evidence, they are indifferent between these two types of models even though they have earlier theorized that econometrically, return models are inferior to the price models

Discussion and summary, the merits and demerits of return and valuation models has been an ongoing debates for nearly forty years with early researchers tends to favour the returns model but more recent studies have largely adopted valuation models, especially the valuation approach by Feltham and Ohlson. The coefficients of valuation models are unbiased because they are based on levels not changes, and the ERC will still be unbiased even in an imperfectly specified model. Consequently, the major portion of information is anticipated and is irrelevant in explaining contemporaneous returns, thus biases downward the ERC, Empirically, identifying unexpected surprise component of accounting disclosures requires measuring price changes, which is an odious task. Hence, returns captures only the short-run relationships of the firm whereas valuation models is modelled to capture the long-run relationships of the firm, but return models exhibit less serious heteroscedasticity and specification problems than price model.

2.6. Summary and Conclusions

This chapter focus on the review of the decline usefulness of earnings in relating to share prices (returns) and the value-relevance (usefulness) of book values, non-earnings and other information. MBAR is limited mainly due to its over-reliance of accounting data (particularly earnings), low usefulness, no cohesive methodology and no agreeable size of window has been used for over 30 years of research. Valuation models using book values + earnings have documented that the value-relevance of earnings has declined over the past 44 years, and many academics believe that one of the main sources of the decline in the value-relevant of accounting information is the accounting system. The hallmark of financial reporting is the accrual-based historical method of recognizing economic events, resulting in conservatism that causes the book values and market values to differ. The main problem with conservatism is that it indicates growth but does not add value. Hence, advocates of alternative methods of reporting, such as cash flows and alternative data question the adequacy of accrual accounting, and they suggest that both earnings, non-earnings and other information (eg cash flows, *RD, HR*) provide a richer set of value relevant information to be used by investors.

The few studies examining the use of nonfinancial information in valuing firm values are innovative and are interesting and the results are encouraging. No doubt there is theoretical (these studies are done purely on empirical ground) and methodology issues, they should provide the motivation for future research in the areas of fundamental analysis using nonfinancial information in CMRA. Except for the use of order backlog, empirical studies using capital expenditures, dividends and earnings forecasts to proxy for other information (v_t) are consistent with the OFF. However, there is no cohesive use of methodologies (eg uses of per share basis and no agreeable deflator in cross-sectional estimations) and selection of variables to proxy for v_t in these studies.

Findings in US show that *RD* is long-lived but its coefficient varies with firm size and industry, whereas *AD* is short-lived. In UK, evidence of *RD* as an intangible is weak, especially in the early years (early 90s) probably due to too few firms reporting *RD* expenditures, however, *RD* used in conjunction with other independent variables (eg *RI, BV*) has a stronger association with market value. Empirical studies by HR academics

support the notion that *HR* is linked to performance of the firm, and HR decisions do influence value creation, a view shared by academics in accounting and finance.

Most studies reviewed confirm to the positive signalling hypothesis of dividends and this signal is perceived to be important because they tell investors something about the true measures of corporate prosperity, like cash flow and the extent of positive NPV investment opportunities. The few literature on the signalling hypothesis of debts report conflicting results and are difficult to form a general consensus regarding the signs of external debt financing. This suggests that debt signalling hypothesis is not as consistent with that of dividends.

The merits and demerits of return and valuation models has been an ongoing debates for nearly forty years with early researchers tends to favour the returns model but more recent studies have largely adopted valuation models, especially the valuation approach by Feltham and Ohlson. Valuation models are preferred over return models because in the former, the (1) coefficients are unbiased because they are based on levels not changes, and the ERC will still be unbiased even in an imperfectly specified model; and (2) model captures the long-run relationships of the firm. On the other hand, return models exhibit less serious heteroscedasticity and specification problems than the price model. Empirically, identifying unexpected surprise component of accounting disclosures requires measuring price changes, which is an odious task.

RESIDUAL INCOME INFORMATION DYNAMICS AND EQUITY VALUATION: A STUDY USING UK DATA

DEVELOPMENT OF TESTABLE MODELS 3

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CHAPTER 3
DEVELOPMENT OF TESTABLE MODELS

3.1. Introduction

This chapter is about the development of a testable model by taking accounting book values and non-earnings data directly into the valuation process. Following the literature review in the previous chapter in which the various modelling approach used in relating various form of information to equity prices (returns) were critically examined, ultimately, the choice of the proposed model is based on the linear residual income valuation models developed by Ohlson (1995); and Feltham and Ohlson (1995, 1996), which is referred to as the Ohlson-Feltham Framework or OFF for this thesis. The OFF rely on the concept of the clean surplus relation (CSR) and the role of residual income (*RI*) in relating accounting and other information with share prices. The empirical implications, testing methodology and likely issues to be encountered during the tests, and sample data to be used for estimating this model will be discussed in the next chapter.

The remainder of this chapter is organized as follows. **Section 2** provides various arguments why the OFF is a better model than competing models, eg the DDM, ECM and others. **Section 3** critically evaluates the roles of accounting in equity valuation. **Section 4** examines the basis and justifications for the use of the OFF for this research. **Section 5** is about the derivation of the proposed models, which is the focus for this chapter. **Section 6** concludes.

3.2. Ohlson-Feltham Framework (OFF) vs. Dividend Discounting Model (DDM), Earnings Capitalization Model (ECM), Free Cash Flow Model (FCFM) and Other Models

Since the overwhelming majority of CMRA in both UK and US has adopted the returns approach rather than value, the approach taken here needs some justifications. The justifications for the choice of RIVM for this research is made in view of its comparative merits compared with competing models, such as the DDM, FCFM, ECM and return and other valuation models.

Penman (1992a) states that the pre-1995 of the Ohlson's model provides a powerful argument for a change of emphasis away from excessive attention on returns/earnings

models to fundamental valuation models. Consistent with this view, Walker (1997, p. 342) considers the works of Ohlson (1989a, 1989b, 1990, 1995); and Feltham and Ohlson (1995) represent an attempt to move accounting theory back in the direction of the fundamental measurement perspective. These works of Ohlson and Feltham are thereafter referred to as the **Ohlson-Feltham Framework or OFF** in this thesis. The OFF can be viewed as an attempt to improve market-based accounting research (MBAR) by combining modern economic theories of rational capital markets with economic theories of income measurement. By this approach, the OFF focuses on fundamental valuation of firms directly rather than correlating earnings surprises with returns. Likewise, Francis and Schipper (1999) state that the Ohlson (1995) model is particularly suited for testing the ability of financial information to capture or summarize information as it uses accounting numbers directly as opposed to some other models, such as DDM or DCF[1]. Earlier, Bernard (1995) considers that the OFF approach is very much based on fundamental analysis as it involves a study of a firm's current activities and prospects for purposes of estimating its value using a wide varieties of factors like sales, industry, corporate, economic, political, etc. By focusing on the interpretation of financial statement data and fundamental analysis allow us to estimate value using information independent of price (p. 736). Similarly, Green, Stark and Thomas (1996) consider that the work of Ohlson establishes a formal role for the accounting comprehensive earnings measurement process in valuation.

In Penman (2001), the advantage of the RIVM over other valuation models is that it incorporates the value already recognized in the balance sheet (the book value); and future income statement (the forecasted earnings). This is due to the use of the concept of residual income as a performance measure where:

$$RI_t \equiv NI_t - rBV_{t\text{-}1} \qquad \text{(reproduced)} \tag{3.1}$$

where:

- NI_t = Accounting net income or earnings at time t
- r = Cost of equity capital
- $BV_{t\text{-}1}$ = Net book value of assets at time $t-1$

With this equation, one can determine whether or not value is created. Value is created when (1) earnings is in excess of the cost of capital X beginning net book value ($NI_t - rBV_{t\text{-}1} > 0$); or (2) the rate of earnings is greater than the cost of capital ($\rho > r$). The other

[1] Otherwise also known as the free cash flow model (FCFM).

advantage of *RI* is that it links the income statement and the balance sheet through the use of net income and book value, which suggests that the specification of the *RI* model rely on accounting fundamentals.

Walker (1997) indicates that the OFF has many appealing features not found in return/earnings models. A salient feature of models with linear information dynamics is their abilities to produce accounting-based valuation models based on observable data and due to their more general framework than return/earnings models, they allow us to produce a logically consistent representation of several fundamental characteristics of financial reporting systems, such as:

- The importance of persistence of abnormal earnings in determining the relative weighting of earnings and book value in accounting-based valuation models (Walker, 1997, p. 348).

- The valuation of observable data before this data is reflected in the published accounts (Walker, 1997, p. 348). For instance, the NPV of new projects may be impounded into price either during or before the actual capital expenditure is reported in the accounts (see Feltham and Ohlson, 1995; and Clubb, 1996).

Kothari (2001) considers the OFF appealing on pragmatic and economic sense as its theoretical assumption that above-normal rates of returns on investments will decay and positive growth is the result of reinvestment. To Lo and Lys (2000a), the attractiveness of Ohlson (1995); and Feltham and Ohlson (1995) to empiricists is they provide a testable pricing equation that identifies the roles of accounting and non-accounting information, and only three accounting constructs are required to summarize the accounting component (Lo and Lys, 2000a, p. 13) and that the models provide an internally consistent set of valuation equations for price levels and returns in place a number of ad hoc models in the last three decades. More importantly, the model is sufficiently tractable to allow derivation of specific predictions and rejection criteria (p. 14).

Jacobs and Levy (1988) state that the implementation of the DDM may be problematic because the fundamental assumptions for the model, such as the investors' required rate of return (r), the constant, long-term dividends growth rate (g), the risk-free rate; and the equity risk-premium are not obtainable in practice, and proxies are often used

instead. Penman (1992a); and Penman and Sougiannis (1998) are critical of the usefulness of the DDM as a valuation model because (1) forecasted future dividends are often not related to value; (2) valuation errors are higher using dividends than earnings in finite-horizon analysis; (3) history of dividends is far too incomplete to provide a set of realizations that are representative of outcomes that investors perceive ex ante under all information conditions; (4) coincides with the dividend irrelevancy theory of M&M (1961), a firm's dividend payout policy is arbitrary or discretionary; and (5) other models such as the RIVM and Coherent Model (CM) (GAAP accounting) produced better results than DDM. However, the problem of obtaining the appropriate cost of capital, which include the risk-free rate; and the equity risk-premium is also problematic for the RIVM but the RIVM is considered a better model than the DDM in terms of higher R^2 or lower forecast errors are difficult to justify since the RIVM is a reformulated DDM (see Penman and Sougiannis, 1998; and Lundholm and O'Keefe, 2001).

Penman (1992a) argues that the FCFM advocated by Copeland, Koller and Murrin is theoretically inadequate and it can be subjected to manipulation as a higher cash flow may not be viewed favourably because it indicates disinvestment, ie FCF concerns the distribution of wealth rather than the generation of wealth.

The development of the OFF coincides with recent evidence that cast doubt of capitalization models that include earnings as the only explanatory variable, such as the earnings capitalization model (ECM). The main weakness of the ECM is due to the omission of equity book value in the model because studies by Easton and Harris (1991); Hayn, 1995; Jan and Ou (1995); Collins et al., (1997); Penman (1998); and Collins et al. (1999) show that both equity book value and net income are priced, and the omission of either one of them would potentially lead to model misspecification.

Rees (1997); Walker (1997); and Frankel and Lee (1998) consider that valuation models like the Ohlson (1995); and Feltham (1995) are more 'complete' models because they are modelled to capture the long-run relationships of the firm while return models typically focus on short horizons.

No matter how good the OFF are as compared with other approaches, the former has some limitations. Walker (1997, p. 349) warns that the change to a valuation approach from a returns/earnings approach should not be allowed to go too far because there are

bound to be some issues where a returns-based approach will be indispensable, eg understanding the motivation for certain types of voluntary disclosures. Brennan (1991, p. 67) argues that a major problem with valuation models is that they are downward bias and inaccurate to some degree, due to the likelihood of correlated omitted variable(s). Relatedly, examination of the median, mean, standard deviations, maximum and minimum values (descriptive statistics), and residual sum of squares of level equations shows that when these equations are estimated without scaling, they have a size (scale) problem (see Sougiannis, 1994; Barth and Kallapur, 1996; Easton and Sommers, 2002).

Lo and Lys (2000a) criticize Ohlson (1995) to be unrealistic and unworkable because it does not provide for project selection by managers. They argue that, given that the AR process holds and that other information is zero ($v_t=0$), it follows that *RI* are zero unconditionally $[E(RI_t)=0]$ and hence, unconditional goodwill are also zero ($E(UG_t)=0$), which mean that all projects must be NPV = 0 (p. 350). To overcome this problem without violating CSR or PVED, Lo and Lys (2000a) suggest that a constant term should be incorporated into the information dynamics so that expected abnormal earnings are positive; or the dynamic includes a model or project selection. However, this problem should not concern Feltham and Ohlson (1995, 1996) as these two models allow growth or positive NPV to take place.

Barth and Clinch (1996) argue that a practical problem in implementing the Ohlson (1995); and Feltham and Ohlson (1995) models is deviations from the CSR, caused by regulatory restriction in some countries, e.g. Australia, HKSARC, and UK. Since these countries require a clean surplus less frequently than do US GAAP, this implies that the estimation equations based on the CSR assumption are less appropriate in the international setting. Consequently, Pope (1993) empirically finds that a 'dirty surplus' specification might be more appropriate for UK and Australian firms. However, 'dirty surplus' is not a severe problem since researchers could adjust the data to coincide with CSR (Barth and Clinch, 1996).

Recently, there is a surge to empirically apply the OFF by regressing stock price on current book value and current net income, and there is a general decline in the employment of MBAR, DDM, FCFM and ECM. This suggests the RIVM, and in particular the OFF is a preferred valuation approach to some popular alternatives (Palepu et al., 1996; Frankel and Lee, 1998).

Discussion and summary, the main advantage of the OFF is that by the use of the CSR and the concept of *RI*, one can determine whether or not value is created; and the CSR and *RI* links the income statement and the balance sheet. As such, the OFF uses accounting numbers directly, which enable the model to capture summarized financial more efficiency as opposed to some other models, such as DDM, ECM or FCFM. This represents an attempt to move accounting theory back in the direction of the fundamental measurement perspective. The other appealing feature of the OFF over other models is the use of the LID. The LID models economic events of the firm more realistically, and it provides a testable pricing equation that identifies the roles of accounting and non-accounting information. Consequently, a major problem with estimating unscaled valuation models is the result of large RSS, suggesting a likelihood of omitted correlated variable(s) and/or models are riddled with scale and/or heteroscedasticity issues.

3.3. Accounting and Equity Valuation

The subject of accounting is a branch from various disciplines, such as economics, finance, mathematics, human and physiological sciences. From the previous section, the OFF has been compared with various competing models, and it came out unscattered, and is the likeliest candidate for use in this research. The OFF is an accounting model using accounting and other information that attempts to pursue accounting theory and the use of *RI* in an accounting context assures that firm performance can be measured, and hence, it is natural to focus on a theory of measures of accounting net income and their relation to value (Beaver, 2002, p. 459). This is the first time that an accounting-based model using accounting and other information in equity valuation, and hence, this clearly demonstrates that accounting can play a vital role in valuation.

To Penman (1992a), the preferred role of accounting instead of economic constructs in equity valuation is based on three valid and important attributes. Firstly, accounting has the attributes of a value measurement system, e.g. the measurement of book value as the 'net worth' of equity. Secondly, accounting is a disciplined system, bound by rules of reporting transactions (or phenomena) and thirdly, accounting has a connection to future dividends, i.e. book value must exist before dividends can be paid.

Penman and Sougiannis (1998) evaluate how DDM, FCFM and ECM perform in finite-horizon analysis and find that valuation errors are lower using valuation models

using GAAP-based numbers rather than cash flow discounting and dividend discounting techniques. The analysis demonstrates explicitly how accrual accounting provides a correction to discounted cash flow valuation

Lee et al. (1999) indicate that accounting systems play at least three important roles in equity valuation as follows: (1) they provide a language of forecasting; (2) accounting systems provide helpful information for forecasting future payoffs to shareholders; and (3) accounting systems serve as ex post settling-up mechanisms because today's analysts' forecasts are compared to the actual (and audited) earnings reported in the future.

Easton (1999) describes the role of accounting data as capturing the effects of economic outcomes with a lag, and hence, accounting data, especially book value and earnings contains accumulated past information and forward information respectively that influence the value of the firm.

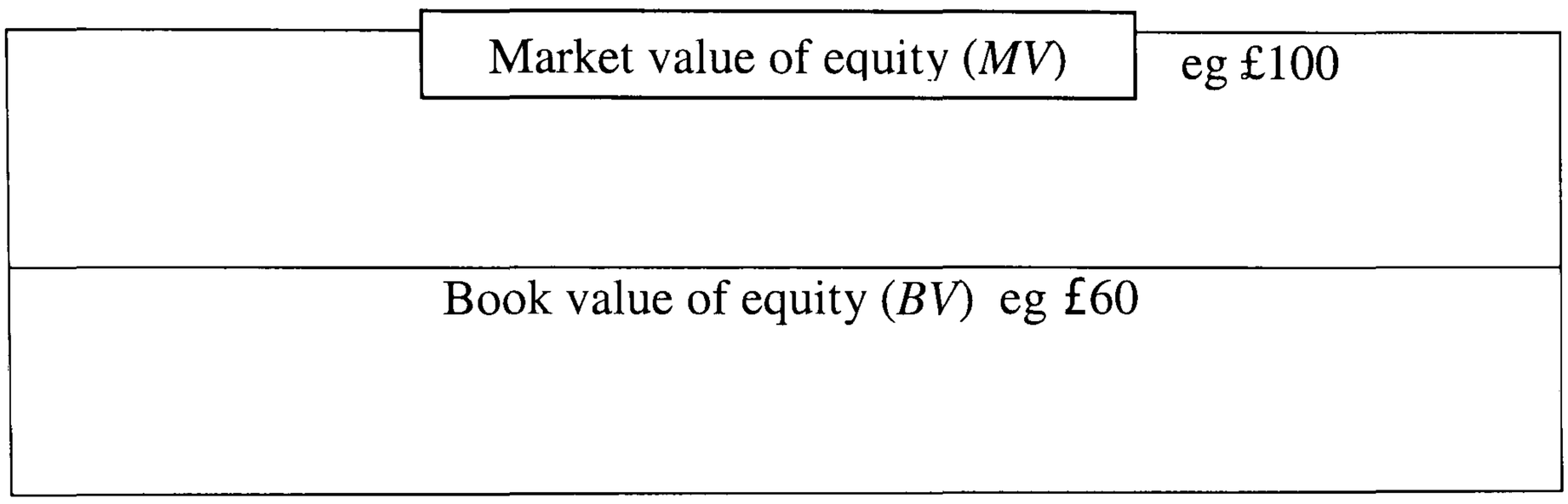
Beaver (2002, p. 463) indicates that accounting research can play three roles: (1) research can help articulate the nature of the issues, and can provide a paradigm or language with which to frame the questions of interest. The paradigm of the value of information is not a predictive theory in itself, but provides a definitional and taxonomic framework for formulating the informational role of accounting numbers; (2) research can provide a theory. This theory can be normative which leads to prescriptive statements, or positive, which provides hypotheses and testable predictions; and (3) research can provide empirical evidence

Remarks from these prominent authors in CMRA argue that accounting definitely has important roles in security valuation, and an accounting-based model, such as the OFF that uses accounting surrogates in equity valuation will unmistakably provides a motivation for the use of the OFF in modelling equity valuation for this research.

In summary, in the past, accounting research rely on the use of other surrogates in modelling equity values, but with the OFF, an accounting-based model using accounting variables as surrogates is used in equity valuation for the first time. Notable authors in CMRA (eg Penman, Sougiannis, Lee, Easton and Beaver) affirm the vital role of accounting as (1) attributes of a good measurement system; (2) predictors of future values (forecasting); (3) influence the value of the firm; (4) provider of information about values; and (5) provides testable hypotheses.

3.4. The Justifications of the Ohlson-Feltham Framework (OFF) used for this Research

To assist investors and speculators alike, the ultimate objective in any equity valuation model is to be able to predict (explain) market value of equity (*MV*) as accurately as possible, using available information. In the accounting perspective, the most likely information that is used to predict (explain) market value of equity is the book values of equity (*BV*), which is readily available from the balance sheet, but the *BV* is unlikely to align with the market value of equity, as depicted below:



The reasons for this misalignment between *BV* and *MV* are (1) firms practice conservatism (2) traditional financial statements unable to capture current projects with positive NPV potentials (3) vital expenditures are not capitalized in the balance sheet, and (4) *BV* is not timely. Thus, this requires a model with *BV* as its core fundamental independent variable and one or more independent variable(s) to provide incremental information beyond *BV* in explaining (predicting) *MV*. A natural choice for such a model is the OFF as it not only expresses *BV* as its core fundamental independent variable in explaining (predicting) *MV*, and by incorporating the concept of *RI* as a performance measure in the equation, one can determine whether or not value is created. In addition, the OFF is particularly suited for testing the ability of financial information to capture summarized information as it uses accounting numbers directly as opposed to some other models, such as dividend-discounting model (DDM) or free-cash flow model (FCFM). By this approach, the OFF focuses on fundamental valuation of firms directly rather than correlating earnings surprises with returns (MBAR).

The OFF provides a wide spectrum of hypotheses that can be tested to align book values with market values, however, all past studies tend to focus on a very narrow dictum of the framework because they either choose one of the OFF or test the different models independently, with either no other information (v_t) or used a single variable to proxyv_t,

and their results were not encouraging. For instance, Dechow et al. (1999) find only modest improvement in explanatory power over past empirical researches using analysts' earnings forecasts using the DDM while Myers (1999) find order backlogs fails to predict future *RI* and most of his models tested failed to meet the expectations of the OFF. Therefore, I hypothesize that a more realistic approach is to adopt a **valuation methodology based on an integrated but under a more general assumption of the OFF in testing for the internal consistency of the LID and the valuation model consisting of multiple measures in the form of a comprehensive set of accounting variables (CSV)**[2]. The multiple measures objective is motivated by the multiple measurement perspectives of the Balanced Scoreboard where Kaplan and Norton, (1996, p. 93) argue that multiple measures represents a significant improvement over performance measures that are based on a single or small number of variables. Empirically, multiple measures in the form of fundamental signals are found to be useful in explaining future earnings or abnormal (Lev and Thiagarajan, 1993; Abarbanell and Bushee, 1997, 1998; Al-Debie and Walker, 1999). The CSV considered are based on the theoretical justifications of the OFF and GAAP and from previous studies which suggest that these variables might be relevant in predicting future financial performance of firms and in equity valuation.

Normative arguments by OFF, GAAP posit that accounting information are necessary for making investment decisions, and empirical studies using book values (*BV*) (eg Collins et al., 1997; Lev and Zarowin, 1999), residual income (*RI*) (eg Sougiannis, 1994; Stark and Thomas, 1998), and operating assets (*OA*) (Stober, 1996; Ahmed et al., 2000) found them to be value-relevant. McConnell and Muscarella (1985) examine the reaction of share prices to announcements of capital investments (*CI*), and find that increased in capital expenditures are associated with increases in share prices and reductions are associated with falls. Abarbanell and Bushee (1997) find *CI* is useful in predicting future abnormal earnings. All empirical studies using the OFF (eg Dechow et al., 1999; Hand and Landsman, 1999) find current *RI* is able to predict future *RI*.

Research & development expenditures (*RD*), human resource costs (*HR*) and advertising costs (*AD*) are increasingly viewed as intangibles and measures of value creation (AICPA, Jenkins Report, 1994; SEC, 1995, 1996; FASB, 2001; ICAEW-New Measures, 2000; CPA Australia-Intangibles, 2000). Early empirical studies of *RD* were

[2] 'CSV' is used as it does not sound restrictive as ideally, nonaccounting variables should be used.

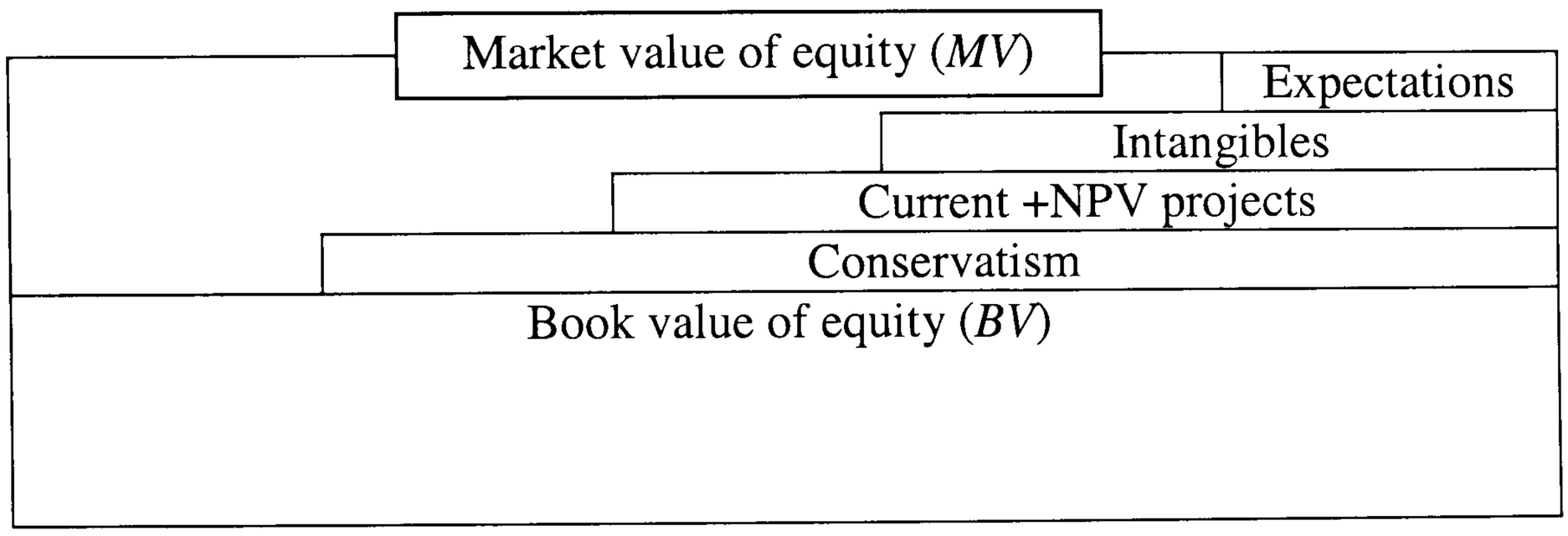
motivated by the 'Tobin's *q* ratio in which the capitalized values of firms are attributable to tangible and intangible assets, and they find that *RD* is generally value-relevant (Hirschey, 1982; Hirschey and Weygandt, 1985; Hirschey and Spencer, 1992; Chauvin and Hirschey, 1993; Sougiannis, 1994; Green et al., 1996; Stark and Thomas, 1998) and useful in explaining returns (Bublitz and Ettredge, 1989). Recent empirical studies find that the decline in the combined value-relevance of earnings + book values of firms may be attributed to *RD* (eg Francis and Schipper, 1999; Lev and Zarowin, 1999). In UK, Al-Debie and Walker (1999) find *DC* contributes to the increased explanatory power of excess returns. Prahalad and Hamel (1990); Barney (1991, 1995); Collins and Montgomery (1995); and Lahteenmaki et al. (1998) posit that HR is increasingly viewed as performance enhancing resource that can contribute to an organizational success. Huselid and Becker (1996) report that reasonable changes in an HR system can affect a firm's market value by $15,000-$45,000 per employee, and Welbourne and Andrews (1996) report that changes in HR policies can affect the probability of survival for a new firm by as much as 22%. Interestingly, in May, 1997, Microsoft has stock market value of nearly US$1.5 billion but only about 7% of it's value was accounted for by traditional tangible assets recorded on its balance sheet while the rest (93%) made up of intangible assets-brands, *RD* and *HR*. Starbucks, a prominent coffee chain, much of its operating expenses, on the order of 32% of sales consistently consists of *AD*.

Total external debts (*TD*) and common dividends (*DIV*) are the two traditional signalling variables used in equity valuation. Ross (1977) developed and tests a model in which external debt signals optimistic perception of firms. Miller and Rock (1985) find that an unexpected increase in dividends will increase shareholders' wealth. Green et al. (1996) found that firms raising external debt may be rewarded by the market. Giner and Reverte (2001) find that debt provides positive news to the market. Early theoretical and empirical studies on dividends signalling indicate that dividends is a signal of value for stock splits (Fama et al. 1969), changes in dividends (Lintner, 1956; Pettit, 1972; Aharony and Swary, 1980, Handjiinicolaou and Kalay, 1984). Lobo et al (1986) find past dividend payout and dividends per share information are useful for forecasting annual earnings. In Rees (1997), the inclusion of dividends in the EBO improves the explanatory power of the model from 54% to 60%. Hands and Landsman (1999) find that dividends help predict future *RI*, incremental to current and lagged *RI*.

From the above literature reviewed and basing on the theoretical justifications of the OFF and GAAP, the CSV is carefully selected where (1) *BV, RI, OA, CI* are necessary for making investment decisions; and (2) *RD, HR, DC* are intangibles, and *TD, DIV* are signalling variables, all are other information, v_t included into the information dynamics to capture other relevant information other than those information already contained in earnings to predict future expected *RI*. *DC* is used because *AD* is not available in UK. This research employs multiple accounting variables to proxy for v_t because previous studies that tend to use a single measure have met with either no or limited success. Due to definitional and operationalization difficulties concerning v_t, I am restricted to use accounting variables to infer v_t because they are observable. As a result, this study is unable to provide a direct test on the consistency of the *RI* information dynamics as well as the valuation models within the OFF. This limitation is recognized as using observable accounting variables is much better than omitting v_t altogether as in some previous empirical studies because the omission of v_t misapply the model under the OFF and inferences drawn from the results obtained thereto are invalid (see Ohlson, 1998; Myers, 1999; Lo and Lys, 2000a). Thus, the relation between nonaccounting or other information and stock prices represents a potentially fruitful area for future research that deserves a more extensive exploration.

This research extends previous studies by examining the role of *RI* in equity valuation, focusing on the linear information dynamics (LID) and the OFF by using a different modelling technique and dataset. This study is probably the first to investigate at least five rationales not found in CMRA. Firstly, this study integrates Ohlson (1995); Feltham and Ohlson (1995, 1996) into an integrated framework linking the LID and the VM (OFF). More specifically, the valuation model of this research is based on Feltham and Ohlson (1995, 1996) in linking *BV, RI, OA, CI* and other information; the autoregressive processes of the various variables are based on Ohlson (1995); and adopts multiple measures for v_t as per FO (1995). Secondly, this study uses multiple measures in the form of a comprehensive set of variables (CSV) to test for (1) role of *RI* as a measure of value creation; (2) conservatism; (3) expenditures that can be capitalized as intangibles; (4) future expectations of profitability (loss) using signalling hypothesis. Thirdly, this research employs multiple variables to proxy for other information, unlike previous studies that tends to use a single measure. Fourthly, this study is the first CMRA to empirically test for

the relevance of *HR* in predicting *RI* and in explaining *MVE*. Fifthly, this research is the first to use information obtained from the cash flow statement in addition to the income statement and balance sheet in the formulation of the model under the OFF. The use of a cash flow variable in this research is motivated from theoretical justification for the inclusion of cash flows in addition to accruals in Feltham and Ohlson (1995) (Clubb, 1996) or in return models (McLeay et al., 1997), and past empirical studies that find cash flows provide differential information content relative to accrual, eg cash flows are a better measure in predicting dividends changes and firm performance than accruals because earnings is a measure of profitability, not a liquidity measure as in cash flows (Charitou and Clubb, 1999). Thus, by adopting the OFF and using the CSV to measure (1) value creation; (2) conservatism; (3) current +NPV projects; (4) intangibles; and (5) expectations of future profitability, a more elaborate framework in aligning BV with MV is envisaged, as depicted below:



Unlike past studies that either made ad hoc modifications to the LID or ignore the LID, this study not only investigates the internal validity of both the LID and VM, it uses fundamental information to estimate a prediction model, identifying which of these variables are significant in the prediction model and which variables are relevant for valuing the equity of firms. Also, unlike most studies outside the US that have replicated research already conducted in the US without questioning the applicability and relevance of the methodology and hypotheses in a different context (see Dumontier and Raffourier, 2002), this study adopts modelling techniques and robust tests that have not been researched elsewhere.

In summary, this research extends previous studies by examining the role of *RI* in equity valuation, focusing on the LID and the OFF by using a different modelling techniques and dataset, rather than replicating research already conducted elsewhere. The major contribution of this research is the rigorous theoretical framework of model

development using a comprehensive set of accounting surrogates in equity valuation, and empirically provides UK evidence on the usefulness of a range of accounting data as predictors of future *RI* as well as their value relevance in explaining security prices.

3.5. Model Development

This section is about the development of a mathematical model of the relationship between (1) other information and residual income; and (2) accounting measures and equity valuation. The **proposed models** used in this research are based on the linear residual income valuation framework. **Appendix 3.1** provides a more detailed derivation of the proposed models. Assuming in an efficient market with risk neutrality (risk free), no arbitrage, no information asymmetry (i.e. homogeneous beliefs of players in the market), and price is equal to the present value of expected dividends (PVED):

$$P_t = \sum_{\tau=1}^{\infty} \frac{E_t\left[DIV_{t+\tau}\right]}{(1+r)^{\tau}} \qquad \text{(PVED)} \tag{3.1}$$

where:

- P_t = Market value (Price) of the firm's equity at time t
- D_t = Net dividends paid at time t
- r = The assumed constant discount rate (risk-free rate)

Next, the Clean Surplus Relation (CSR) provides that the basis of the value of a firm is matched with the creation and distribution of value, which implies that dividends reduce current book value, but not current earnings are satisfied:

$$BV_{t\text{-}1} = BV_t + DIV_t - NI_t \tag{3.2}$$

where:

- $BV_{t,\,t\text{-}1}$ = Book value of equity at time t, t-1
- NI_t = Accounting earnings (Net income) for the period from t-1 to t.

The performance measure, residual income (*RI*) is expressed as:

$$RI_t \equiv NI_t - rBV_{t\text{-}1} \tag{3.3}$$

Substituting equation (3.3) into (3.2) and then into equation (3.1) produces:

$$P_t = \sum_{\tau=1}^{\infty} \frac{E_t\left[BV_{t+\tau\text{-}1}(1+r) + RI_{t+\tau} - BV_{t+\tau}\right]}{(1+r)^{\tau}} \tag{3.4}$$

Transforming equation (3.4) algebraically becomes:

$$P_t = BV_t + \sum_{\tau=1}^{\infty} \frac{E_t\left[RI_{t+\tau}\right]}{(1+r)^{\tau}} - \frac{E_t\left[BV_{t+\infty}\right]}{(1+r)^{\infty}} \tag{3.5}$$

The final term of equation (3.5), ie $\left(\frac{E_t[BV_{t+\infty}]}{(1+r)^{\infty}}\right)$ is assumed to be zero and thus, price can be expressed as the sum of book value and the present value of future (anticipated) residual income.

$$P_t = BV_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}]}{(1+r)^{\tau}} \tag{3.6}$$

Since *RI* is defined as the difference between market and book values, hence, the discounted expected future *RI* of a firm is unrecorded goodwill *(UG)*. Thus expressing (3.6) in the form of *UG*:

$$P_t = BV_t + UG_t \tag{3.7}$$

Equation (3.6) is an infinite series, hence, to operationalize the model, an additional structure, known as the **linear information dynamics (LID)** is required to link between observable variables and expected *RI* as an essential part of the valuation framework. I hypothesize that a more realistic approach is to use **a comprehensive set of non-earnings accounting variables (CSV)** to enter the information dynamics. The variables, measurement objectives, and the considerations for the CSV are provided as follows:

Variables		Measurement Perspective	Theoretical justification
BV	Book value of equity	(net) Assets in place	Ohlson (1995), Feltham and Ohlson (1995), GAAP
RI	Residual Income	Persistence of future *RI*	
OA	Operating assets	Conservatism	Feltham and Ohlson (1995, 1996)
CI	Capital investment	Positive NPV projects	Feltham and Ohlson (1996), GAAP
RD	Research & development expenditures	Intangibles	AICPA-Jenkins Report (1994), SEC (1995, 1996), FASB (2001), ICAEW - New Measures (2000), CPA Australia-Intangibles (2000)
DC	Distribution costs	Intangibles	
HR	Human Resource costs	Intangibles	HRM (Prahalad and Hamel, 1990; Barney, 1991,1995; Collins and Montgomery 1995; Lahteenmaki et al., 1998)
TD	Total debts	Expected future external financing	Signalling Hypothesis (Ross, 1977)
DIV	Ordinary Dividends	Expected future profitability/cash flows	Signalling Hypothesis (Lintner, 1956; Aharony and Aswary, 1980; Kalay, 1980; Handjiinicolaou and Kalay, 1984; Miller and Rock, 1985)

Table 3.1 – Variables, measurement objectives, and justifications for the CSV

RD, DC, HR, TD and *DIV* proxies for v_t included into the information dynamics to capture other relevant information other than those information already contained in earnings to predict future expected *RI*. Hence, the LID for the proposed model will be:

$$RI_{t+1} = \omega_{11}RI_t + \omega_{12}OA_t + \omega_{13}CI_t + \omega_{14}RD_t + \omega_{15}HR_t + \omega_{16}DC_t + \omega_{17}TD_t + \omega_{18}DIV_t + \varepsilon_{1t+1} \quad \text{Prop-LID} \qquad \text{LID1}^3$$

$$OA_{t+1} = \omega_{22}OA_t + \varepsilon_{2t+1} \qquad \text{LID2}$$

$$CI_{t+1} = \omega_{33}CI_t + \varepsilon_{3t+1} \qquad \text{LID3}$$

$$RD_{t+1} = \omega_{44}RD_t + \varepsilon_{4t+1} \qquad \text{LID4}$$

$$HR_{t+1} = \omega_{55}HR_t + \varepsilon_{5t+1} \qquad \text{LID5}$$

$$DC_{t+1} = \omega_{66}DC_t + \varepsilon_{6t+1} \qquad \text{LID6}$$

$$TD_{t+1} = \omega_{77}TD_t + \varepsilon_{7t+1} \qquad \text{LID7}$$

$$DIV_{t+1} = \omega_{88}DIV_t + \varepsilon_{8t+1} \qquad \text{LID8}$$

To derive the expected asymptotic behaviour of the variables of the LID, priori restrictions on the parameters is imposed to ensure that the convergence/divergence of these variables is appropriate (see **Appendix 3.1** for details):

(i) $0 \leq \omega_{88} < 1$

(ii) $0 \leq \omega_{77} < 1$

(iii) $\omega_{66} > 0$

(iv) $\omega_{55} > 0$

(v) $\omega_{44} > 0$

(vi) $1 \leq \omega_{33} < (1+g)$

(vii) $0 \leq \omega_{22} \leq 1$

(viii) $0 \leq \omega_{11} < 1$

By combining LID1 to 8 with equation (3.7), valuation can be defined in terms of unrecorded goodwill (UG):

$$UG_t = \alpha_1 RI_t + \alpha_2 OA_t + \alpha_3 CI_t + \alpha_4 RD_t + \alpha_5 HR_t + \alpha_6 DC_t + \alpha_7 TD_t + \alpha_8 DIV_t \qquad (3.8)$$

Assuming the theoretical basis for a firm's market value holds, and using equation (3.8), the linear valuation model encompassing a conservative accounting framework can be mathematically formulated:

$$V_t = BV_t + \alpha_1 RI_t + \alpha_2 OA_t + \alpha_3 CI_t + \alpha_4 RD_t + \alpha_5 HR_t + \alpha_6 DC_t + \alpha_7 TD_t + \alpha_8 DIV_t \quad \text{[Prop-VM]} \qquad (3.9)$$

Where:

[3] LID1-8 are the equivalent of (A.8) to (A.15) in the Appendix.

- $\alpha_1 = \dfrac{\omega_{11}}{(1+r-\omega_{11})}$
- $\alpha_2 = \dfrac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})}$
- $\alpha_3 = \dfrac{\omega_{13}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{33})}$
- $\alpha_4 = \dfrac{\omega_{14}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{44})}$
- $\alpha_5 = \dfrac{\omega_{15}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{55})}$
- $\alpha_6 = \dfrac{\omega_{16}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{66})}$
- $\alpha_7 = \dfrac{\omega_{17}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{77})}$
- $\alpha_8 = \dfrac{\omega_{18}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{88})}$

The proposed LID and the VM serve as the basis for the empirical tests for this study, and further discussion and the implications of the estimating techniques and expectations for the various tests will be covered in the next Chapter.

3.6. Summary and Conclusions

The focus on this Chapter is to formulate a testable valuation construct based on a integrated framework of the OFF in testing for the internal consistency of the LID and the valuation model where the models are specified by multiple measures in the form of a comprehensive set of non-earnings accounting variables (CSV). The CSV considered are based on the theoretical justifications of the OFF, GAAP and from previous studies which suggest that these variables might be relevant in predicting future financial performance of firms and in equity valuation. The OFF is the natural choice because (1) by the use of the CSR and the concept of residual income (*RI*), one can determine whether or not value is created; (2) the CSR and *RI* links the income statement and the balance sheet. As such, the OFF value accounting numbers directly, which enable the model to capture summarized financial information more efficiency as opposed to some other models, such as DDM, ECM or FCFM; and (3) it allows various fundamentals measuring different characteristics to be specified in a model.

EMPIRICAL RESEARCH METHODOLOGY AND DATASET

4

SECTION OUTLINE

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CHAPTER 4
EMPIRICAL RESEARCH METHODOLOGY AND DATASET

4.1. Introduction

In Chapter 3, I developed a mathematical valuation model using accounting data to value equity and a prediction model to predict future residual income. The focus of this chapter is to operationalize the models developed using the appropriate quantitative, statistical and econometric techniques. To facilitate the test, this research uses a sample consisting of all nonfinancial firms of the London Stock Exchange (LSE) during the period 1990-2001 (12 years) obtained from the DataStream terminal. As data extraction from DataStream is laborious and odious because the data is not in integrated form and the arrangement is not suitable for use in the empirical study, much of the data extraction and data processing has to be done with the aid of self-written computer programs. Four forms of computer programs are specially written for this empirical study: (1) a file conversion utility program to convert incompatible files from DataStream into text format; (2) a database system to store master/permanent data and the generation of macros for the extraction of data from DataStream; (3) a data manipulation and process system using Excel Spreadsheet; and (4) enhancement of the testing capabilities and the generation of econometric results of Econometric Views (EViews).

The remainder of this chapter is organized as follows. **Section 2** describes the research design and estimating techniques used and the likely econometric and testing issues (eg scale-effect and heteroscedasticity) faced in this research. This section ends with the discussion of the various estimating equations used for this research. **Section 3** discusses the sample data, and the description and measurements of the variables used for this study. A large part of this discussion is about data extraction, processing, analysis and dissemination for this research; and **Section 4** concludes.

4.2. Research Design, and Estimating Techniques and Issues

The focus here is on the empirical research methodology that is going to be used for the estimation of the proposed models. In conformity with CMRA, the technique used is quantitative, mainly using statistical and econometric estimating methods.

4.2.1. Cross-sectional, Time-series, and Pool (Panel) Estimations

This study uses a pooled cross-sectional analysis as does most previous empirical accounting studies used in recent capital market research. (eg Lev and Thiagarajan, 1993; Charitou and Clubb, 1999). Using cross-sectional analysis is consistent with the internal consistency of the linear information dynamics (LID) and the valuation model since both of these models impose at most, a one-period lag structure (see Bar-Yosef et al., 1996; Morel, 1999). Evidence indicates that time-series estimation lacks power because there are only a few time-series observations of annual earnings available for most firms, and the use of a long time-series introduces survivor bias (Stober, 1996; Kothari, 2001). Thus, if the LID is estimated using time-series, the number of available firms in the sample is strictly restricted, and sample selection bias may be introduced. Thus, the use of variables, such as research & development expenditures (*RD*) expenditures is constrained because disclosure of *RD* in UK is only imposed after 1989; and moreover, many firms, particularly smaller and young firms do not report *RD* expenditures. Other justifications for the use of a cross-sectional analysis over a time-series analysis are:

(1) My main motivation for this study is to evaluate the effect of accounting and other information on the *MVE* for different firms rather than in time.

(2) Accurate estimation of time-series data requires that the sample firms are stable over time, but in practice, data is affected by change factors, eg inflation rates. These factors would not adversely affect cross-sectional data greatly since we are estimating the data across firms on yearly basis, and hence, spurious inference is less likely than in time series (see Thomas, 1997; Al-Debie and Walker, 1999).

(3) Since time-series estimation is based on individual firm basis, and so does the discount rate used. However, obtaining firm-specific discount rate is difficult and tedious. This is avoided using cross-sectional test as a constant discount rate can be used for all firms, and moreover, the choice of discount rate has little effect on cross-sectional analysis (see Lee et al., 1999; Myers, 1999).

One weakness of cross-sectional estimation is that firm-specific information on the time-series is sacrificed, eg we are not able to attest the validity of the degree of persistence of the parameters on the LID on a firm-specific basis. To overcome the weaknesses of cross-sectional estimation, this research also used the pooling of observations over a twelve years time period. Studies using pool (panel) data is gaining popular in CMRA, and has largely replaced pure time-series or pure cross-sectional research with recent studies such as Hand and Landsman (1999); Dechow et al. (1999); and Beaver and Ryan (2000). The benefits from using panel data include the following:

(1) Panel data is most suited on individuals or firms where many variables are better measured at the micro level, and biases resulting from aggregation over individuals (firms) are eliminated (Baltagi, 1999, p. 5).

(2) Panel data has more variability and hence, is more informative than cross-section data, and less collinearity among the variables, more degrees of freedom than time-series data (Baltagi, 1999, p. 4).

(3) Panel data is better able to capture adjustments than cross-sectional data because the former can relate data behaviour at one point in time to other behaviour at another point in time.

On the other hand, the limitations of panel data include: (1) when researchers are not using all observed data that led to the use of truncated sample, and inferences from truncated sample introduces bias (Baltagi, 1999, p. 6); (2) attribution of data due to survivorship bias, but this will not apply for this research as dead firms are also used.

4.2.2. Analysis of the Structure of the Equations of the Proposed Models, and Estimation Techniques and Issues

The proposed *RI* (Prop-LID) and valuation models (Prop-VM) are to be estimated using ordinary least squares (OLS) technique. In conformity with CMRA, a whole range of models ranging from simple regression to multiple regressions is estimated.

To determine the value relevance of individual variable usually requires the use of statistical *t*-test to determine the statistical significance of the coefficient of the variable. There are several ways to evaluate the incremental value relevance of variables due to the addition of explanatory variables in a multiple regression. A common way is to use either the adjusted R^2or *F*-test. While the R^2 uses a direct approach, the *F*-test is an indirect approach based on the analysis of variance to determine the closeness of the relationship between the variables, *X* and *Y*. For robustness, AIC and Schwarz Criterion are also used to determine the validity of adding new variables. Comparing the predictive abilities of competing valuing models, forecast errors and estimations of the coefficients for the models are carried out by allowing the coefficients to vary cross-sectionally within each year (pool), as a function of parameters estimated from the Prop-LID, and from the linear information models.

Even the proposed models are formulated based on a theoretical framework, the likelihood of irrelevant variables and the possibility of omitted variables that ought to be in the regression models cannot be ruled out. Detection of the likelihood of omitted variables

is by examining the magnitudes of the intercepts, inverse of scale term (for deflated equations), residual errors and the goodness-of-fit. Evaluation of irrelevant variables will be made by examining the *t*- and heteroscedasticity-adjusted statistics.

Though time-series estimations are not used for this research, the issue of multicollinearity is less of a major issue, although it is still a concern. Multicollinearity detection will be conducted by the examination of models with high standard errors and low *t*-stats, or a relatively high R^2 with few significant *t*-stats or that the *F*-stats is highly significant while none/few of the individual variables are significant, and relatively high correlation between a pair of explanatory variables.

4.2.3. Scale-effect and Heteroscedasticity

Barth and Kallapur (1996, p. 528) consider two major econometric issues in cross-sectional studies: (1) scale differences (scale-effect) among sample firms that can result in biased coefficient estimates; and (2) heteroscedasticity (ie error variances are not constant) that can cause biased standard error and estimation efficiency. Further, they indicate that scale differences can result in heteroscedasticity and hence, the source of coefficient bias is ambiguous. In view of this, an appropriate approach in estimating models cross-sectionally without being influenced by scale or heteroscedasticity is still an ongoing debate. Since cross-sectional estimation is part of this study, scale-effect and heteroscedasticity are major concerns for this study.

In reality, observed data will not be free of scale because the 'true' scale is unobservable, and hence, researchers are likely to use scale-affected data, and the scale-effect is likely to differ across samples. Similarly, researchers are likely to encounter erratic variances in the disturbances for different observations (heteroscedasticity). The occurrence of heteroscedasticity can be analysed as follows. Under the assumptions of the classical linear regression model, the disturbances can be summarily represented as:

$$\varepsilon = IID(0,\ \sigma^2) \tag{4.1}$$

where *the vector of disturbances,* ε *is independently and identically distributed with mean 0; covariance 0 (non-autocorrelated); constant variance,* σ^2 *(homoscedastic).* Since $\varepsilon = n\ X\ 1$ vector, and $\varepsilon\varepsilon'$ would therefore form the $n\ X\ n$ matrix and by taking expectations, the **variance-covariance matrix** $\sigma^2 I_n$ appears as follows:

$$E(ee') = \begin{bmatrix} E(\varepsilon_1^2) & E(\varepsilon_1\varepsilon_2) & E(\varepsilon_1\varepsilon_3) & \dots & E(\varepsilon_1\varepsilon_n) \\ E(\varepsilon_2\varepsilon_1) & E(\varepsilon_2^2) & E(\varepsilon_2\varepsilon_3) & \dots & E(\varepsilon_2\varepsilon_n) \\ E(\varepsilon_3\varepsilon_1) & E(\varepsilon_3\varepsilon_2) & E(\varepsilon_3^2) & \dots & E(\varepsilon_3\varepsilon_n) \\ \vdots & \vdots & \vdots & & \vdots \\ E(\varepsilon_n\varepsilon_1) & E(\varepsilon_n\varepsilon_2) & E(\varepsilon_n\varepsilon_3) & & E(\varepsilon_n^2) \end{bmatrix} \quad (4.2)$$

Since each disturbance has zero mean, the diagonal elements in the symmetric matrix represent the variances of the disturbances, and the off-diagonal elements are covariances between different disturbances (Thomas, 1997, p. 186). Hence, the matrix of equation (4.2) is the variance-covariance matrix of the disturbances (VCMD), thus:

$$E(ee') = \begin{bmatrix} Var(\varepsilon_1) & Cov(\varepsilon_1\varepsilon_2) & Cov(\varepsilon_1\varepsilon_3) & \dots & Cov(\varepsilon_1\varepsilon_n) \\ Cov(\varepsilon_1\varepsilon_2) & Var(\varepsilon_2) & Cov(\varepsilon_2\varepsilon_3) & \dots & Cov(\varepsilon_2\varepsilon_n) \\ Cov(\varepsilon_1\varepsilon_3) & Cov(\varepsilon_2\varepsilon_3) & Var(\varepsilon_3) & \dots & Cov(\varepsilon_3\varepsilon_n) \\ \dots & \dots & \dots & \dots & \dots \\ Cov(\varepsilon_1\varepsilon_n) & Cov(\varepsilon_2\varepsilon_n) & Cov(\varepsilon_3\varepsilon_n) & \dots & Var(\varepsilon_n) \end{bmatrix}$$

The above matrix can be written in short form:

$$E(ee') = \begin{bmatrix} \sigma^2 & 0 & 0 & \dots & 0 \\ 0 & \sigma^2 & 0 & \dots & 0 \\ 0 & 0 & \sigma^2 & \dots & 0 \\ \vdots & \vdots & \vdots & & \vdots \\ 0 & 0 & 0 & \dots & \sigma^2 \end{bmatrix} = \sigma^2 I_n \quad (4.3)$$

where:

- σ^2 = Population variance (σ = standard deviation)
- $I_n = n\ X\ n$ identity matrix

When disturbances have the above properties, they are said to be spherical (Thomas, 1997, p. 276). If the VCMD takes any other form, eg breakdown of the classical assumptions, non-spherical disturbances result and the variance-covariance matrix (4.3) would now take the form:

$$E(ee') = \begin{pmatrix} \sigma_1^2 & 0 & 0 & \dots & 0 \\ 0 & \sigma_2^2 & 0 & \dots & 0 \\ 0 & 0 & \sigma_3^2 & \dots & 0 \\ \vdots & \vdots & \vdots & & \vdots \\ 0 & 0 & 0 & \dots & \sigma_n^2 \end{pmatrix} \quad (4.4)$$

While the 'off-diagonal' terms in the matrix of equation (4.4) remains *0*, the disturbance variances are not constant, thus, the disturbances are now heteroscedastic. However, the OLS estimators given by the vector $\hat{\beta} = (X'X)^{-1} X'Y$, remain linear, unbiased and consistent provided we use a different OLS formula for the estimation of the variances and standard errors when the disturbances are non-spherical. More importantly is that the usual *t*- or *F*-tests are all invalid and incorrect inferences about the regression parameters will be drawn when one rely on these statistical results.

Barth and Kallapur (1996) offer three solutions for scale-related/heteroscedasticity problems in cross-sectional data: (1) including a scale proxy as an independent variable; (2) deflating regression variables by a scale proxy; and (3) using White (1980) heteroscedasticity-consistent standard error estimates.

Since the 'true' scale factor is unobservable, Brown et al. (1999) suggest the use of proxies for scale-effect, such as share price or book value. For example, the scale of a share trading at £10 is twice the scale of a share trading at £5. Therefore, if a sample consists of 100 firms, the scale factor for each firm must be calculated, which can be tedious if the sample size is large. This suggests that the solution to the scale-effect is not to satisfy the ceteris paribus condition in finding a point where all firms (in a sample) have the same value (which is impossible), but to ensure that the starting values of the investments are the same point in time (eg in monetary values £) (Lo and Lys, 2000a). A solution to the problem of the scale-effect in cross-sectional price-levels regression models by including a scale proxy as an independent variable is demonstrated by Easton (1998). Ordinarily, in a price-levels regression:

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 NI_{it} + \varepsilon_{it} \tag{4.5}$$

where:

- P_{it} = Price of firm *i* at time *t*
- BV_{it} = Book value of firm *i* at time *t*
- NI_{it} = Earnings of firm *i* during time *t*-1 to *t*
- ε_{it} = Non-random error term

To remove the scale-effect, Easton (1998, p. 238) uses share price as the measure for the scale factor (S_{it}). Thus, equation (4.5) becomes:

$$S_{it}P_{it} = \alpha_0 + \alpha_1 (S_{it}BV_{it}) + \alpha_2 (S_{it}NI_{it}) + \varepsilon_{it} \tag{4.6}$$

Brown et al. (1999) show that the presence of scale-effect in levels regressions is due to some firms having larger values and some having small values in the sample.

Similarly, Easton and Sommers (2002, p. 25) find that removal of large firms from the sample does not remove the coefficient bias caused by scale-effect, which led them to conclude that the scale-effect is driven by a relatively small number of the very largest firms in the sample.

As indicated, solution to scale-effect/heteroscedasticity can also be achieved by deflation, using similar proxies for scale. One of the most cited papers on the scale-effect and heteroscedasticity problem in accounting research is Christie (1987). He states that for tests based on cross-sectional comparisons of firms, it is important to scale (deflate) the variable concerned with some measure of size (eg the market value of equity at the beginning of the year, MVE_{it-1}) to minimize heteroscedasticity in the data. He advocates the use of the returns regression specification in order to avoid scale-effect, whereas Easton (1998) advocates the use of market value as the deflator in price-levels regressions since scale is market capitalization. Using a measure based on market capitalization (ie number of shares outstanding *X* price per share) and not merely by dividing the independent variables by the number of shares (per share basis), equation (4.5) becomes:

$$\frac{MVE_{it}}{MVE_{it-1}} = \alpha_0 + \alpha_1\left(\frac{BV_{it}}{MVE_{it-1}}\right) + \alpha_2\left(\frac{NI_{it}}{MVE_{it-1}}\right) + \varepsilon_{it} \tag{4.7}$$

Easton and Sommers (2002) empirically examine the scale-effect of regressing *BV* and *NI* on *MV* using two regression equations, one unscaled and the other is deflated by (closing) capitalization with the following specification:

$$\frac{MVE_{it}}{MVE_{it}} = \alpha_{0t}\frac{1}{MVE_{it}} + \alpha_{1t}\frac{BV_{it}}{MVE_{it}} + \alpha_{2t}\frac{NI_{it}}{MVE_{it}} + e_{it} \tag{4.8}$$

The unscaled equation is estimated using OLS while the scaled equation is estimated using weighted least squares (WLS) technique. Sample data for all nonfinancial firms for the period 1963-99 consisting of 163,097 firm-year observations were drawn from Compustat. They find that the annual means of absolute values of studentized residuals, indicating heteroscedasticity are no longer significant, ranging from 0.68 to 1.25 for the scaled equation. However, the fit for the scaled equation deteriorates, with average adjusted *R*-squared falls from 78.21% to 54.15%. By splitting the sample into two subgroup periods, ie 1963-91 and 1982-99 indicates that the signs of the coefficients of the equation estimated using the OLS and WLS differs slightly, which led Easton and Sommers to suggest that coefficient bias could lead to spurious inferences in undeflated

price-levels regression. With this evidence, Easton and Sommers conclude that the scale-effect has been successfully mitigated via the deflation by market capitalization. Interestingly, this is the first and only paper that uses closing MV_{it} as scalar, and while the result indicates that scale has been successfully mitigated, it is too soon to tell whether the methodology used is valid.

Other deflators cited in the literature are net capital contributions by shareholders (Barth and Clinch, 2001) and one-lagged price (Brown et al., 1999), however they warn researchers against deflating the variables by more than one lag as it reduces the deflator's ability to remove scale-effect. Barth and Kallapur (1996) find that deflating the variables using proxies such as total assets, sales, book value of equity, net income, number of shares outstanding, and share price in mitigating coefficient bias only by a small amount, if not at all (p. 529). They warn that when a proxy is highly correlated with the true scale factor, deflation can worsen coefficient bias; and deflating heteroscedasticity when there is no coefficient bias can decrease estimation efficiency.

Sougiannis (1994, p. 52) reports that residual analysis revealed significant departures from normality in valuation equations when the variables were scaled. He indicates that one way to reduce this problem is to use the natural log of the market-to-book ratio as the dependent variable. In his study, he reports that the use of the valuation model estimated in the semi-log form, the residual variance were significantly reduced, resulting in smaller standard errors, higher *t*-statistics, and higher R^2. In addition, skewness of the regression equation was significantly reduced.

The use of per share basis, such as earnings per share (*EPS*) as a deflator for the controlling of heteroscedasticity/scale-effect in levels empirical studies have been made by many notable researchers over the years, such as Kothari and Zimmerman (1996); Collins, Maydew and Weiss (1997); Rees (1997); Barth and Clinch (1998); and Dechow et al. (1999). But employing the per share basis is not effective in valuing accounting numbers, eg RIVM because the share values of some stocks are extremely large, eg Bershire Hathaway, (price per share at US$45,000 in June, 1999) or if there are changes in transactions involving shares, such as stock-splits, new issues, etc. during the course of the testing period or across periods (see Easton, 1998; Brown et al., 1999; Ohlson, 2000). As a result, the change in book value per share *(bvps)* will differ from earnings per share *(eps)* minus dividends per share *(dps)*. Ohlson (2000) argues that there is no compelling reason

why book values per share should be used in a CSR since one of the assumptions of the RIVM is that the buying of shares is value-irrelevance (consistent with M&M). Easton (1998) and Brown et al. (1999) show that using per share basis, where the dependent variable is price, result in higher R^2 than those regressions not affected by the scale factor, and they caution researchers when interpreting results of studies based on per share basis because scale has not been controlled for.

White (1980) devised a heteroscedasticity-consistent covariance estimator to mitigate the effect of heteroscedasticity. Firstly, equation (4.1) is now assumed to be:

$$\varepsilon = INID \tag{4.9}$$

where *the vector of disturbances, ε is independently but not (necessarily) identically distributed random vectors.* Hence, instead of the normal assumption that $E(\varepsilon_i \mid X_i) = 0$; or X_i and ε_i are independent with $E(\varepsilon_i) = 0$ for a homoscedastic equation, White allows heteroscedasticity of the form:

$E(\varepsilon_i^2 \mid X_i) = g(X_i)$ where g_i is a known (possibly parametric) function.

Under such conditions, a more reliable estimate of the variance $\hat{\beta}$, known as the **Heteroscedasticity-consistent Covariance Estimator is:**

$$\hat{\Psi} = (X'X)^{-1} X'\hat{\Omega}X (X'X)^{-1} \tag{4.10}$$

where:

- $\hat{\Omega} = diag(\hat{\mu}_1^2, ...\hat{\mu}_n^2)$
  = Diagonal matrix formed out of the vector of squared OLS residuals

The important property of this estimator is that its consistency does not rely on whether the error variances are constant, ie it is consistent both under homoscedasticity and heteroscedasticity. An advantage feature of this estimator over other heteroscedasticity mitigating approach is that this estimator does not require a formal modelling of the structure of the heteroscedasticity; and all it requires are the regressors and the estimated least squares residuals for its computation. While heteroscedasticity cannot be completely eliminated, White indicates that correct inferences can be drawn, and the estimator is useful in a wide variety of applications (p. 821).

Barth and Kallapur (1996); Rees (1997); and Aboody and Lev (1998) find that including a scale proxy as an independent variable and report inferences based on White standard errors is more effective than deflating alone at mitigating coefficient bias. If

heteroscedasticity is present in the estimated models, the parameters estimated remain unbiased but their standard errors will be inconsistent. Under these circumstances, White's (1980) heteroscedasticity consistent covariance matrix provides consistent estimates of the standard errors of the estimated coefficients. However, for specifications with an intercept where the number of shares is used as a deflator, White's standard errors can severely understate the true standard errors (see Barth and Kallapur, 1996, Table 1; and Stober, 1996, p. 13 and 35). Green et al. (1996) report that the White's standard errors reduce the estimated coefficients for deflated equations. Nevertheless, the use of White's test to mitigate heteroscedasticity is well supported in econometric texts, such as Maddala (1992) and is a standard feature in cross-sectional empirical studies.

Discussion and summary, there is no consensus on the technique used to controlling for scale-effect and heteroscedasticity in cross-sectional data. The literature offers four solutions for scale-related/heteroscedasticity problems in cross-sectional data: (1) including a scale proxy as an independent variable; (2) deflating variables by a scale proxy; (3) using White (1980) heteroscedasticity-consistent standard error estimates; and (4) reduction of residual variance by estimating models in log form. However, problems concerning scale/heteroscedasticity remains as no one appropriate scalar is established, and the White's standard errors reduce the estimated coefficients for deflated equations. As part of this study uses cross-sectional data, controlling for scale/heteroscedasticity is vital to the success of this research, and to be prudent, this study adopts all the analyses/tests evaluated in the literature.

4.2.4. Estimating Equations

To empirically estimate the relevance of the variables identified with respect to their potential ability to predict residual income and in valuing a firm's market value of equity, a series of regression equations estimated cross-sectionally and by pooling are used. For the *RI* information dynamics estimation (Prop-LID), the equations are estimated (1) without scaling; (2) scaled by closing book values of equity; and (3) scaled by closing market value of equity. For the valuation model (Prop-VM), the equations are estimated (1) without scaling; (2) scaled by closing book values of equity; and (3) scaled by opening market value of equity. The purpose of scaling is to mitigate the scale-effect and heteroscedasticity, while the unscaled equations act as a control. The use of two different

scalars is to provide a more robust test to this study. For the convenience of readers, the theoretical Prop-LID and Prop-VM are reproduced from Chapter 3.

$$RI_{t+1} = \omega_{11}RI_t + \omega_{12}OA_t + \omega_{13}CI_t + \omega_{14}RD_t + \omega_{15}HR_t + \omega_{16}DC_t + \omega_{17}TD_t + \omega_{18}DIV_t + \varepsilon_{t+1} \quad \text{[Prop-LID]} \tag{4.11}$$

$$V_t = BV_t + \alpha_1 RI_t + \alpha_2 OA_t + \alpha_3 CI_t + \alpha_4 RD_t + \alpha_5 HR_t + \alpha_6 DC_t + \alpha_7 TD_t + \alpha_8 DIV_t \quad \text{[Prop-VM]} \tag{4.12}$$

Both the theoretical models do not have an intercept, but for empirical reasons, an intercept and an inverse of size term are included in the estimating equations. For undeflated equations, the intercept is aimed to capture one/more omitted variables(s) or economic factors, eg whether a constant value be included in the model. For deflated equations, the intercept is to capture any likely omitted deflated variables in the model. The inverse of size term is to capture the effect of unscaled relevant variables not included in the model or likely economic factor.

By assuming risk-adverse investors use risk-adjusted required rate of return, but such rate is impossible to obtain, particularly in cross-sectional and pool data[1]. One approach commonly used by researchers in CMRA is to assume a standard rate, eg 12% in most US empirical studies but this is too simplistic. The approach here adopts a more rigorous approach by using three different rates for the cost of equity capital, *r*, ie 10%, 15% and 20%, where the rates are selected based on past studies which range from about 10% to 20% (Penman and Sougiannis, 1998 use 10% while Rees, 1997 uses 20%). Hence, the set of equations are run three times, each time using a different *r*, ie 10%, 15% and 20% respectively. The following are the symbols representing all the variables used for the two estimating models, which are used throughout this thesis:

- $RI_{it,\ it+1}$ = Residual income, firm *i*, time *t*, *t*+1
- OA_{it} = Operating assets, firm *i*, time *t*, *t*-1
- BV_{it} = Book values, firm *i*, time *t*
- CI_{it} = Investments in operating assets, firm *i*, time *t*
- RD_{it} = Research & Development expenditures, firm *i*, time *t*
- HR_{it} = Human resource expenditures, firm *i*, time *t*
- DC_{it} = Distribution costs, firm *i*, time *t*
- TD_{it} = Total Debts, firm *i*, time *t*
- DIV_{it} = Ordinary Dividends, firm *i*, time *t*

[1] Estimating the required rate of returns may be calculated using Capital Asset Pricing Model (CAPM); however, obtaining the risk-premium is a daunting task.

4.2.4.1. Residual Income Information Dynamics

The main estimating equations for the *RI* information dynamics (Prop-LID) are: (1) without scaling; (2) scaled by closing book values of equity; and (3) scaled by closing market value of equity. An intercept (ω_0) is included in all equations while the inverse of scale term (ω_1) ($\frac{1}{BV_{it}}$ for equations scaled by closing book values and $\frac{1}{MV_{it}}$ for equations scaled by closing market values) are included for all scaled equations.

RModel 1 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it+1}$

RModel 2 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + e_{it+1}$

RModel 3 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + e_{it+1}$

RModel 4 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + e_{it+1}$

RModel 5 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + e_{it+1}$

RModel 6 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it+1}$

RModel 7 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + e_{it+1}$

RModel 8 $RI_{it+1} = \omega_0 + \omega_{11} RI_{t} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it+1}$

Estimating the equations is based on the above order because (1) the order of *RI*, *OA* and *CI* (ie RModel 1 to 3) is essential and fixed as they are the analogues of the theoretical *RI* information dynamics (without other information) for O (1995), FO (1995), and FO (1996) respectively; (2) the addition of *RD*, *HR*, *DC*, *TD* and *DIV* to the regression is aimed at capturing the incremental information content of other information beyond *RI*, *OA* and *CI*; (3) *RD*, *HR* and *DC* are grouped together because they proxy for intangibles; (4) *TD* and *DIV* are grouped together because they both 'signaling variables'; and (5) intangibles (*RD*, *HR* and *DC*) are assumed to be of higher order than the signaling variables (*TD* and *DIV*).

Since RModel 1 to 3 are essential and the order is fixed, and that RModel 6 and 8 do not require alternative ordering, for robustness, RModel 4, 5 and 7 can be specified alternatively. RModel 4 can also be estimated as:

$$RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{15} HR_{it} + e_{it+1}$$
$$RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{16} DC_{it} + e_{it+1}$$

RModel 5 can also be estimated as:

$$RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{16} DC_{it} + e_{it+1}$$
$$RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it+1}$$

RModel 7 can also be estimated as:

$$RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{15} HR_{it} + \omega_{14} RD_{it} + \omega_{16} DC_{it} + \omega_{18} DIV_{it} + e_{it+1}$$

Following theoretical considerations of the OFF, GAAP and past empirical studies, the expectations of the signs for the coefficients of the variables are:

Variable		Exp Sign	Explanations
RI_{it-1}	=	Positive	OFF, GAAP + evidence (Stober, 1996; Dechow et al., 1999; Hand and Landsman, 1999; Myers, 1999; Ahmed et al., 2000)
OA_{it}	=	Positive	OFF, GAAP posits positive but evidence indicates negative (Stober, 1996; Myers, 1999; Ahmed et al., 2000)
CI_{it}	=	Positive	OFF, GAAP posits positive but evidence indicates negative (Myers, 1999; Ahmed et al., 2000). Lev and Thiagarajan (1993) find *CI* adds explanatory power of earnings in respect to excess returns.
RD_{it}	=	Positive	I hypothesize it can predict future *RI*
HR_{it}	=	Positive	I hypothesize it can predict future *RI*
DC_{it}	=	Positive	I hypothesize it can predict future *RI* + evidence indicates contribution to excess returns (Al-Debie and Walker, 1999)
TD_{it}	=	Positive	I hypothesize it signals good news
DIV_{it}	=	Positive	I hypothesize it signals good news + evidence (Dechow et al., 1999; Hand and Landsman, 1999). Lobo et al (1986) find past dividend and dividends per share information are useful for forecasting annual earnings.

For robustness, estimations of all the models without an intercept are conducted since the question for the inclusion of an intercept in scaled equations is an unresolved one. This would be of interest to this study and for CMRA.

Tests of the ability of current and lagged research and development expenditures (*RD*), human resource (*HR*) and distribution costs (*DC*) in predicting one-period ahead *RI* are estimated: (1) scaled by closing book values of equity; and (2) scaled by closing market value of equity. The lagged is from year 1 to 4 as in previous studies (Sougiannis, 1994; Green et al., 1996).

Model RRD $$RI_{it+1} = \omega_R + \omega_{RRI} RI_{it} + \omega_R RD_{it} + \sum_{t=1}^{4} \omega_{Rt} RD_{it-t} + e_{it+1}$$

Model RHR $$RI_{it+1} = \omega_H + \omega_{HRI} RI_{it} + \omega_H HR_{it} + \sum_{t=1}^{4} \omega_{Ht} HR_{it-t} + e_{it+1}$$

Model RDC $$RI_{it+1} = \omega_D + \omega_{DRI} RI_{it} + \omega_D DC_{it} + \sum_{t=1}^{4} \omega_{Dt} DC_{it-t} + e_{it+1}$$

All the parameters of RRD, RHR and RDC are expected to be positives since they are expected to be long-lived assets, while the intercept should capture the *RI* effects of

variables not included in the equation. To reduce the number of parameters of *RD*, *HR* and *DC*, I use Almon Polynomial distributed lags to impose a smoothness on the lag coefficients (see Almon, 1965). Smoothness is expressed as requiring that the coefficients lie on a polynomial of relatively low degree (≤ 3). A polynomial distributed lag model with order *p* restricts the β coefficients to lie on a *p-th* order polynomial of the form:

$$\beta_j = \gamma_1 + \gamma_2(j-\overline{c}) + \gamma_3(j-\overline{c})^2 + \ldots + \gamma_{p+1}(j-\overline{c})^p \qquad (4.13)$$

for *j=0,1,2,...,k*, where $\overline{c}$ is a pre-specified constant to avoid numerical problems that can arise from collinearity and it does not affect the estimates of β. Results of the most appropriate lagged *RD*, *HR* and *DC* obtained from RRD, RHR, RDC and the Polynomial analysis will then be fed into the main equations to determine whether or not, lagged *RD*, *HR* and *DC* provide better estimates on one-year ahead *RI*. All equations are scaled by closing book values of equity and closing market value of equity.

Model RL1
$$\frac{RI_{it+1}}{BV_{it}} = \omega_L + \omega_{L1}\frac{1}{BV_{it}} + \omega_{L1}\frac{RI_{it}}{BV_{it}} + \omega_{L2}\frac{OA_{it}}{BV_{it}} + \omega_{L3}\frac{CI_{it}}{BV_{it}} + \sum_{t=1}^{3}\omega_{L4}\frac{RD_{it-}}{BV_{it}} + \sum_{t=1}^{3}\omega_{L5}\frac{HR_{it-}}{BV_{it}} + \sum_{t=1}^{1}\omega_{L6}\frac{DC_{it-}}{BV_{it}} + \omega_{L7}\frac{TD_{it}}{BV_{it}} + \omega_{L8}\frac{DIV_{it}}{BV_{it}} + e_{it+1}$$

Model RL2
$$\frac{RI_{it+1}}{MV_{it}} = \omega_L + \omega_{L1}\frac{1}{MV_{it}} + \omega_{L1}\frac{RI_{it}}{MV_{it}} + \omega_{L2}\frac{OA_{it}}{MV_{it}} + \omega_{L3}\frac{CI_{it}}{MV_{it}} + \sum_{t=1}^{3}\omega_{L4}\frac{RD_{it-}}{MV_{it}} + \sum_{t=1}^{2}\omega_{L5}\frac{HR_{it-}}{MV_{it}} + \sum_{t=1}^{1}\omega_{L6}\frac{DC_{it-}}{MV_{it}} + \omega_{L7}\frac{TD_{it}}{MV_{it}} + \omega_{L8}\frac{DIV_{it}}{MV_{it}} + e_{it+1}$$

4.2.4.2. Residual Income Valuation Model

For the Market Value (Prop-VM) estimations, using an intercept is not possible for equations scaled by BV_{it} as BV_{it} is one of the variables. Excluding an intercept in a regression equation is equivalent to have the intercept constrained to 0, resulting in erratic and negative R^2s because $\frac{ESS}{TSS}$ need not lie within 0 and 1, and hence, interpretation of R^2 is difficult (Pindyck and Rubinfeld, 1998, p. 89; Green, 2003, p. 37). While an intercept can be included in equations scaled by MV_{it-1}, equations are also run without an intercept in direct conformity with equations scaled by BV_{it}. Thus, the main estimating equations for Prop-VM are run on (1) unscaled equations with an intercept (ω_0); (2) equations scaled by closing book values with an inverse of size term (ω_1) ($\frac{1}{BV_{it}}$) and no intercept; (3) equations

scaled by opening market value of equity with an inverse of size term (ω_1) ($\frac{1}{MV_{it}}$) and no intercept; and (4) equations scaled by opening market value of equity with an inverse of size term (ω_1) ($\frac{1}{MV_{it}}$) and an intercept (ω_0).

MModel 1	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$
MModel 2	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + e_{it}$
MModel 3	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + e_{it}$
MModel 4	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + e_{it}$
MModel 5	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + e_{it}$
MModel 6	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + e_{it}$
MModel 7	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + e_{it}$
MModel 8	$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

The basis and the order of estimating the above equations are similar to Prop-LID. As per Prop-LID, for robust reason, we can use alternative order of estimation in capturing the incremental information content of *RD, HR, DC, TD* and *DIV* beyond *BV*, *RI, OA* and *CI*. Since MModel 1 to 3 are essential and the estimating order is fixed as they are the analogues of the theoretical market value model (without other information) for O (1995), FO (1995), and FO (1996) respectively, and that MModel 6 and 8 do not require alternative ordering, MModel 4, 5 and 7 can be specified alternatively. Thus, MModel 4 can also be estimated as:

$$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_5 HR_{it} + e_{it}$$
$$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_6 DC_{it} + e_{it}$$

MModel 5 can also be estimated as:

$$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_6 DC_{it} + e_{it}$$
$$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + e_{it}$$

RModel 7 can also be estimated as:

$$MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_5 HR_{it} + \alpha_4 RD_{it} + \alpha_6 DC_{it} + \alpha_8 DIV_{it} + e_{it}$$

Following theoretical considerations of the OFF and past empirical studies, the expectations of the signs for the variables in the valuation equations are:

Variable		Exp Sign	Explanations
BV_{it}	=	Positive	OFF, GAAP + evidence (eg Easton and Harris, 1991; Stober, 1996; Green et al., 1996; Rees, 1997; Colins et al., 1997; Lev and Zarowin, 1999; Penman and Sougiannis, 1998; Frankel and Lee, 1998; Lee et al., 1999; Dechow et al., 1999; Hand and Landsman, 1999)
RI_{it}	=	Positive	OFF, GAAP + evidence (eg Sougiannis, 1994; Green et al., 1996; Stark and Thomas, 1998; Dechow et al., 1999; Hand and Landsman, 1999)
OA_{it}	=	Positive	OFF, GAAP + evidence (Stober, 1996)
OA_{it-1}	=	Positive	OFF, GAAP + evidence (Ahmed et al., 2000)
CI_{it}	=	Positive	OFF, GAAP + evidence (Rees, 1997; Ahmed et al., 2000)
RD_{it}	=	Positive	Evidence (Hirschey, 1982; Hirschey and Weygandt, 1985; Hirschey and Spencer, 1992; Chauvin and Hirschey, 1993; Sougiannis, 1994; Green et al., 1996; Stark and Thomas, 1998; Colins et al., 1997; Francis and Schipper, 1999; Lev and Zarowin, 1999)
HR_{it}	=	Positive	HRM posits it imply value creation (Prahalad and Hamel, 1990; Barney, 1991, 1995; Collins and Montgomery, 1995; and Lahteenmaki et al., 1998) + evidence (Huselid and Becker, 1996; Welbourne and Andrews, 1996; Tyson, 1999)
DC_{it}	=	Positive	I hypothesize it imply value creation
TD_{it}	=	Positive	I hypothesize it signals good news + evidence (Ross, 1977; McConnell and Muscarella, 1985; Green et al., 1996; Giner and Reverte, 2001)
DIV_{it}	=	Positive	I hypothesize it signals good news + evidence (Lintner, 1956; Fama et al., 1969; Pettit, 1972; Aarony and Swary, 1980; Handjiinicolaou and Kalay, 1984; Green et al., 1996; Rees, 1997; Dechow et al., 1999; Hand and Landsman, 1999)

Regression equations are also run to test for value relevance of the current and lagged *RD, HR and DC* cost to determine whether they can be treated as intangibles. All equations are scaled by closing book values of equity and closing market value of equity.

Model MRD $$MV_{it} = \alpha_{RBV} BV_{it} + \alpha_{RRI} RI_{it} + \sum_{t=1}^{4} \alpha_{Rt} RD_{it-t} + e_{it}$$

Model MHR $$MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \sum_{t=1}^{4} \alpha_{Ht} HR_{it-t} + e_{it}$$

Model MDC $$MV_{it} = \alpha_{DBV} BV_{it} + \alpha_{DRI} RI_{it} + \sum_{t=1}^{4} \alpha_{Dt} DC_{it-t} + e_{it}$$

All the parameters of MRD, MHR and MRD are expected to be positive since they are expected to be long-lived assets. Similar to *RI*, Almon Polynomials (see Almon, 1965) is used to estimate the lagged *RD, HR* and *DC* parameters.

Since FO (1996) theories that lagged-one *OA* instead of current *OA* be used to proxy for conservatism, the valuation models are estimated using lagged *OA* and are scaled by closing *BV* and opening *MV*.

$$\text{Model ML1}\ \frac{MV_{it}}{BV_{it}} = \alpha_B \frac{1}{BV_{it}} + \alpha_{L0}\frac{BV_{it}}{BV_{it}} + \alpha_{L1}\frac{RI_{it}}{BV_{it}} + \alpha_{L2}\frac{OA_{it-1}}{BV_{it}} + \alpha_{L3}\frac{CI_{it}}{BV_{it}} + \alpha_{L4}\frac{RD_{it}}{BV_{it}} + \alpha_{L5}\frac{HR_{it}}{BV_{it}} + \alpha_{L6}\frac{DC_{it}}{BV_{it}} + \alpha_{L7}\frac{TD_{it}}{BV_{it}} + \alpha_{L8}\frac{DIV_{it}}{BV_{it}} + e_{it}$$

$$\text{Model ML2}\ \frac{MV_{it}}{MV_{it-1}} = \alpha_B \frac{1}{MV_{it-1}} + \alpha_{L0}\frac{BV_{it}}{MV_{it-1}} + \alpha_{L1}\frac{RI_{it}}{MV_{it-1}} + \alpha_{L2}\frac{OA_{it-1}}{MV_{it-1}} + \alpha_{L3}\frac{CI_{it}}{MV_{it-1}} + \alpha_{L4}\frac{RD_{it-1}}{MV_{it-1}} + \alpha_{L5}\frac{HR_{it-1}}{MV_{it-1}} + \alpha_{L6}\frac{DC_{it}}{MV_{it-1}} + \alpha_{L7}\frac{TD_{it}}{MV_{it-1}} + \alpha_{L8}\frac{DIV_{it}}{MV_{it-1}} + e_{it}$$

The final tests involve the estimations of the coefficients for the valuation models by allowing the coefficients to vary cross-sectionally within each year (pool), as a function of parameters estimated from the Prop-LID; and as a function of parameters estimated from the linear information models.

The series of estimating regression equations, RModel 1 to 8, RRD, RHR, RDC, RL1 and RL2 form the basis of the Prop-LID while MModel 1 to 8, MRD, MHR, MDC, ML1 and ML2 form the basis of the Prop-VM. RModel 8 and MModel 8 are the empirical analogues of equation (4.11) and (4.12) respectively. RModel 8 can be viewed as a transformation of equation (4.11) where the variables are scaled by closing *BV* or *MV* and the intercept and disturbance term are added to the latter. Similarly, MModel 8 can be viewed as a transformation of equation (4.12) where the variables are scaled by closing *BV* or opening *MV* and the disturbance term is added to the latter. All other models (ie Models 1-7) are partial models for Prop-LID and Prop-VM which can be used to examine the sensitivity of the results to alternative specifications.

In summary, to evaluate the hypotheses formulated, the variables contained in the *RI* dynamics and the valuation models are tested using cross-sectional and pooling estimations. For cross-sectional tests, scale/heteroscedasticity are the vital issues, and hence, the variables are scaled, after which the White's consistent standard error test and residual analysis are used to mitigate scale/heteroscedasticity in equations. The tests to be conducted are robust with varying specifications so as to examine the sensitivity of the results to alternative specifications.

4.3. Sample Data, Description and Measurement of Variables

The primary motivation for this research is to develop and test a mathematical valuation model using accounting data and a prediction model to examine the role of *RI* in equity valuation. To ensure that the empirical research represents as large as possible the number of firms listed in the London Stock Exchange (LSE) over the sample period, both live and dead companies are essential, and ought to be included in the sample. Since firms, such as banks, financial institutions, insurance companies, pension institutions and investment companies have different accounting systems and generally have little *RD* expenditures and low operating assets, these firms are excluded from the sample. The sample data is obtained from DataStream Windows Version 2, 2002 (DSW) on-line terminal system for the period 1988 to 2002. A preliminary study to familiarize with the DSW establish that the system is not user-friendly, containing massive number of codes and programs that can be used to extract the same data, format of output data is not suitable for regression analysis, and the data extraction process is laborious. Internal data validity and reliability tests were conducted using different techniques of data extraction (manual and with specially written DSW macros) and different DSW programs to extract the same information (eg 900C and 190F to extract accounting data). External verifications were also conducted by comparing the financial statements (P/L accounts, balance sheet and cash flow statements) of two selected companies (Boots and British Airways) obtained from DSW and from the companies' websites. In general, except for minor differences, inconsistency of recording year-end dates and data unavailability (ie they are either coded blank or as 'NA'), the data output from DSW is satisfactory. In view of the difficult, laborious, unfriendly mode of data extraction from DataStream, I decided to write a series of computer programs to extract, process, and generate the necessary output required for the entire empirical study.

4.3.1. Automating Data Extraction, Maintenance and Processing

Automating the data collection process is done in the following manner. First, master files for accounts codes, industry sectors and companies are obtained from DSW. Since these file formats are not in any of the popular file format, I have to write a utility tool (coded in Microsoft C++ V6) to convert these files into text files (.txt) as they are safest with least formatting rules so that the data contained in these files can later be put into good use. To better manage data and to provide a more speedy and efficient data

processing system, data is stored in Microsoft Access relational database system with self-written computer programs. I call this customized computer-based database and data processing system as the **DataStream Relational Database System (DSRDS)** (Figure 4.1). With DSRDS, (1) data can be imported from various sources, eg from DSW, spreadsheet, text files and other databases to provide an integrated dataset; (2) data can be stored centrally with no duplication of data; (3) data can be manipulated, updated, processed and sorted more speedily and more efficiently than spreadsheets; (4) the well-written customized program provides accurate, well-presented and 'call as you want' output and screen display. Since the entire program listing is enormous, only the listing for the generation of DSW macros to extract the monthly share prices is in **Appendix 4.1.**

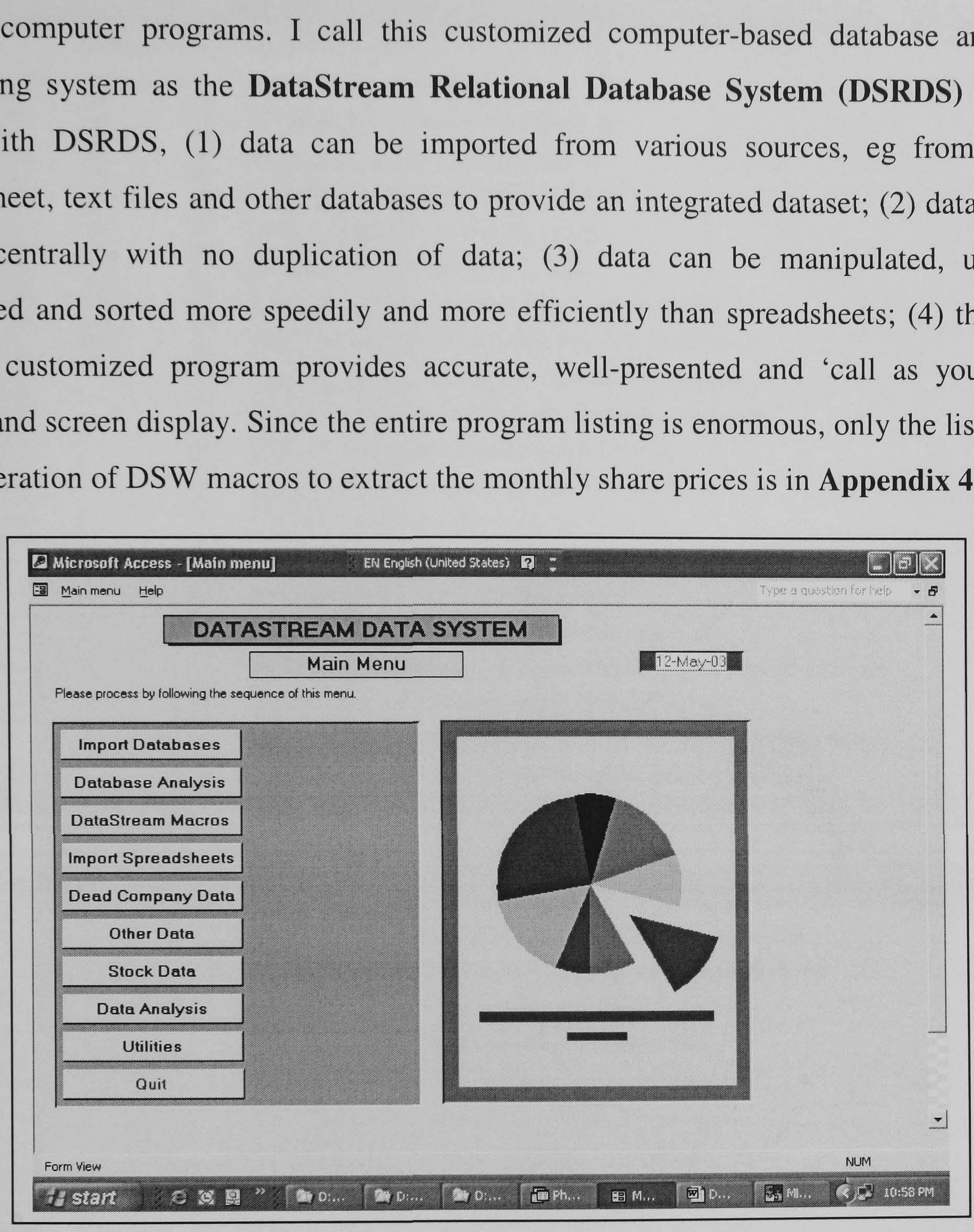


Figure 4.1 – The DataStream Relational Database System (DSRDS) with customised programs for data maintenance and manipulation

As the econometric package used for this study is Econometric Views V3.1 (EViews) which only allows for the importation of text (txt) and spreadsheet files (xls), data preparation in the form suitable to be used for EViews is done using Microsoft Excel supported by self-written VBA programs that will automate data transfer between the Access-based DSRDS and the excel-based **DataStream Spreadsheet Automation System (DSSAS)** (Figure 4.2). The DSSAS enables the preparation and dissemination of information to be done more accurately and quickly as it will do away with the 'cut and paste' approach. Description of the DSRDS and DSSAS is in **Appendix 4.2**.

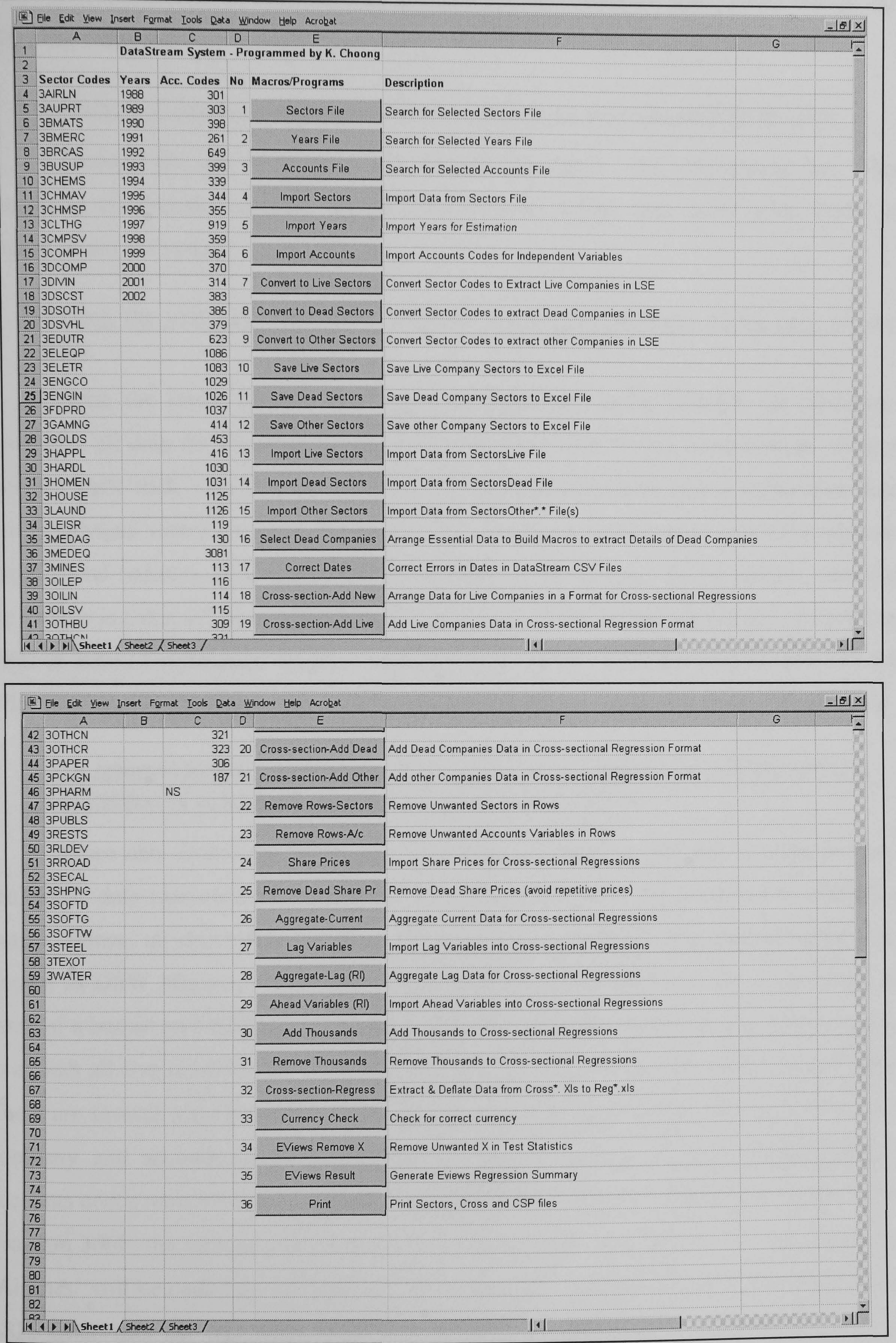


Figure 4.2 – The DataStream Spreadsheet Automation System (DSSAS) with customized VBA Programs for preparing data for Data Analysis

The utilisation of DSRDS and DSSAS for this research are carried out in the following manners.

1. Importation of data for companies, industry sectors and accounts code from DSW

Through the use of DSRDS (1) 'Import Databases', the reformatted 'txt' files containing companies, industry sectors and accounts codes data taken from DSW is imported into the system.

2. Selecting the relevant companies, industry sectors and accounts codes data for the sample

Once the three master files have been imported, using DSRDS (2) 'Database Analysis', all data are checked for accuracy, duplicates and coding consistencies. Master data are static data, which are not likely to be changed frequently unlike transaction data that is changed whenever there is a transaction. The purpose here is to select the relevant nonfinancial industry sectors and accounts codes for the sample. To be prudent, data for the sample is collected from 1 January 1988 to 31 July 2002 for the sample period covering 1990 to 2001. The selected industry sectors and accounts codes are then exported to the DSSAS (Figure 4.2). These codes will be used subsequently under functions (18) onwards.

3. Use of selected industry sectors and accounts codes information to form the basis for the extraction of accounting data for live companies on DSW

Since data extraction for as many nonfinancial firms as possible is required from the DSW, data extraction will be difficult, laborious and may be subjected to erroneous output. Hence, all data extraction from DSW is made via DSW command-like programs, known as DSW Macros, which direct DSW to provide the relevant data as specified. A press of a button on DSRDS (3) 'Database Macros', generate all the relevant DSW macros to extract all live nonfinancial firms with the relevant accounting and industry sector data. There are several ways to extract data from DSW but the most organized way is to extract company and accounting data classified by industry sectors. Firstly, all the selected accounts codes must be entered into DS Program F113. Secondly, through the use of DSW Program 300F, the various nonfinancial sectors are created in a form of 'list, eg the sector 'Airlines' will be coded as 'L#AIRLN'. The prefix 'L#' indicates sectors pertaining to the LSE. Once this list has been completed, using the DSW macros as generated earlier through DSRDS Function (3), and using DSW Program 900C, all live nonfinancial firms with the relevant accounting and industry sector data will be extracted from DSW.

4. Use of selected industry sectors and accounts codes to form the basis for the extraction of accounting data for dead companies on DSW

To increase sample size and reduce survivorship bias, dead companies are also extracted from DSW. This is done in two steps. Firstly, a press of a button on DSRDS (5) 'Dead Company Data', generate all the relevant DSW macros to extract all dead firms through DSW Program 301X. Then using DSSAS Function (16) 'Select Dead Companies' to weed out all financial firms and firms with incomplete data to generate a dead company list consisting of company codes, names and industry sectors for the required nonfinancial firms. This list is then imported into the DSRDS via Function (4) 'Import Spreadsheets' to be stored, and then to be combined with the master file data (company codes, sector codes and accounts codes) to generate DSW macros to be used to extract the nonfinancial dead companies from DSW Program 900A. Next, a press of a button on DSRDS, Function (5) generates all the relevant DSW macros to extract all the requested nonfinancial dead firms with the selected industry sector and accounting data.

5. Use of selected industry sectors, accounts codes and the extracted live and dead firms to form the basis for the extraction of accounting data for live and dead companies on DS Advanced system

Data for the sample to be used for the empirical work is extracted from DSW on April-May 2001. However, in the late Summer of 2001 (September), Imperial College installed DataStream Advanced System (DSA). In order to ensure data extracted using DSW is complete, a check is made to ensure that data for the same sample period not contained in DSW is kept in DSA system. By specifying the same nonfinancial firms from the same industry sectors and account codes, and through the use of excel, both the required live and dead companies were extracted from DSA Programs respectively. Using DSRDS, (4) 'Import Spreadsheets', this new data extracted from DSA is first imported into the DSRDS. Activating DSRDS, (6) 'Other Data' the new data from DSA is compare with existing live and dead companies obtained from DSW, and it was revealed that an additional 301 live firms and 1,213 dead firms are not contained in the DSW system. On the other hand, 219 live firms and 316 dead firms are contained in DSW but not in DSA. This indicates that data kept in these two DataStream systems is inconsistent. A press of a button on DSRDS, Function (6) generates all the relevant DSW macros to extract the 'new' live and dead firms with the selected sector and accounting data using DSW.

6. Use of selected live and dead firms to form the basis for the extraction of share prices on DSW

Share price data will be used as the dependent variable for the Prop-VM model and as deflator for both Prop-LID and Prop-VM. First, all live and dead companies' codes and fiscal year dates are imported into DSRDS, (7) 'Stock Data'. Then, a press of a button on DSRDS, Function (7) generates all the relevant DSW macros to extract the share prices for different dates for both live and dead firms using DSW's Program 900B.

7. Data analysis and relevant output for use in this sample

Using DSRDS, (8) 'Data Analysis', pressing a series of buttons on DSRDS, generates the various reports that aid in the sampling process.

8. Correcting data for all Live and Dead companies extracted from DSW

During random checking on year-end dates, many of the year-end dates were found to be incorrectly recorded, eg the year-ends for 1991, 1992 and 1993 for a firm may be recorded as 2/1/92, 27/12/92 and 5/2/93. As this study estimates data across-sectionally annually, incorrect year-end dates will affect sample size from year to year, hence, the dates of 2/1/92 and 27/12/92 will be treated as falling in the same year. A press of a button on DSSAS, Function (17) will correct the year-end dates for those dates that were incorrectly recorded by DSW. In addition, 'NA' and blanks are assigned 0 indicating they have zero value.

9. Data preparation in a form suitable to be used in EViews for the estimations of the Proposed Models

The objective here is to rearrange the data extracted from DS in a suitable format in which all companies are arranged in rows and accounting variables in columns, to be used in EViews for the model estimations. This is achieved by pressing DSSAS, Functions (18)-(21), and once the company and accounting data are rearranged, share prices data is placed alongside with the accounting data via DSSAS, Function (24). DSSAS, Function (26) 'Aggregate-Current' will aggregate the data in accounting numbers, eg book value of equity is obtained by aggregating ordinary share capital, share premium account, associate reserves (O/W), grants, legal reserve and profit & loss account (see Definition of Variables). Since the sample includes lagged variables, eg ordinary share capital, share premium account to formed lagged book values for the calculation of residual income,

Functions (27) 'Lag Variables' and (28) 'Aggregate-Lag (*RI*)' respectively are then activated. Similarly, Function (29) 'Ahead Variables (*RI*)' will be activated to obtain one-period-ahead *RI*. Since the DS's accounting data are truncated by £000 and share prices are in terms of pence, three zeros (000) must be added to the end of each accounting data, and the share prices must be divided by 100 to express them in pounds, and these processes are activated by pressing Function (30) 'Add Thousands'. By pressing Function (32) 'Cross-section-Regress', the relevant data is arranged in a form suitable for regression estimations. Since the currency units must be in £, currency units other than £ or blanks are deleted by pressing Function (33) 'Currency Check'.

4.3.2. Automating the Estimating Process

In addition to the DSRDS and DSSAS, the estimation process is automated by exploiting the full potential of EViews's programming language, which I coined it as the EV Automation System or EVAS. EVAS first imports the relevant information in spreadsheet format from the final DSSAS Function (32), 'Cross-section Regress'. EVAS will then pick all the relevant variables from the spreadsheet, after which, descriptive and correlation statistics are calculated, graphed and output generated. Next, the program estimates the required equations by generating a range of statistics, such as R^2, $\bar{R}^2$, standard errors, *F*- and *t*-statistics, AIC. Once the statistical output is generated, the program compute the 1%, 5%, and 10% confidence level and any coefficients that are statistical significant are highlighted. At the end of the estimation process, the EVAS generates a report summarizing the test results, containing information such as coefficient values, standard errors, *t*- and White statistics and adjusted R^2 (see **Appendix 4.3** for program listing). This study is probably the first of its kind that rely on computer software to automate almost the entire data extraction, preparation, and estimation process as well as output for result analysis.

In summary, in view of the difficult, laborious, unfriendly mode of data extraction from DataStream, I decided to write a series of computer programs to extract, process, and generate the necessary output required for the empirical analysis. Firstly, only the company, sector and accounts files are converted to .txt files, so that they can be stored, manipulated and information generated by the DSRDS. To compliment DSRDS and to speed up processing, the DSSAS enables data preparation and the generation of spreadsheet output to be used subsequent by EVAS in more efficient manner as it will do

away with the 'cut and paste' approach. Through EVAS, the estimation and statistical analysis are automated in order to provide the required econometric and statistical reports.

4.3.3. Sample Selection

All accounting variables used for this research is based on levels basis. The data for this study are based on a sample of nonfinancial firms in the UK obtained from the 2002 DataStream Windows on-line terminal for the period 1988 to 2002. The measurement interval examined is annual basis, regardless of the date of year-ends. Thus, for firms' year-end that are not based on fiscal year, say to 31st. March, 2000, the sample period will be extended to 2001. Data for report periods not equal to one-year were annualised. Firms are excluded if they do not have enough data to calculate the required variables. In order to determine whether a firm should be included in the sample for the cross-sectional and pooling estimations, the following criteria are required:

(1) Market value (MV_t) is calculated for calendar year t as the market value of the firm, measured six months after the financial year ending in calendar year t. Six months after the financial year-end is used to ensure that the information in the latest financial statements is reflected in the market price because UK listed firms have up to 6 months to submit their annual accounts. For example, the financial year-end of a firm ends at 31st December, 1990, market value will be based on 1st July 1991, or the nearest trading day. This approach is used in Green et al. (1996); and Stark and Thomas (1998).

(2) *Earnings* (NI_i) is measured as earnings after exceptional and extraordinary items to be consistent with the CSR.

(3) Opening and closing book value at the end of the year must not be less than 0. This is to ensure that the firms included are not in financial distress and since book value is used as a deflator, negative book values affect the sign of estimated coefficients.

Since studies have indicated that outliers may contribute negatively/positively to the results of regression models, estimations of regression equations in this study are performed on samples with and without outliers and their results are analysed and compared. From the entire set of existing listed companies on the London Stock Exchange (LSE), 2,694 companies were selected from DSW (**Appendix 4.4**). To improve sampling, various adjustments are needed to derive at the final sample (table below):

	Nonfinancial Firms			Not	Duplicate	Non-£/0 or		$BV > 0$			$BV \geq$ £5 Millions			
									Outliers		$BV <$ £5		Outliers	
Year	Live	Dead	Total	Complete	Firms	Missing	$BV \leq 0$	**Remain**	Deleted	**Remain**	Millions	**Remain**	Deleted	**Remain**
1991	1,173	150	1,323	33	10	68	36	**1,176**	19	**1,157**	214	**962**	20	**942**
1992	1,157	149	1,306	37	8	76	25	**1,160**	27	**1,133**	220	**940**	29	**911**
1993	1,192	158	1,349	45	8	61	45	**1,190**	27	**1,163**	192	**998**	26	**972**
1994	1,240	178	1,418	54	8	70	47	**1,239**	30	**1,209**	178	**1,061**	29	**1,032**
1995	1,283	200	1,483	57	5	60	55	**1,306**	26	**1,280**	192	**1,114**	31	**1,083**
1996	1,390	224	1,614	62	7	127	42	**1,376**	29	**1,347**	219	**1,157**	27	**1,130**
1997	1,414	238	1,651	65	7	155	39	**1,385**	28	**1,357**	261	**1,124**	27	**1,097**
1998	1,375	223	1,598	56	6	208	76	**1,252**	27	**1,225**	227	**1,025**	29	**996**
1999	1,254	187	1,441	42	6	191	72	**1,130**	28	**1,102**	209	**921**	27	**894**
Pool	11,478	1,707	13,183	451	65	1,016	437	**11,214**	241	**10,973**	1,912	**9,302**	245	**9,057**

Table 4.1 – Summary of Sample Analysis to derive the various Subsamples

All accounting variables used for this research is based on **levels** basis, using a sample of nonfinancial live and dead nonfinancial firms listed in the London Stock Exchange, UK obtained from the 2002 DataStream Database (DSW). After adjusting for duplicate firms, missing dependent variables and share prices, omitting currency units other than £ or blanks, deletion of negative book values, and omitting outliers, the various pool sample sizes for the empirical study are (1) 11,214 for $BV > 0$ (2) 10,973 for $BV > 0$ and after omitting outliers (3) 9,302 for $BV \geq$ £5 millions; and (4) 9,057 for $BV \geq$ £5 millions and after omitting outliers. Distribution of the various subsamples by Industrial classifications and the number of firms and % of total number of firms in each classification is presented in Table 4.2.

Sector	Description	*BV > 0*		*BV > 0* after Outliers		*BV ≥ £5 Millions*		*BV ≥ £5 Millions* after Outliers	
		No. Co.	%	No. Co.	%	No. Co.	%	No. Co.	%
AEROS	AEROSPACE	98	0.9	98	0.9	98	1.1	98	1.1
AIRLN	AIRLINES + AIRPORTS	63	0.6	60	0.5	59	0.6	55	0.6
AUPRT	AUTO PARTS	100	0.9	100	0.9	95	1.0	94	1.0
AUTOS	AUTOMOBILES	3	0.0	3	0.0	3	0.0	3	0.0
BMATS	BUILDING MATERIALS	346	3.1	338	3.1	334	3.6	323	3.6
BMERC	BUILDERS MERCHANTS	104	0.9	104	0.9	79	0.8	79	0.9
BRCAS	BROADCASTING	185	1.6	183	1.7	131	1.4	129	1.4
BREWS	BREWERS	12	0.1	12	0.1	12	0.1	12	0.1
BUSUP	BUSINESS SUPPORT	551	4.9	546	5.0	439	4.7	434	4.8
CABLE	CABLE + SATELLITE	7	0.1	7	0.1	6	0.1	6	0.1
CHEMS	CHEMICALS, COMMODITY	48	0.4	47	0.4	41	0.4	40	0.4
CHMAV	CHEMS.ADVANCED MATS.	57	0.5	57	0.5	56	0.6	56	0.6
CHMSP	CHEMICALS, SPECIALITY	153	1.4	148	1.3	135	1.5	129	1.4
CLTHG	CLOTHING + FOOTWEAR	228	2.0	228	2.1	167	1.8	167	1.8
CMPSV	COMPUTER SERVICES	236	2.1	235	2.1	193	2.1	193	2.1
COMMV	COMMERCIAL VEHICLES	18	0.2	18	0.2	18	0.2	18	0.2
COMPH	COMPUTER HARDWARE	63	0.6	63	0.6	38	0.4	38	0.4
DCOMP	DISTRIB. IND. COMPS.	285	2.5	284	2.6	232	2.5	230	2.5
DEFEN	DEFENCE	49	0.4	33	0.3	49	0.5	35	0.4
DISTV	DISTILLERS + VINTNERS	70	0.6	67	0.6	69	0.7	64	0.7
DIVIN	DIVERSIFIED INDUSTRY	73	0.7	73	0.7	73	0.8	72	0.8
DSCST	DISCOUNT STORES	13	0.1	13	0.1	13	0.1	13	0.1
DSOTH	OTHER DISTRIBUTORS	161	1.4	161	1.5	115	1.2	114	1.3
DSVHL	VEHICLE DISTRIBUTION	181	1.6	180	1.6	164	1.8	161	1.8
EDUTR	EDUCATION + TRAINING	135	1.2	135	1.2	73	0.8	73	0.8
ELECT	ELECTRICITY	93	0.8	90	0.8	89	1.0	81	0.9
ELEQP	ELECTRICAL EQUIPMENT	150	1.3	150	1.4	109	1.2	109	1.2
ELETR	ELECTRONIC EQUIPMENT	381	3.4	379	3.5	299	3.2	297	3.3
ENGCO	ENG. CONTRACTORS	77	0.7	77	0.7	58	0.6	58	0.6
ENGFA	ENGINEERING FABRICATORS	147	1.3	147	1.3	95	1.0	95	1.0
ENGIN	ENGINEERING, GENERAL	570	5.1	564	5.1	498	5.4	492	5.4
ERETL	RETAILERS E-COMMERCE	10	0.1	9	0.1	6	0.1	5	0.1
FDPRD	FOOD PROCESSORS	323	2.9	307	2.8	296	3.2	275	3.0
FDRET	FOOD + DRUG RETAILERS	171	1.5	170	1.5	146	1.6	145	1.6
FMFSH	FARMING AND FISHING	39	0.3	39	0.4	17	0.2	17	0.2
GAMNG	GAMING	53	0.5	52	0.5	39	0.4	38	0.4
GASDS	GAS DISTRIBUTION	7	0.1	6	0.1	7	0.1	6	0.1
GOLDS	GOLD MINING	14	0.1	14	0.1	11	0.1	11	0.1
HAPPL	HSEHOLD APPS+HSEWARES	100	0.9	100	0.9	68	0.7	68	0.8
HARDL	RETAIL, HARDLINES	233	2.1	226	2.1	192	2.1	187	2.1
HOMEN	HOME ENTERTAINMENT	128	1.1	126	1.1	62	0.7	62	0.7
HOSPM	HOSPITAL MANAGEMENT	46	0.4	46	0.4	33	0.4	33	0.4
HOTEL	HOTELS	96	0.9	94	0.9	86	0.9	82	0.9
HOUSE	HOUSE BUILDING	264	2.4	264	2.4	248	2.7	247	2.7
HSEPR	HOUSEHOLD PRODUCTS	36	0.3	36	0.3	36	0.4	36	0.4
INTNT	INTERNET	43	0.4	43	0.4	22	0.2	22	0.2

Sector	Description	*BV > 0*		*BV > 0* after Outliers		*BV ≥ £5 Millions*		*BV ≥ £5 Millions* after Outliers	
		No. Co.	%	No. Co.	%	No. Co.	%	No. Co.	%
LEISR	LEISURE FACILITIES	252	2.2	234	2.1	203	2.2	188	2.1
LSREQ	LEISURE EQUIPMENT	70	0.6	69	0.6	49	0.5	49	0.5
MEDAG	MEDIA AGENCIES	148	1.3	145	1.3	103	1.1	103	1.1
MEDEQ	MED EQUIP + SUPPLIES	200	1.8	198	1.8	136	1.5	135	1.5
MINES	OTHER MINING	71	0.6	68	0.6	56	0.6	50	0.6
MULTI	RETAILERS, MULTI DEPT	150	1.3	140	1.3	138	1.5	131	1.4
NOFMS	NON FERROUS METALS	34	0.3	34	0.3	32	0.3	32	0.4
OILEP	OIL + GAS EXPL/PROD.	152	1.4	150	1.4	129	1.4	127	1.4
OILIN	OIL INTEGRATED	30	0.3	3	0.0	30	0.3	4	0.0
OILSV	OIL SERVICES	35	0.3	35	0.3	29	0.3	29	0.3
OTHBU	OTHER BUSINESSES	9	0.1	9	0.1	6	0.1	6	0.1
OTHCN	OTHER CONSTRUCTION	239	2.1	236	2.2	214	2.3	210	2.3
OTHCR	OTHER HEALTH CARE	32	0.3	32	0.3	28	0.3	28	0.3
PAPER	PAPER	33	0.3	33	0.3	33	0.4	33	0.4
PCKGN	PACKAGING	147	1.3	146	1.3	144	1.5	143	1.6
PHARM	PHARMACEUTICALS	197	1.8	180	1.6	166	1.8	148	1.6
PHOTO	PHOTOGRAPHY	12	0.1	12	0.1	12	0.1	12	0.1
PRNSL	PERSONAL PRODUCTS	56	0.5	56	0.5	54	0.6	54	0.6
PRPAG	PROPERTY AGENCIES	50	0.4	50	0.5	27	0.3	27	0.3
PUBLS	PUBLISHING&PRINTING	420	3.7	413	3.8	329	3.5	319	3.5
RESTS	BREWERIES,PUBS,RESTS	314	2.8	313	2.9	252	2.7	251	2.8
RLDEV	REAL ESTATE DEV.	828	7.4	823	7.5	704	7.6	704	7.8
RROAD	RAIL, ROAD, FREIGHT	176	1.6	170	1.5	171	1.8	169	1.9
SECAL	SECURITY AND ALARMS	44	0.4	44	0.4	27	0.3	26	0.3
SEMIC	SEMICONDUCTORS	27	0.2	27	0.2	26	0.3	26	0.3
SHPNG	SHIPPING AND PORTS	114	1.0	111	1.0	110	1.2	106	1.2
SOFTD	SOFT DRINKS	19	0.2	19	0.2	19	0.2	19	0.2
SOFTG	RETAILERS, SOFT GOODS	244	2.2	242	2.2	211	2.3	205	2.3
SOFTW	SOFTWARE	289	2.6	277	2.5	190	2.0	176	1.9
STEEL	STEEL	54	0.5	52	0.5	51	0.5	49	0.5
TELEQ	TELECOM EQUIPMENT	50	0.4	49	0.4	48	0.5	47	0.5
TELFL	TELECOM FIXED LINE	56	0.5	39	0.4	47	0.5	38	0.4
TELWR	TELECOM WIRELESS	20	0.2	19	0.2	19	0.2	18	0.2
TEXOT	TEXTILES+LEATHER GDS	202	1.8	202	1.8	187	2.0	187	2.1
TOBAC	TOBACCO	13	0.1	6	0.1	13	0.1	6	0.1
WASTE	ENVIRONMENTAL CONTROL	41	0.4	41	0.4	38	0.4	38	0.4
WATER	WATER	166	1.5	164	1.5	162	1.7	162	1.8
POOL		11,214	100.0	10,973	100.0	9,302	100.0	9,057	100.0

Table 4.2 – Distribution of the various subsamples by Industrial classifications and the number of firms and % of total number of firms in each classification (Generated by DSRDS)

4.3.4. Definition of Variables

The definitions of these variables used for the statistical tests are:

Variable	Notation	Definition/source	DataStream Code
Book value of equity	BV_t	Ordinary share capital + Share premium account + Associate reserves (O/W) + Grants + Legal reserve + Profit & Loss account	301 303 398 261 649 399
(net) Operating assets	OA_t	Total Fixed Assets (net) + Total Intangibles + Total Associates Investments + Investment in Joint Ventures + Other Assets + Total Stocks & *WIP* + Total Debtors & Equivalent – Total Long-term Provisions – Total Current Provisions – Total Creditors & Equivalent – Other Current Liabilities - Total	339 344 355 919 359 364 370 314 383 385 379
Earnings	NI_t	Pre-tax Profit – Total Tax Charge + Minority interest Profits/Losses on Termination of Operation – Reorganisation/restructuring Costs + Profits/Losses on Sale of Fixed Assets + Other Special Gains/Losses	154 203 1086 1079 1080 1081 1082
Cost of capital	r	10%, 15% and 15%	
Residual income	RI_t	$RI_t = NI_t - r_E BV_{t-1}$	
Capital investment	CI_t	Net Payments for Intangibles + Net Payments for Fixed Assets + Net Payments – Subsidiaries, etc. + Equity issued for Acquisition + Preference issued for Acquisition + Loans issued for Acquisition + Payments – Associate Investments – Receipts – Associate Investments + Payments – Oth. Acquisitions/Disposals – Receipts – Oth. Acquisitions/Disposals	1029 1026 1037 414 453 416 1030 1031 1125 1126
Research & Development	RD_t	Research and Development	119
Distribution costs	DC_t	Distribution Costs, proxy for Advertising	130
Human Resource	HR_t	Wages & salaries + Other Employment Costs + Pension contributions + Profit sharing	113 116 114 115

Total Debt	TD_t	Borrowings Repayable < 1 Year + Short term loans + Leasing Finance & *HP* + Long term loans + Convertible Loans + Debentures + Preference capital	309 318 267 319 320 323 306
Ordinary Dividends	DIV_t	Ordinary share dividends	187
Market value of equity	MV_t	Ordinary share price X Number of shares issued at balance sheet date, $P_t X NS_t$	

Table 4.3 – Definition of Variables, Notation and DataStream Codes

The variables can be depicted in the diagrams below:

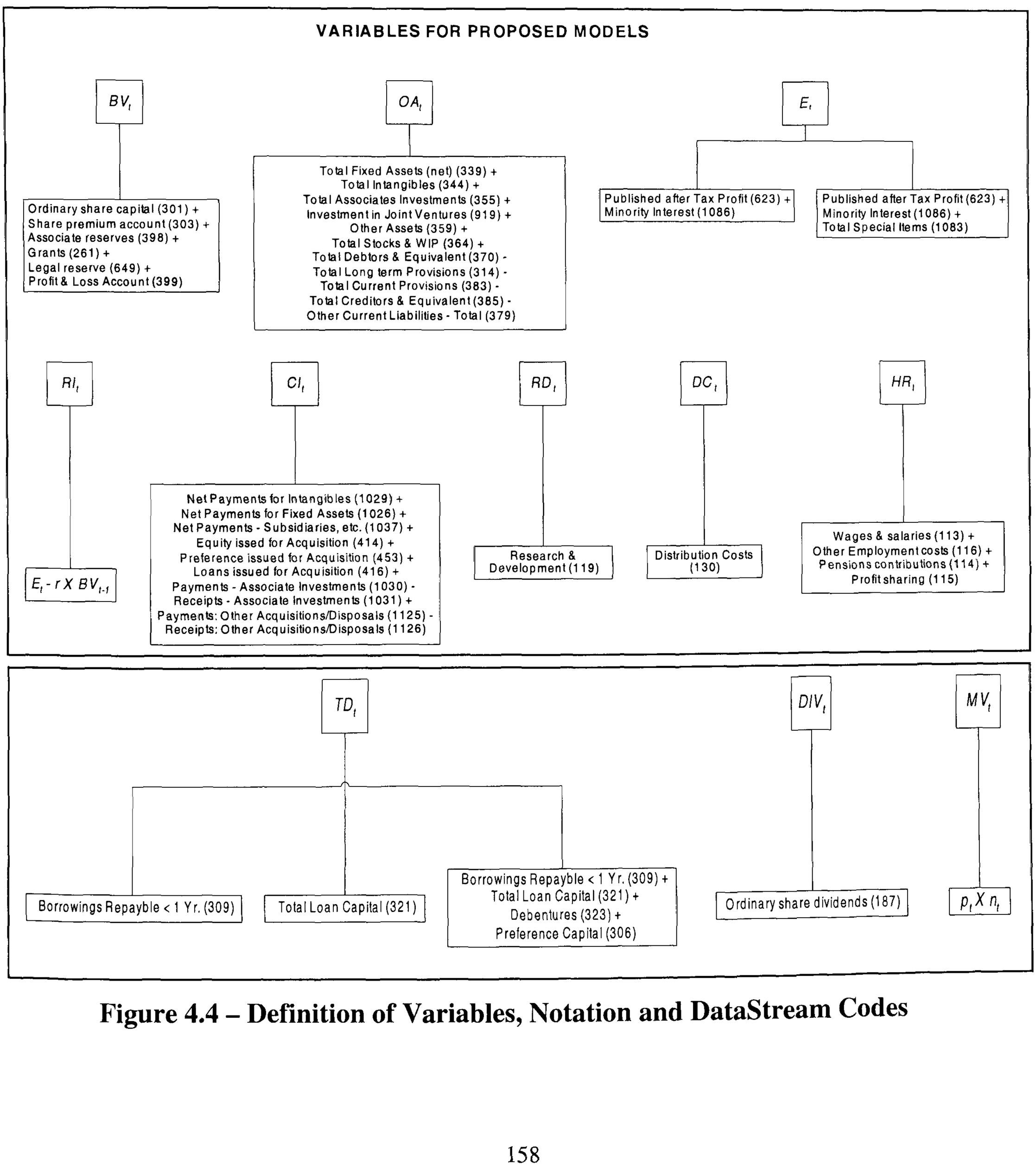


Figure 4.4 – Definition of Variables, Notation and DataStream Codes

4.4. Summary and Conclusions

The focus on these reviews and analyses is based on the belief that the relative merits of fundamental valuation-based framework using accounting book values and non-earnings data in equity valuation and the role of residual income (*RI*) as a topic of central importance that (1) aids in understanding of the determinants of value which facilitates investment decisions and valuation; and (2) for the design of reporting system which aim to satisfy the information needs of investors. To evaluate the expectations formulated, the variables contained in the *RI* dynamics and the valuation models are tested using cross-sectional and pooling estimations techniques. For cross-sectional tests, scale/heteroscedasticity are vital issues, and hence, the variables are scaled, after which the White's consistent standard error test and residual analysis are used to mitigate scale/heteroscedasticity in equations. The tests to be conducted are robust with varying specifications so as to examine the sensitivity of the results to alternative specifications.

Sample data used for this research consists of all nonfinancial firms listed on the LSE extracted from DataStream 2002. The measurement of these variables is strictly based on GAAP and the definition of DataStream. To speed up data processing and for a more efficient way to estimate the models, a large part of the extraction, processing, and generation of information necessary for the empirical analysis is automated through the use of a series of self-written computer programs, called the DSRDS, DSSAS and EVAS.

The contribution of this research is to provide UK evidence on both the usefulness of a range of accounting data as predictors of future residual income and their usefulness as explanatory variables for security prices. Secondary contributions should come from the benefits of the use of automation software to assist in the empirical investigations of the chosen variables and models, to conduct various statistical and econometric tests to establish an appropriate sample and model for cross-sectional and pool estimations, whether differential cost of capital and the inclusion of an intercept in regressions affect cross-sectional and pool estimations.

RESULTS AND ANALYSES: RESIDUAL INCOME INFORMATION DYNAMICS

5

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CHAPTER 5
RESULTS AND ANALYSES: RESIDUAL INCOME INFORMATION DYNAMICS

5.1. Introduction and Background

The main aim of this chapter is to conduct tests to estimate a prediction model, identifying which of these non-earnings accounting variables (comprehensive set of variables, CSV) are significant in the prediction model and which variables are relevant for valuing the equity of the firms. The non-earnings variables considered are based on previous studies which suggest that these variables might be relevant in predicting future financial performance of firms in the form of residual income. The empirical test for this study is done in two steps. Firstly, past and current residual income (*RI*) and other accounting variables are used to estimate a cross-sectional (pool) prediction model for future residual income. Secondly, *RI* valuable variables identified in the information dynamics are then used as fundamental variables to explain market value of equity. The approach taken here is consistent with the OFF in which variables that are able to predict expected *RI* are also value-relevant in determining a firm's value. Tests to determine the value-relevant of the selected variables and the appropriate specification of the proposed valuation model will be covered in the next chapter. As many of the equations for this study are to be estimated cross-sectionally, techniques used to investigate the effect of scale and heteroscedasticity on regressions play an important role for this research.

The secondary aim of this chapter is to conduct various statistical and econometric tests to establish an appropriate sample and model for cross-sectional and pool estimations, whether differential cost of capital, the inclusion of an intercept in regressions and deflation affect statistical results, and if multicollinearity and parameter stability are issues in the samples.

This research extends previous studies by using a different modelling and estimating techniques and dataset, Using a large dataset of firms on the London Stock Exchange over 12 years from 1990 to 2001, this study investigates the pool and cross-sectional properties of accounting data consisting of *RI*, book values, and a comprehensive set of non-earnings accounting variables. To speed up processing, ensure data integrity and

to facilitate the accurate generation of output, all tests and result analysis are carried out using self-written customized computer programs, supplemented by database, spreadsheet and econometric package. The contribution of this research is to provide UK evidence on both the usefulness of a range of accounting data (non-earnings) as (1) predictors of future residual income and (2) their usefulness as explanatory variables in valuing the value of firms. The empirical study for (1) will be carried out in this chapter while the corresponding empirical study for (2) will be conducted in the next chapter.

The OFF attracts considerable interest in CMRA. The OFF is based on a set of linear information dynamics that lead to a closed-form valuation model. Thus, the coefficients of the valuation model are functions of the underlying parameters of the LID. In theory, the parameters in the LID vary across firms, and therefore, the coefficients in the valuation model should reflect this variation. Dechow et al. (1999) criticize researchers of the OFF that ignore the information dynamics because their models is purely a transformation of the DDM with no reference to book value or residual income. However, only five papers test for the relationship between empirically estimated linear information models and estimated equity valuation models and all of these studies are carried out in the US. Stober (1996) uses Feltham and Ohlson (1995) to test for the time-series properties of the LID and reports most estimates of the persistence parameter, ω_{11} lie between 0 and 1, which is within the plausible bounds set by FO (1995)[1]. The median for both is approximately 0.4. The results of the estimates of the growth parameter, ω_{22} show that more than half of these estimates are < 1.0, the theoretical lower bound of the LID in FO (1995), indicates that the parameters estimated are not consistent with the theoretical assumption of the LID in FO (1995). Almost 75% of the estimated parameter, ω_{12} representing either unbiased ($\omega_{12} = 0$) or conservative ($\omega_{12} > 0$) are < 0, which are largely inconsistent to the theory of the LID in FO (1995).

In Dechow et al. (1999), the AR(1) coefficients for LID1 and LID2 are within the range specified by Ohlson (1995) where ω and γ were estimated to be 0.62 and 0.32 respectively. They use analysts' forecasts as a proxy for other information, v_t in predicting future *RI* but their results show only modest improvements in explanatory power over past empirical researches using analysts' earnings forecasts using the traditional DDM.

[1] This section only provides the salient points of the relevant literature that used the OFF and extensive discussion of the literature are covered in Chapter 2.

Hand and Landsman (1999) include dividends in O (1995) and find that dividends help predict future *RI*, incremental to current and lagged *RI*, and it improves the explanatory power of their valuation models. Thus, they conclude that dividends should be able to predict cross-sectional variation in equity values over and above a dividend displacement role, in contrast to the assumption of O (1995); and FO (1995) where $\frac{dv}{dDIV} = 0$ and the M&M's dividend displacement theory.

Myers (1999) investigates unbiased accounting, conservatism, capital investments and other information using modified form of O (1995); FO (1995, 1996) independently. He uses order backlog to proxy for v_t since it is readily available, and argues that on average, order backlog should indicate increased *RI* in the following period, and thus, is value-relevant for valuation (p. 11). The median autoregressive parameter (ω_{11}) for O (1995), FO (1995) and FO (1996) are 0.234, 0.036 and 0.167 respectively, which supports the OFF. More than 60% of the conservative parameter (ω_{12}) is negatives for both FO (1995) and FO (1996). This indicates that the LID does not capture the effect of conservatism assumed by these two models. He finds most of ω_{13} (*capx)* are negatives and are statistically significant (median = –0.048). Myers hypothesizes *CI* captures the income effect of conservatism, hence, ω_{13} are expected to be negative but in the OFF, current investments have a positive net value, thus ω_{13} are expected to be positive. Finally, when order backlog is included to proxy for v_t, median ω_{11} declines from 0.036 to 0.013 for FO (1995) and ω_{12} continue to be negative, which lead him to conclude that order backlog is not a useful variable for v_t.

Ahmed et al. (2000) test conservatism and capital investment using the FO (1996) valuation model and the abnormal earnings linear dynamics (OED) derived in Myers (1999). The cross-sectional mean estimated parameter for abnormal operating earnings, ω_{11} is 0.467; operating assets, ω_{12} is –0.041; and capital investment, ω_{13} is –0.064. The signs and magnitudes of ω_{11} are consistent with prior empirical studies (Stober, 1996; Dechow et al., 1999; Myers, 1999) and the OFF. While the signs of ω_{12} (57% are negatives) are consistent with prior empirical studies, it is inconsistent with the theory of conservatism of the OFF. Similarly, ω_{13} is consistent with Myers (1999) but is inconsistent to the theory of capital expenditures of FO (1996).

Only three of these studies (Dechow, 1999; Hand and Landsman, 1999 and Myers, 1999) empirically test for the usefulness of other information in the LID. Ohlson (1998, 2001); Myers (1999); and Lo and Lys (2000a) comment that researchers investigating the OFF by excluding v_t would not only make the OFF restrictive, but also violates the internal consistency of the overall OFF because v_t is an integral part of the information dynamics that is expected to influence future *RI* and the *MV*. Thus, exclusion of v_t in the LID can be construed to be similar to the problem of omitting a relevant variable in a regression. Lo and Lys (2000a) suggest that empirical researchers that have omitted v_t in the past do so, either they (1) consider it to be unobservable; (2) could not find a good proxy for v_t since it is not defined; or/and (3) want to test competing models that do not have other information as one of its surrogates.

Clearly, order backlog fails to be of any use as a proxy for v_t, and the use of analysts' earnings forecasts as a proxy for v_t in predicting future *RI* show only modest improvements in explanatory power over past empirical researches using analysts' forecasts using the DDM. While Hand and Landsman report dividends provide strong signals of future profitability and cash flows to the market, their equations were unscaled; and when Lo and Lys (2000a) replicated the test of Hand and Landsman by using the same sample and by scaling their equations by opening market value of equity, the explanatory power reduced by more than half and the sign of the coefficient for dividends reversed. It appears that researchers use a single ad hoc proxy for v_t and this may be a limitating factor of their research, and the use of multiple measures using a comprehensive set of variables may be more appropriate in identifying performance measures that can predict future *RI*.

Out of these five empirical studies that have implemented the LID, only three of these (Dechow et al., 1999; Hand and Landsman, 1999; and Myers, 1999) have validly related the properties of the LID with that of the properties of the valuation model. Stober (1996) and Ahmed et al. (2000) merely incorporate the parameters estimated from the LID into an enlarged valuation-based model to test for the incremental effects of persistence and conservatism on the valuation model parameters. For Dechow et al. (1999), when ω and γ were fed into the parameters of the valuation model, the mean forecast error slightly decreased, as compared with competing models, suggesting that the coefficients of the valuation model are influenced by the underlying parameters of the LID. The coefficients of the valuation models of Hand and Landsman (1999) were fed by the parameters, ω and γ

estimated from the LID, and their result suggests that the coefficients for *BV, NI* and *DIV* for the VM are largely positives and statistically significant. However, this result should be viewed with caution since all the cross-sectional equations are unscaled (see Lo and Lys, 2000a). In Myers (1999), *V/P* = 0.411, 0.644 and 0.924 for O (1995), FO (1995) and FO (1996) respectively. This indicates that the value of the firm is close to the market value under FO (1996) only. For FO (1995), the median firm-specific valuation coefficients of bv_t and RI_t fed by the time-series LID are 0.909 and 0.033 respectively as compared with the estimated coefficients in the cross-sectional valuation model of 0.543 and 0.481. This indicates that the coefficients estimated from the LID do not provide the best estimates of firm price. For FO (1996), the median firm-specific valuation coefficients of bv_t, RI_t and $capx_t$ fed by the time-series LID are 0.798, 0.176 and –3.766 respectively as compared with the estimated coefficients in the cross-sectional valuation model of 0.975, 0.926 and 0.007. This indicates that the coefficients estimated from the LID do not provide the best estimates of firm price. Moreover, the parameters estimated from the LID are noisy as evidenced by the rather low R^2 of 0.335 (FO, 1996) and 0.392 under FO (1995).

A major issue identified in the literature on the OFF is the general lack of an established methodology used in formulating and estimating a model under the OFF. All researchers either select one of the OFF or test the different models independently. For example, Hand and Landsman (1999) and Dechow et al (1999) selected O (1995) while Myers tested O (1995); FO (1995, 1996) independently. So far, no researcher has attempted to integrate O (1995); FO (1995, 1996) as an integrated framework in investigating the LID and the valuation model. Stober, and Ahmed et al. use per share basis for both the LID and the VM while Dechow et al. use MV_{it} as the scalar for the LID and per share basis for the VM, Myers uses *MV* and *BV* as the scalar in his VM, and Hand and Landsman use undeflated equations for both the LID and VM. Easton (1998, p. 237) cautions researchers when interpreting results where studies were based on per share or EPS basis because scale has not been controlled for; as a result, such conclusion is based on all variables that have the same scale. While Stober, Myers and Ahmed et al. use time-series and cross-section estimations for their LID and VM respectively, Dechow et al., and Hand and Landsman use pool estimations for both the LID and VM.

Discussion and summary, except for the correct sign and magnitude of the persistent *RI* parameter with the OFF, the performance of the conservative, capital investment and other information parameters of the LID in the five literature reviewed are

disappointing. Two of these studies did not even operationalise the other information v_t, which suggests that the models specified violate the internal consistency of the OFF. All researchers that have included v_t in their models appear to use a single ad hoc variable to proxy for v_t, and this may be a limitation of their research, and the use of multiple measures may be more appropriate in identifying performance measures that can predict future *RI*. Out of these five studies that have implemented the LID, only three of these (Dechow et al., 1999; Hand and Landsman, 1999; and Myers, 1999) have validly related the properties of the LID with that of the properties of the valuation model. The result of Dechow et al. suggests that when ω and γ were fed into the parameters of the valuation model, the forecasting accuracy of the valuation model improves slightly over other competing models. In Myers (1999), the value of the firm is close to the market value under FO (1996) only. The valuation coefficients of bv_t, RI_t and $capx_t$ fed by the time-series LID of FO (1995, 1996) do not provide the best estimates of firm price, suggesting that the parameters estimated from the LID are not useful in valuing market value of equity. Moreover, the parameters estimated from the LID are noisy as evidenced by the low R^2 for both FO (1995) and FO (1996). While the estimated coefficients of the LID and valuation models of Hand and Landsman (1999) suggest that they are largely positives and statistically significant, however, the signs and magnitudes changed when Lo and Lys (2000a) replicated the test using the same sample and by scaling the equations, and hence, the result of Hand and Landsman should be viewed with caution. However, cross-sectional and pooling of time-series and cross-sectional data are increasingly being used to investigate the OFF. So far, all the testing for the relationship between the LID and VM are carried out in the US. Therefore, the main purpose of this chapter and the contribution of this research is motivated by OFF to examine the ability of a number of variables to predict *RI* and to consider their value relevance, using UK data.

The remainder of this chapter is organised as follows. **Section 2** describes the summary statistics and the correlation matrix for the samples. **Section 3** examines the results from regressing the main equations of the proposed LID. **Section 4** extends from the previous section in examining the impact of current and lagged *RD, HR* and *DC* expenditures on future *RI,* and to determine whether they can be validly used as proxies for intangibles in the RI model. **Section 5** investigates whether the inclusion of lagged *RD, HR* and *DC* instead of their current form with current *RI, OA, CI, TD* and *DIV* in the Prop-LID have an impact on one-year ahead *RI*. **Section 6** concludes.

5.2. Summary Statistics

This section examines the (1) descriptive statistics; and (2) correlation matrix among dependent and independent variables for the four samples over the period 1990-2001: (1) $BV > 0$; (2) $BV > 0$ after outliers; (3) $BV \geq$ £5 millions; and (4) $BV \geq$ £5 millions after outliers using (1) unscaled variables; and (2) scaled by closing *BV* and closing *MV*. The independent variables are made up of a comprehensive set of non-earnings accounting variables (CSV) for estimating a prediction model and a valuation model. The descriptive statistics enable us to determine the distribution of the observations, while the correlation matrix provides useful information about the relationship between variables in the samples.

As the amount of information generated from the descriptive statistics and correlation matrix among the four samples are voluminous, only the information generated from the sample where $BV \geq$ £5 millions is reported since it has the best results among the four samples. However, references to other samples will be made from time to time if necessary, eg for comparison purposes. For all samples, the median and mean for all variables are extremely far apart (especially *MV* and *OA* and a lesser extend, *RI*), with the exception of *BV* and *HR* with a median-to-mean ratio of less than 10 (Tables 5.1). In *RD*, the median is 0, indicates that there are many observations with 0 values. For all variables in all samples, the maximum and minimum are far apart while the standard deviations are far from 0. This clearly shows that the sample data will have a size (scale) problem. Thus, control for scale effect is a necessity when estimating the equations for the proposed models. The skewness for all variables in all samples is not close to 0 implying that the distribution is not quite symmetric. Most of the variables are positively skewed because most of the data are small with only a few data that are large. The Kurtosis (*k*) for all variables in all samples is substantially greater than 3, hence results in thicker than normal tails. The Jarque-Bera statistic (JB) of all variables in all samples is substantially large [ranging from 0.6 millions for *OA* and *HR* ($BV \geq$ £5 millions after outliers) to 22,500 millions for *CI* ($BV > 0$)], which is substantially > the critical value of chi-square distribution at the 5% level of significance ($\chi^2_{0.05}$) of 43.77, suggesting the presence of outliers. For instance, a few observations for *OA* are far away from the rest. On the whole, the distributions for all the variables in all samples have little inclination to normality.

Table 5.1 - Descriptive Statistics (top) and Correlation Matrix of Undeflated Variables for Pool Sample where $BV \geq$ £5 Millions

Statistics	$RI_{t+1}(10\%)$	$RI_t(10\%)$	$RI_{t+1}(15\%)$	$RI_t(15\%)$	$RI_{t+1}(20\%)$	$RI_t(20\%)$	BV_t	MV_t	OA_t	CI_t	RD_t	HR_t	DC_t	TD_t	DIV_t
Mean*	16.8	17.9	5.5	7.9	-5.8	-2.2	227.0	692.0	387.0	47.0	7.3	104.0	37.9	169.0	22.5
Median*	1.2	1.3	-0.1	0.1	-1.3	-0.9	30.7	65.7	41.0	2.9	0.0	16.1	0.1	12.7	1.7
Maximum*	5,340.0	3,010.0	4,120.0	2,760.0	4,010.0	2,510.0	42,800.0	121,000.0	149,000.0	44,200.0	1,810.0	5,200.0	7,740.0	11,400.0	5,810.0
Minimum*	-13,300.0	-1,410.0	-15,400.0	-2,560.0	-17,600.0	-3,700.0	4.9	0.0	-20,100.0	-3,820.0	0.0	0.0	0.0	0.0	0.0
Std. Dev.*	213.0	132.0	220.0	123.0	237.0	124.0	914.0	3,420.0	2,110.0	517.0	59.7	312.0	274.0	636.0	119.0
Jarque-Bera*	1,160.0	8.4	2,700.0	10.4	4,220.0	15.0	191.0	55.5	2,740.0	12,900.0	29.6	2.4	53.9	3.4	216.0
Skewness	-21.2	9.3	-34.4	7.4	-43.4	2.4	20.3	16.1	39.8	68.5	14.9	7.4	17.3	8.4	20.8
Kurtosis	1,733.1	149.4	2,639.5	165.9	3,301.6	199.8	703.4	380.2	2,662.7	5,771.1	277.6	79.7	374.2	94.8	747.5
Observations	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302

Variables	$RI_{t+1}(10\%)$	$RI_t(10\%)$	$RI_{t+1}(15\%)$	$RI_t(15\%)$	$RI_{t+1}(20\%)$	$RI_t(20\%)$	BV_t	MV_t	OA_t	CI_t	RD_t	HR_t	DC_t	TD_t	DIV_t
$RI_{t+1}(10\%)$	1	0.480	0.978	0.427	0.923	0.336	-0.060	0.282	-0.261	-0.482	0.304	0.313	0.345	0.225	0.394
$RI_t(10\%)$	0.480	1	0.366	0.963	0.250	0.846	0.472	0.655	0.343	0.190	0.430	0.523	0.498	0.451	0.614
$RI_{t+1}(15\%)$	0.978	0.366	1	0.353	0.983	0.310	-0.265	0.116	-0.415	-0.595	0.224	0.163	0.265	0.085	0.256
$RI_t(15\%)$	0.427	0.963	0.353	1	0.273	0.958	0.288	0.514	0.232	0.141	0.351	0.341	0.433	0.293	0.468
$RI_{t+1}(20\%)$	0.923	0.250	0.983	0.273	1	0.275	-0.439	-0.038	-0.539	-0.674	0.144	0.022	0.183	-0.044	0.123
$RI_t(20\%)$	0.336	0.846	0.310	0.958	0.275	1	0.069	0.321	0.095	0.077	0.239	0.118	0.330	0.100	0.274
BV_t	-0.060	0.472	-0.265	0.288	-0.439	0.069	1	0.756	0.788	0.625	0.335	0.673	0.328	0.639	0.600
MV_t	0.282	0.655	0.116	0.514	-0.038	0.321	0.756	1	0.677	0.451	0.540	0.622	0.449	0.635	0.737
OA_t	-0.261	0.343	-0.415	0.232	-0.539	0.095	0.788	0.677	1	0.799	0.234	0.440	0.327	0.610	0.446
CI_t	-0.482	0.190	-0.595	0.141	-0.674	0.077	0.625	0.451	0.799	1	0.151	0.238	0.135	0.305	0.228
RD_t	0.304	0.430	0.224	0.351	0.144	0.239	0.335	0.540	0.234	0.151	1	0.591	0.421	0.321	0.481
HR_t	0.313	0.523	0.163	0.341	0.022	0.118	0.673	0.622	0.440	0.238	0.591	1	0.562	0.658	0.654
DC_t	0.345	0.498	0.265	0.433	0.183	0.330	0.328	0.449	0.327	0.135	0.421	0.562	1	0.377	0.533
TD_t	0.225	0.451	0.085	0.293	-0.044	0.100	0.639	0.635	0.610	0.305	0.321	0.658	0.377	1	0.594
DIV_t	0.394	0.614	0.256	0.468	0.123	0.274	0.600	0.737	0.446	0.228	0.481	0.654	0.533	0.594	1

Data for the sample of UK firms is from 1 April 1991 to 31 March 2001 (1991-1999). Variable definitions are per **Table 4.3.**

*The mean, median, maximum, minimum, standard deviations and Jarque-Bera statistics are in million of pounds.

$RI_{t+1}(10\%)$, $RI_{t+1}(15\%)$, $RI_{t+1}(20\%)$ and $RI_t(10\%)$, $RI_t(15\%)$ and $RI_t(20\%)$ are the one-period ahead Residual Income (RI) and current RI based on a cost of capital of 10%, 15% and 20% respectively.

Table 5.2a - Descriptive Statistics (top) and Correlation Matrix of Variables deflated by BV_t for Pool Sample where $BV \geq$ £5 Millions

Statistics	$RI_{t+1}(10\%)$	$RI_t(10\%)$	$RI_{t+1}(15\%)$	$RI_t(15\%)$	$RI_{t+1}(20\%)$	$RI_t(20\%)$	OA_t/BV_t	CI_t/BV_t	RD_t/BV_t	HR_t/BV_t	DC_t/BV_t	TD_t/BV_t	DIV_t/BV_t
Mean	0.028	0.020	-0.021	-0.025	-0.071	-0.070	1.679	0.216	0.026	0.757	0.202	0.742	0.074
Median	0.046	0.049	-0.004	0.006	-0.054	-0.036	1.319	0.114	0.000	0.550	0.008	0.408	0.057
Maximum	36.194	7.387	36.144	7.867	36.094	8.346	101.078	24.028	3.499	48.825	20.618	98.807	3.037
Minimum	-12.336	-11.650	-12.386	-12.233	-12.436	-12.817	-5.654	-19.088	0.000	0.000	0.000	0.000	0.000
Std. Dev.	0.562	0.413	0.562	0.427	0.562	0.445	2.260	0.706	0.105	1.073	0.501	1.870	0.115
Jarque-Bera*	1,420.0	17.2	1,410.0	16.8	1,410.0	15.9	104.0	52.9	37.8	88.6	70.8	370.0	10.5
Skewness	25.844	-8.573	25.830	-8.503	25.811	-8.341	16.301	8.186	13.461	14.057	14.622	23.882	10.197
Kurtosis	1,914.185	213.267	1,912.868	210.200	1,911.119	204.564	519.654	372.049	313.985	480.376	429.434	979.019	166.662
Observations	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302	9,302

Variables	$RI_{t+1}(10\%)$	$RI_t(10\%)$	$RI_{t+1}(15\%)$	$RI_t(15\%)$	$RI_{t+1}(20\%)$	$RI_t(20\%)$	OA_t/BV_t	CI_t/BV_t	RD_t/BV_t	HR_t/BV_t	DC_t/BV_t	TD_t/BV_t	DIV_t/BV_t
$RI_{t+1}(10\%)$	1	0.196	1.000	0.174	1.000	0.153	0.077	0.179	0.006	0.066	0.001	0.067	0.379
RI_t (10%)	0.196	1	0.196	0.996	0.196	0.984	-0.165	0.105	-0.080	0.028	0.010	-0.192	0.256
$RI_{t+1}(15\%)$	1.000	0.196	1	0.174	1.000	0.153	0.077	0.179	0.006	0.066	0.001	0.067	0.379
RI_t (15%)	0.174	0.996	0.174	1	0.174	0.996	-0.177	0.110	-0.091	0.014	0.006	-0.206	0.219
$RI_{t+1}(20\%)$	1.000	0.196	1.000	0.174	1	0.153	0.077	0.179	0.006	0.066	0.001	0.067	0.379
RI_t (20%)	0.153	0.984	0.153	0.996	0.153	1	-0.186	0.114	-0.099	0.001	0.003	-0.218	0.183
OA_t/BV_t	0.077	-0.165	0.077	-0.177	0.077	-0.186	1	0.183	0.056	0.283	0.270	0.841	0.308
CI_t/BV_t	0.179	0.105	0.179	0.110	0.179	0.114	0.183	1	0.072	0.111	0.081	0.175	0.131
RD_t/BV_t	0.006	-0.080	0.006	-0.091	0.006	-0.099	0.056	0.072	1	0.200	0.184	0.106	0.158
HR_t/BV_t	0.066	0.028	0.066	0.014	0.066	0.001	0.283	0.111	0.200	1	0.479	0.371	0.306
DC_t/BV_t	0.001	0.010	0.001	0.006	0.001	0.003	0.270	0.081	0.184	0.479	1	0.311	0.267
TD_t/BV_t	0.067	-0.192	0.067	-0.206	0.067	-0.218	0.841	0.175	0.106	0.371	0.311	1	0.284
DIV_t/BV_t	0.379	0.256	0.379	0.219	0.379	0.183	0.308	0.131	0.158	0.306	0.267	0.284	1

Data for the sample of UK firms is from 1 April 1991 to 31 March 2001 (1991-1999). Variable definitions are per **Table 4.3.**

*The Jarque-Bera statistics are in million of pounds.

$RI_{t+1}(10\%)$, $RI_{t+1}(15\%)$, $RI_{t+1}(20\%)$ and $RI_t(10\%)$, $RI_t(15\%)$ *and* $RI_t(20\%)$ are the one-period ahead Residual Income (RI) and currentRI deflated by BV_t based on a cost of capital of 10%, 15% and 20% respectively.

Table 5.2b - Descriptive Statistics (top) and Correlation Matrix of Variables deflated by MV_t for Pool Sample where $BV \geq$ £5 Millions

Statistics	$I_{t+1}(10\%)$[1]	RI_t (10%)	$RI_{t+1}(15\%)$	RI_t (15%)	$RI_{t+1}(20\%)$	RI_t (20%)	OA_t/MV_t	CI_t/MV_t	RD_t/MV_t	HR_t/MV_t	DC_t/MV_t	TD_t/MV_t	DIV_t/MV_t
Mean	-0.030	-0.030	-0.071	-0.067	-0.111	-0.104	1.345	0.124	0.009	0.491	0.123	0.580	0.038
Median	0.024	0.025	-0.002	0.003	-0.030	-0.020	0.738	0.055	0.000	0.264	0.003	0.218	0.030
Maximum	6.411	8.294	6.335	8.294	6.259	8.294	130.122	31.921	0.885	40.271	8.810	102.939	4.014
Minimum	-21.410	-49.176	-23.490	-53.479	-25.571	-57.783	-1.610	-17.128	0.000	0.000	0.000	0.000	0.000
Std. Dev.	0.487	0.657	0.503	0.704	0.533	0.758	3.784	0.678	0.033	1.009	0.318	2.417	0.092
Jarque-Bera*	251.0	4,560.0	354.0	5,120.0	401.0	5,230.0	128.0	272.0	8.6	110.0	7.6	230.0	212.0
Skewness	-20.323	-47.791	-24.144	-50.152	-25.473	-50.693	21.113	20.728	9.541	17.331	8.644	24.431	23.952
Kurtosis	807.060	3,436.878	958.495	3,639.461	1,020.067	3,680.411	576.681	841.165	151.010	535.578	142.540	772.900	741.509
Observations	9,277	9,277	9,277	9,277	9,277	9,277	9,277	9,277	9,277	9,277	9,277	9,277	9,277

Variables	$I_{t+1}(10\%)1$	RI_t (10%)	$RI_{t+1}(15\%)$	RI_t (15%)	$RI_{t+1}(20\%)$	RI_t (20%)	OA_t/MV_t	CI_t/MV_t	RD_t/MV_t	HR_t/MV_t	DC_t/MV_t	TD_t/MV_t	DIV_t/MV_t
RI_{t+1}(10%)	1	0.628	0.985	0.627	0.945	0.619	-0.092	0.113	-0.022	0.067	-0.027	-0.102	0.252
RI_t (10%)	0.628	1	0.627	0.994	0.609	0.979	-0.171	0.109	-0.024	0.028	-0.025	-0.246	0.220
RI_{t+1}(15%)	0.985	0.627	1	0.643	0.987	0.650	-0.246	-0.009	-0.040	-0.058	-0.080	-0.240	0.118
RI_t (15%)	0.627	0.994	0.643	1	0.640	0.995	-0.259	0.050	-0.036	-0.041	-0.052	-0.321	0.136
RI_{t+1}(20%)	0.945	0.609	0.987	0.640	1	0.661	-0.380	-0.120	-0.056	-0.170	-0.126	-0.360	-0.009
RI_t (20%)	0.619	0.979	0.650	0.995	0.661	1	-0.332	-0.002	-0.045	-0.100	-0.076	-0.382	0.062
OA_t/MV_t	-0.092	-0.171	-0.246	-0.259	-0.380	-0.332	1	0.663	0.090	0.646	0.212	0.894	0.712
CI_t/MV_t	0.113	0.109	-0.009	0.050	-0.120	-0.002	0.663	1	0.072	0.522	0.201	0.662	0.557
RD_t/MV_t	-0.022	-0.024	-0.040	-0.036	-0.056	-0.045	0.090	0.072	1	0.149	0.025	0.073	0.092
HR_t/MV_t	0.067	0.028	-0.058	-0.041	-0.170	-0.100	0.646	0.522	0.149	1	0.396	0.619	0.509
DC_t/MV_t	-0.027	-0.025	-0.080	-0.052	-0.126	-0.076	0.212	0.201	0.025	0.396	1	0.191	0.156
TD_t/MV_t	-0.102	-0.246	-0.240	-0.321	-0.360	-0.382	0.894	0.662	0.073	0.619	0.191	1	0.616
DIV_t/MV_t	0.252	0.220	0.118	0.136	-0.009	0.062	0.712	0.557	0.092	0.509	0.156	0.616	1

Data for the sample of UK firms is from 1 April 1991 to 31 March 2001 (1991-1999). Variable definitions are per **Table 4.3.**

*The Jarque-Bera statistics are in million of pounds.

$RI_{t+1}(10\%)$, $RI_{t+1}(15\%)$, $RI_{t+1}(20\%)$ and $RI_t(10\%)$, $RI_t(15\%)$ *and* $RI_t(20\%)$ are the one-period ahead Residual Income (RI) and current RI deflated by MV_t based on a cost of capital of 10%, 15% and 20% respectively.

To determine the likelihood of multicollinearity among independent variables in a multiple regression, Anderson (1997) suggests that a variable can be classified in terms of their correlation between another variable. He argues that as long as the variables are not highly correlated (ie does not exceed 85%), multicollinearity is not too serious a problem in the regression (p. 46). A correlation between two variables of less than 40% is considered low correlation. The correlation among the undeflated independent variables and the deflators for the sample where $BV \geq$ £5 millions are presented in Table 5.3a.

Variables	Highly correlated > 0.85	Moderately correlated 0.4 ≤ 0.85	Lowly correlated < 0.4
RI (10%)		*BV, MV, RD, HR, DC, TD, DIV*	*OA, CI*
RI (15%)		*CI, MV, DC, DIV*	*BV, OA, RD, HR, TD*
RI (20%)			*BV, MV, OA, CI, RD, HR, DC, TD, DIV*
BV		*RI(10%), MV, OA, CI, HR, TD, DIV*	*RI(15%), RI(20%), RD, DC*
MV		*RI(10%), RI(15%), MV, OA, CI, RD, HR, DC, TD, DIV*	*RI(20%)*
OA		*BV, MV, CI, HR, TD, DIV*	*RI(10%), RI(15%), RI(20%), RD, DC*
CI		*BV, MV, OA*	*RI(10%), RI(15%), RI(20%), RD, HR, DC, TD, DIV*
RD		*RI(10%), MV, HR, DC, DIV*	*RI(15%), RI(20%), BV, OA, CI, TD*
HR		*RI(10%), BV, MV, OA, RD, DC, TD, DIV*	*RI(15%), RI(20%), CI*
DC		*RI(10%), RI(15%), MV, RD, HR, DIV*	*RI(20%), BV, OA, CI, TD*
TD		*RI(10%), BV, MV, OA, HR, DIV*	*RI(15%), RI(20%), CI, RD, DC*
DIV		*RI(10%), RI(15%), BV, MV, OA, RD, HR, DC, TD*	*RI(20%), CI*

Table 5.3a – Analysis of the Correlation Matrix among undeflated independent variables and the deflators, *BV* and *MV* for the Pool Sample where $BV \geq$ £5 millions

The analysis indicates that all of the independent variables have a low-to-medium correlation between them with no variable that is highly correlated with another variable. The evidence shows that multicollinearity in the regression may not be a serious concern. Analysis of the correlation matrix for samples after outliers reveal that three variables (*OA* with *BV, TD*) are highly correlated, with *BV, HR* and *TD* having > 0.7 correlation between another variable, and some variables are negatively correlated. This indicates that multicollinearity in the regression may be a serious concern for samples without outliers. Since both samples without outliers exhibit similar pattern of correlation between variables, only the sample where $BV > 0$ after outliers is presented (Table 5.3b).

Variables	Highly correlated > 0.85	Moderately correlated 0.4 ≤ 0.85	Lowly correlated < 0.4
RI (10%)		*BV, MV, OA, HR, DIV*	*CI, RD, DC, TD*
RI (15%)			*BV, MV, OA, CI, RD, HR, DC, TD, DIV*
RI (20%)			*-BV, MV, -OA, -CI, RD, -HR, -DC, -TD, DIV*
BV	*OA*	*RI(10%), MV, CI, HR, TD, DIV*	*RI(15%), -RI(20%), RD, DC*
MV		*RI(10%), RI(15%), MV, OA, CI, RD, HR, DC, TD, DIV*	*RI(20%), DC*
OA	*BV, TD*	*RI(10%), MV, CI, HR, DIV*	*RI(15%), -RI(20%), RD, DC*
CI		*BV, MV, OA*	*RI(10%), RI(15%), -RI(20%), RD, HR, DC, TD, DIV*
RD		*MV, HR,*	*RI(10%), RI(15%), RI(20%), BV, OA, CI, DC, TD, DIV*
HR		*RI(10%), BV, MV, OA, RD, DC, TD, DIV*	*RI(15%), -RI(20%), CI*
DC		*HR*	*RI(10%), RI(15%), -RI(20%), BV, MV, OA, CI, RD, TD, DIV*
TD	*OA*	*BV, MV, HR, DIV*	*RI(10%), RI(15%), -RI(20%), CI, RD, DC,*
DIV		*BV, MV, OA, HR, TD*	*RI(15%), RI(20%), CI, RD, DC*

Table 5.3b – Analysis of the Correlation Matrix among undeflated independent variables and the deflators, *BV* and *MV* for the Pool Sample where *BV* > 0 after Outliers

It would be interesting to investigate the correlation matrix for the scaled variables. While it is obvious that the descriptive statistics for the deflated variables have less deviations, skewness and the distribution is more symmetric, *RI(10%), RI(15%)* and *RI(20%)* are now negatively correlated with other independent deflated variables, and the low correlation among many deflated variables, particularly for the samples where *BV* ≥ £5 millions (Tables 5.4a-b).

Variables	Highly correlated > 0.85	Moderately correlated 0.4 ≤ 0.85	Lowly correlated < 0.4
RI (10%)			*-OA, CI, -RD, HR, DC, -TD, DIV*
RI (15%)			*-OA, -RD, CI, HR, DC, -TD, DIV*
RI (20%)			*-OA, CI, -RD, HR, DC, -TD, DIV*
OA		*TD*	*-RI(10%), -RI(15%), -RI(20%), CI, RD, HR, DC, DIV*
CI			*RI(10%), RI(15%), RI(20%), OA, RD, HR, DC, TD, DIV*
RD			*-RI(10%), -RI(15%), -RI(20%), OA, CI, HR, DC, TD, DIV*
HR		*DC*	*RI(10%), RI(15%), RI(20%), OA, CI, RD, TD, DIV*
DC		*HR*	*RI(10%), RI(15%), RI(20%), OA, RD, CI, TD, DIV*
TD		*OA*	*-RI(10%), -RI(15%), -RI(20%), CI, RD, HR, DC, DIV*

DIV			*RI(10%), RI(15%), RI(20%), OA, RD, HR, CI, DC, TD*

Table 5.4a – Analysis of the Correlation Matrix among independent variables deflated by *BV* for the Pool Sample where *BV* ≥ £5 millions

The variables deflated by *BV* in Table 5.4a is impressive as only four variables are moderately correlated with another variable (ie *OA* with *TD* and *HR* with *DC*) and none of the variable falls under the highly correlated category. However, the correlation between *OA* and *TD* may be a concern in regression as their correlation is rather high (0.841).

Variables	Highly correlated > 0.85	Moderately correlated 0.4 ≤ 0.85	Lowly correlated < 0.4
RI (10%)			*-OA, CI, -RD, HR, -DC, -TD, DIV*
RI (15%)			*-OA, CI, -RD, -HR, -DC, -TD, DIV*
RI (20%)			*-OA, -CI, -RD, -HR, -DC, -TD, DIV*
OA	*TD*	*CI, HR, DIV*	*-RI(10%), -RI(15%), -RI(20%), RD, DC*
CI		*OA, HR, TD, DIV*	*RI(10%), RI(15%), RI(20%), RD, DC*
RD			*-RI(10%), -RI(15%), -RI(20%), OA, CI, HR, DC, TD, DIV*
HR		*OA, CI, TD, DIV*	*RI(10%), RI(15%), RI(20%), RD, DC*
DC			*-RI(10%), -RI(15%), -RI(20%), OA, CI, RD, HR TD, DIV*
TD	*OA*	*CI, HR, DIV*	*-RI(10%), -RI(15%), -RI(20%), RD, DC*
DIV		*OA, CI, HR, TD*	*RI(10%), RI(15%), RI(20%), RD, DC*

Table 5.4b – Analysis of the Correlation Matrix among Independent variables deflated by *MV* for the Pool Sample where *BV* ≥ £5 millions

In Table 5.4b, variables deflated by *MV* have higher correlation with another variable than those deflated by *BV* because the former have more variables that are in the 'moderately correlated' and 'highly correlated' categories than the latter. In particular, the correlation between *OA/MV* and *TD/MV* is a concern in regression as their correlation is high (0.894). Analysis of the correlation matrix also reveals that the signs of the correlation of some variables reverse when different deflators are used (eg *HR* is positively correlated with *RI(15%)* when deflated by *BV* but becomes negatively correlated with *RI(15%)* when deflated by *MV*). This suggests that the correlation of the selected variables between another variable is affected by the deflator. Overall, the main finding suggests that correlation among deflated variables are much lower than undeflated variables, particularly for variables deflated by *BV* as no variable is highly correlated with another, and only *OA* and *TD* are (slightly) highly correlated when the variables are deflated by *MV*, suggesting that as a whole, multicollinearity in the regression is not a serious concern. Thus, the

statistical evidence here indicates that the selection process for the comprehensive set of variables to be included in the proposed models is justified.

Discussion and summary, this section examines the descriptive statistics and correlation matrix among the dependent variable and independent variables (*BV, RI, OA, CI, RD, HR, DC, TD & DIV*) used in the RI prediction model and the valuation model. For all samples for the undeflated variables, the median and mean, maximum and minimum for all variables are extremely far apart, and standard deviations are far from 0. As expected, the descriptive statistics for the deflated variables have less deviations, the skewness for all the deflated variables in all samples is not close to 0 implying that the distribution is not quite symmetric, and the Kurtosis (k) for all the deflated variables in all samples have thicker than normal tails, suggesting that the distributions for the deflated samples have little inclination to normality. Nevertheless, the evidence shows that the undeflated data will have a size (scale) problem, and therefore, the control for scale effect is a necessity when estimating the equations for the proposed LID and the MV models.

Analysis of the correlation matrix indicates that all of the independent undeflated variables have a low-to-medium correlation between them with no variable that is highly correlated with another variable. While the deflated variables have better (lower) correlation between variables than the undeflated variables, the correlation of *OA* and *TD* becomes highly correlated when deflated by *MV*. The correlation of *RI(10%), RI(15%)* and *RI(20%)* with another variable is not consistent in terms of magnitude of the correlation and signs, suggesting that the use of different cost of capital may affect the regression equations. Evidence from both the descriptive statistics and the correlation matrix indicates that samples after omitting outliers have a higher inclination to non-normality, higher scale problem, and more variables that are highly-correlated (*OA* and *BV, OA and TD, BV* and *TD*). The correlation matrix for all samples shows that multicollinearity in the regression may not be a serious concern, though *OA/MV* and *TD/MV* is slightly highly correlated (0.894), all other independent variables (*RI, CI, RD, HR, DC, DIV*) have low-medium correlation between them. Thought not every sample is reported, statistically, sample ≥ £5 millions without omitting outliers for variables scaled by *BV* have lower correlation among the variables. Since the variables deflated by *BV* and *MV* have lower deviations, have more normal distribution and lower correlation among the variables, the evidence strongly suggests that *BV* and *MV* can be used as the scalars for the selected variables.

5.3. Analysis of the Results from Estimating the Main Regression Equations

The main estimating equations for the proposed linear information dynamic models, ie RModel 1 to 8 of **Prop-LID** are estimated based on different criteria using OLS. RModel 1 to 8 are run with an intercept on (1) undeflated equations; (2) equations deflated by closing book values **(EDBV)**; and (3) equations deflated by closing market value of equity **(EDMV)**, in which (2) and (3) include an inverse of size term. While the inclusion of an intercept in undeflated equations is aimed to capture the likelihood of an omitted relevant independent variable, the intercept and the inverse of size terms in deflated equations are to capture the likelihood of an omitted relevant scaled and unscaled variables respectively (see Green et al., 1996, p. 200). For robustness purpose, the next section empirically tests for equations without an intercept. Each regression is run on three different costs of capital rates of 10%, 15% and 20%. Since discount rates are notoriously difficult to estimate (Kothari, 2001, p. 180), particularly with respect to the magnitude of the market risk premium (see Mehra and Prescott, 1985; and Siegel and Thaler, 1997) and substituting a firm-specific discount rate is unlikely to make a big difference in RIVM (see Fama and French, 1998; and Beaver, 1999), running the regressions on three different sets of cost of capital for this research provides a more robust test for the estimating equations.

Since book values (*BV*) is used as a deflator, it is essential that *BV* should not be negative as the signs of the estimated coefficients will be influenced by the sign of the deflator. To this effect, researchers have either use non-negative book values (eg Barth and Kallapur, 1996) or a pre-determined minimum quantum, eg book values with a minimum sum of £5 millions and above (eg Green et al., 1996; and Stark and Thomas, 1998). The approach used by Green et al. (1996); and Stark and Thomas (1998) is in a way similar to omitting outliers. Since there is no way to justify which approach is better, this study use samples with no-negative book values as well as $BV \geq$ £5 millions to determine whether or not, there is any significant difference between these two criteria.

Many researchers in the past have also omitted outliers in an effort to reduce large variations in sample size and the scale effects. For example, Green et al., (1996); Rees (1997) deduct the top and bottom 0.5% of observations in his cross-sectional tests, while Collins et al. (1997) deleted the top and bottom 2% as outliers. Hand and Landsman (1999) use a different approach in which they minimize the effects of reporting errors in market

value and cash flow data by setting observations to missing that were in their extreme top and bottom one percentile. As there is no consensus on the most appropriate method use in respect to the deletion of outliers, this study uses sample without the omission of outliers as well as sample that omit at most 0.5% of the top and bottom observations. The estimations are first carried out by regressing cross-sectionally for each of the sample years, ie 1991 to 1999 (9 annual cross-sections). The data is then pooled over the entire sample periods to be estimated on a panel series. All regressions including the generation of output and statistical analysis are done automatically by specially self-written computer programs. The estimation basis and the numbers of regression runs are summarized as follows:

#	Basis	Estimation Type	Type *X* Equations *X* Years	Total
1	$BV > 0$	Annual cross-section (r = 10%)	3 X 8 X 9	216
		Annual cross-section (r = 15%)	3 X 8 X 9	216
		Annual cross-section (r = 20%)	3 X 8 X 9	216
		Pooled entire sample (r = 10%)	3 X 8	24
		Pooled entire sample (r = 15%)	3 X 8	24
		Pooled entire sample (r = 20%)	3 X 8	24
2	$BV > 0$ & Omit Outliers	Annual cross-section (r = 10%)	3 X 8 X 9	216
		Annual cross-section (r = 15%)	3 X 8 X 9	216
		Annual cross-section (r = 20%)	3 X 8 X 9	216
		Pooled entire sample (r = 10%)	3 X 8	24
		Pooled entire sample (r = 15%)	3 X 8	24
		Pooled entire sample (r = 20%)	3 X 8	24
3	$BV \geq$ £5 millions	Annual cross-section (r = 10%)	3 X 8 X 9	216
		Annual cross-section (r = 15%)	3 X 8 X 9	216
		Annual cross-section (r = 20%)	3 X 8 X 9	216
		Pooled entire sample (r = 10%)	3 X 8	24
		Pooled entire sample (r = 15%)	3 X 8	24
		Pooled entire sample (r = 20%)	3 X 8	24
4	$BV \geq$ £5 millions & Omit outliers	Annual cross-section (r = 10%)	3 X 8 X 9	216
		Annual cross-section (r = 15%)	3 X 8 X 9	216
		Annual cross-section (r = 20%)	3 X 8 X 9	216
		Pooled entire sample (r = 10%)	3 X 8	24
		Pooled entire sample (r = 15%)	3 X 8	24
		Pooled entire sample (r = 20%)	3 X 8	24
Total				2,880

Table 5.5 – Estimation Basis, Type, and the Number of Regression Runs

The analysis of the results from the various estimations of Table 5.5 is done in three steps. The results are first analysed to determine whether there are any likely econometric issues, such as scale effect, heteroskedasticity, and statistical issues such as outliers, etc. that may have an impact on the results obtained. Once the major statistical and

econometric issues have been addressed, analysis will be made on the predictive abilities of the variables chosen. This is the main aim of this section. Finally, the secondary issues, such as deflating methods, multicollinearity, etc. will be addressed.

5.3.1 Analysis of likely Statistical, Econometric and Economic Issues

This analysis is necessary to address any statistical and econometric issues that may have an impact on the results obtained. Three analyses are conducted to determine whether (1) samples with and without outliers; (2) differential cost of capital; and (3) unscaled and scaled equations affect statistical results.

The first analysis of the results obtained in this subsection is to determine whether or not, samples with and without outliers affect statistical results. While outliers have been customary omitted in CMRA, not many studies have substantiated nor analysed results obtained from samples with and without outliers. As the amount of information generated by both annual cross-section and pool estimations are voluminous, it is more appropriate to use the number of coefficients that is at least 10% significant with either the expected and unexpected signs[2] for this analysis, as shown in the table below:

		#	Sample	With Outliers	No Outliers	With Outliers	No Outliers	With Outliers	No Outliers
			r	10%		15%		20%	
BV>0	C/S	1	No deflation	216 (62)	199 (70)	205 (75)	197 (88)	190 (93)	180 (102)
		2	Def. by BV_{it}	175 (91)	174 (91)	176 (92)	173 (90)	176 (92)	172 (89)
		3	Def by MV_{it}	173 (76)	172 (76)	165 (96)	164 (88)	152 (105)	149 (100)
	Pool	1	No deflation	23 (11)	26 (2)	22 (13)	22 (7)	21 (15)	22 (8)
		2	Def. by BV_{it}	13 (19)	14 (16)	14 (18)	14 (16)	14 (17)	14 (17)
		3	Def. by MV_{it}	21 (6)	22 (6)	20 (7)	19 (7)	15 (9)	15 (9)
BV≥ £5 m	C/S	1	No deflation	211 (59)	198 (47)	200 (75)	188 (68)	188 (92)	171 (77)
		2	Def. by BV_{it}	213 (48)	203 (53)	213 (49)	203 (53)	212 (49)	202 (52)
		3	Def. by MV_{it}	174 (66)	178 (71)	162 (80)	171 (73)	160 (91)	158 (83)
	Pool	1	No deflation	23 (11)	25 (4)	21 (13)	21 (7)	21 (15)	20 (10)
		2	Def. by BV_{it}	24 (5)	17 (12)	24 (5)	17 (12)	24 (5)	18 (11)
		3	Def. by MV_{it}	21 (10)	22 (12)	19 (14)	21 (14)	15 (15)	17 (14)

Table 5.6 – Total Number of Coefficients with Expected (Unexpected) signs from Cross-sectional Estimations for samples where $BV > 0$ vs. $BV > 0$ after outliers (top), $BV \geq$ £5 millions vs. $BV \geq$ £5 millions after outliers (bottom)

[2] The justifications for the expected signs for each independent variable are covered in **Chapter 4 – Empirical Research Methodology & Dataset**. The expected signs for RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} and DIV_{it} are all positives. 1% significant coefficients comprises 84% and 94% (cross-sectional), and 95% and 96% (pool) for all significant coefficients for EDBV and EDMV respectively.

From Table 5.6, for both samples ($BV > 0$ and $BV \geq$ £5 millions) estimated cross-sectionally, the undeflated equations and equations deflated by BV consistently outperform the same types of equations in samples after outliers while the EDMV perform better in samples without outliers in 2 out of 3 cases (ie r = 15% and 20%). Using r = 10% generates the highest number of statistically significant coefficients with the correct signs. The pool analysis shows that the undeflated equations and EDBV for $BV > 0$ after outliers consistently outperform the same types of equations in $BV > 0$ while there is little difference for EDMV in both samples. For the sample where $BV \geq$ £5 millions, the undeflated equations and EDMV generally outperform the same types of equations in samples with outliers but EDBV consistently outperform the same type of equation in sample after outliers. Once again, r = 10% generates the highest number of statistically significant coefficients with the correct signs.

Since r = 10% gives the best statistical result as compared with r = 15% and 20%, the analysis in terms of $\overline{R}^2$ will be based on r = 10% (Table 5.7). For $BV > 0$, both the cross-section and pooled results show that on average, the undeflated equations for $BV > 0$ have higher $\overline{R}^2$ than the sample after omitting outliers, and there is not much difference in the magnitude of $\overline{R}^2$ for the two scaled equations in the sample with/without outliers. The cross-section and pooled results for $BV \geq$ £5 millions show that on average, the undeflated equations and EDBV have higher $\overline{R}^2$ than the sample after omitting outliers, and there is little difference in the magnitude of $\overline{R}^2$ for EDMV for the sample with/without outliers.

Overall, there are more significant coefficients with the correct signs estimated cross-sectionally and the pool in sample where $BV \geq$ £5 millions than in the sample without outliers. The sample where $BV > 0$ has more significant coefficients with the correct signs estimated cross-sectionally but the pooled results for sample without outliers have more significant coefficients than sample with outliers. It appears that in general, the sample where $BV \geq$ £5 millions has the most number of coefficients with the correct signs as well as higher $\overline{R}^2$ than other samples.

The second analysis of the results obtained in this subsection is to determine whether differential cost of capital, ie r = 10%, 15% or 20% influence regression results. As the preceding analysis determined that sample where $BV \geq$ £5 millions generated the best cross-sectional and pooled results, only this sample will be used for subsequent

analysis. From Tables 5.8a-c, cross-sectionally, r = 10% generates the most number of statistically significant coefficients with the correct (incorrect) signs for all three types of equations [see Table 5.8a, undeflated equations: 211 (59), EDBV: 213 (48), EDMV: 174 (66)]. For the pool results, except for EDMV (where r = 20% is the best), the best achiever is once again, r = 10% [see Table 5.8a, undeflated equations: 25 (4), EDBV: 17 (12), EDMV: 22 (12)]. Overall, the evidence for $BV \geq$ £5 millions suggests that the use of r = 10% provides the most number of statistically significant t-statistic for firms estimated on an annual cross-sectional and pool basis.

The third analysis of the results obtained in this subsection is to determine whether or not, unscaled and scaled equations affect statistical results. I begin by critically examining the intercept terms for all Prop-LID models (ie RModel 1 to 8) for all the three types of equations (the undeflated equation and the equations deflated by BV and MV) (Table 5.9). For all equations, the coefficients of the intercepts (ω_0) are either positives or negatives with no consistent pattern from both cross-sectional and pooled estimations. The values of ω_0 and the standard errors for both the deflated equations for the cross-sectional and pool data are exceptionally small, most of them hardly exceeding 0.05 and 0.01 respectively. On the other hand, ω_0 for the undeflated equations are exceptionally large [eg −7,169,186 for the full RModel 8 in 1997, and 27,795,478 for RModel 2 (RI + OA) in 1999], but most of the ω_0 (except for 1991 and 1997, and the pool) are not statistically significant. The presence of large coefficient of the intercept in undeflated equations suggest the likelihood of (1) the omission of correlated variable(s) (Barth and Kallipur, 1996) or (2) scale effect (Easton and Sommers, 2002).

The second part of this third analysis centres on the residual sum of squares (RSS) for each type of equation from RModel 1 to 8 (Table 5.10). The $\overline{RSS}$ from cross-sectional and pool estimations for the two deflated equations are exceptionally small, many of which are less than 0.1 while the $\overline{RSS}$ for the undeflated equations are exceptionally large (ranging from over 4,000-10,000 trillions) in all cases. The exceptionally large $\overline{RSS}$ in the undeflated equations suggests that these equations are either poorly specified or/and affected by scale, heteroscedasticity or likelihood of the omission of correlated variable(s) (Barth and Kallipur, 1996; Easton and Sommers, 2002).

Table 5.7 - Adjusted R^2 from Cross-sectional and Pool Estimations for all samples and $r = 10\%$

Year	#	Type	*BV > 0*	*BV > 0 after outliers*	*BV ≥ £5 millions*	*BV ≥£5 millions after outliers*
1991	1	No deflation	0.4 to 0.628	0.702 to 0.745	0.401 to 0.628	0.241 to 0.542
	2	Deflated by BV_{it}	0.085 to 0.227	0.085 to 0.238	0.229 to 0.258	0.214 to 0.259
	3	Deflated by MV_{it}	0.733 to 0.816	0.734 to 0.821	0.58 to 0.693	0.58 to 0.7
1992	1	No deflation	0.235 to 0.445	0.481 to 0.576	0.234 to 0.443	0.386 to 0.539
	2	Deflated by BV_{it}	0.185 to 0.515	0.185 to 0.513	0.143 to 0.222	0.172 to 0.215
	3	Deflated by MV_{it}	0.429 to 0.510	0.429 to 0.511	0.498 to 0.576	0.551 to 0.618
1993	1	No deflation	0.529 to 0.761	0.46 to 0.531	0.528 to 0.76	0.455 to 0.533
	2	Deflated by BV_{it}	0.228 to 0.703	0.252 to 0.705	0.047 to 0.306	0.042 to 0.262
	3	Deflated by MV_{it}	0.195 to 0.366	0.223 to 0.403	0.269 to 0.36	0.32 to 0.406
1994	1	No deflation	0.701 to 0.786	0.494 to 0.605	0.7 to 0.785	0.573 to 0.601
	2	Deflated by BV_{it}	0.088 to 0.36	0.084 to 0.35	0.212 to 0.49	0.358 to 0.505
	3	Deflated by MV_{it}	0.178 to 0.353	0.176 to 0.35	0.181 to 0.413	0.264 to 0.416
1995	1	No deflation	0.677 to 0.797	0.476 to 0.506	0.676 to 0.796	0.542 to 0.556
	2	Deflated by BV_{it}	0.948 to 0.955	0.948 to 0.966	0.26 to 0.371	0.21 to 0.299
	3	Deflated by MV_{it}	0.269 to 0.344	0.263 to 0.348	0.43 to 0.54	0.43 to 0.573
1996	1	No deflation	0.706 to 0.823	0.257 to 0.378	0.705 to 0.822	0.304 to 0.416
	2	Deflated by BV_{it}	0.983 to 0.992	0.983 to 0.992	0.128 to 0.261	0.092 to 0.222
	3	Deflated by MV_{it}	0.43 to 0.581	0.472 to 0.596	0.444 to 0.642	0.441 to 0.645
1997	1	No deflation	0.497 to 0.653	0.294 to 0.529	0.496 to 0.652	0.333 to 0.625
	2	Deflated by BV_{it}	0.206 to 0.297	0.206 to 0.298	0.016 to 0.316	0.016 to 0.287
	3	Deflated by MV_{it}	0.168 to 0.413	0.169 to 0.413	0.202 to 0.52	0.206 to 0.525
1998	1	No deflation	0.51 to 0.613	0.442 to 0.511	0.508 to 0.611	0.487 to 0.582
	2	Deflated by BV_{it}	0.27 to 0.343	0.27 to 0.352	0.379 to 0.51	0.335 to 0.478
	3	Deflated by MV_{it}	0.242 to 0.358	0.242 to 0.36	0.296 to 0.443	0.302 to 0.46
1999	1	No deflation	0.043 to 0.849	0.174 to 0.284	0.043 to 0.849	0.111 to 0.155
	2	Deflated by BV_{it}	0.659 to 0.802	0.688 to 0.812	0.004 to 0.491	0.025 to 0.376
	3	Deflated by MV_{it}	0.415 to 0.487	0.443 to 0.504	0.464 to 0.531	0.466 to 0.532
Pool	1	No deflation	0.232 to 0.65	0.399 to 0.431	0.231 to 0.65	0.355 to 0.38
	2	Deflated by BV_{it}	0.592 to 0.699	0.602 to 0.71	0.04 to 0.181	0.087 to 0.188
	3	Deflated by MV_{it}	0.526 to 0.559	0.529 to 0.563	0.395 to 0.447	0.433 to 0.482

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}.

Table 5.8a - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	ω_{11} (RI_{it})		ω_{12} (OA_{it})		ω_{13} (CI_{it})		ω_{14} (RD_{it})		ω_{15} (HR_{it})		ω_{16} (DC_{it})		ω_{17} (TD_{it})		ω_{18} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	1	No deflation	8	0	0	7	4	0	0	5	0	4	3	0	0	1	1	0	16	17
	2	Deflated by BV_{it}	8	0	0	0	0	0	5	0	0	0	2	0	0	2	1	0	16	2
	3	Deflated by MV_{it}	8	0	0	7	6	0	0	0	4	0	1	0	2	0	1	0	22	7
1992	1	No deflation	8	0	4	1	0	3	1	1	3	0	3	0	1	0	1	0	21	5
	2	Deflated by BV_{it}	8	0	6	0	0	6	4	0	0	2	0	3	0	0	1	0	19	11
	3	Deflated by MV_{it}	8	0	0	7	5	0	0	0	4	0	0	1	2	0	1	0	20	8
1993	1	No deflation	8	0	5	0	6	0	5	0	0	2	3	0	2	0	1	0	30	2
	2	Deflated by BV_{it}	8	0	6	0	5	0	2	0	4	0	3	0	0	1	1	0	29	1
	3	Deflated by MV_{it}	8	0	5	0	6	0	0	0	0	0	0	0	0	0	1	0	20	0
1994	1	No deflation	8	0	0	2	6	0	4	0	3	0	0	3	0	0	1	0	22	5
	2	Deflated by BV_{it}	8	0	5	2	3	0	3	1	3	0	3	0	2	0	1	0	28	3
	3	Deflated by MV_{it}	8	0	5	1	0	0	0	0	0	1	0	0	2	0	1	0	16	2
1995	1	No deflation	8	0	5	0	4	0	5	0	0	4	3	0	2	0	1	0	28	4
	2	Deflated by BV_{it}	8	0	6	0	6	0	0	4	4	0	3	0	0	0	1	0	28	4
	3	Deflated by MV_{it}	8	0	5	1	0	6	0	5	1	0	3	0	2	0	1	0	20	12
1996	1	No deflation	8	0	0	5	2	0	5	0	4	0	3	0	0	2	0	1	22	8
	2	Deflated by BV_{it}	8	0	6	0	6	0	0	1	4	0	0	0	0	0	1	0	25	1
	3	Deflated by MV_{it}	8	0	6	0	0	2	5	0	4	0	0	3	0	1	1	0	24	6
1997	1	No deflation	8	0	6	0	3	0	5	0	4	0	0	3	2	0	1	0	29	3
	2	Deflated by BV_{it}	8	0	5	2	6	0	5	0	3	0	3	0	2	0	1	0	33	2
	3	Deflated by MV_{it}	8	0	6	1	5	0	0	0	1	0	0	3	2	0	1	0	23	4
1998	1	No deflation	8	0	5	0	0	0	5	0	0	4	3	0	2	0	0	0	23	4
	2	Deflated by BV_{it}	8	0	0	7	0	6	1	0	4	0	3	0	2	0	1	0	19	13
	3	Deflated by MV_{it}	8	0	0	7	0	6	0	0	0	4	0	0	2	0	1	0	11	17
1999	1	No deflation	8	0	5	2	0	6	4	0	0	3	2	0	0	0	1	0	20	11
	2	Deflated by BV_{it}	2	2	6	0	6	0	0	5	0	1	0	3	1	0	1	0	16	11
	3	Deflated by MV_{it}	8	0	3	0	6	0	0	5	0	0	0	3	0	2	1	0	18	10
Total	1	No deflation	72	0	30	17	25	9	34	6	14	17	20	6	9	3	7	1	211	59
	2	Deflated by BV_{it}	66	2	40	11	32	12	20	11	22	3	17	6	7	3	9	0	213	48
	3	Deflated by MV_{it}	72	0	30	24	28	14	5	10	14	5	4	10	12	3	9	0	174	66
Pool	1	No deflation	8	0	1	5	0	6	5	0	3	0	3	0	2	0	1	0	23	11
	2	Deflated by BV_{it}	8	0	6	1	6	0	0	1	3	0	0	3	0	0	1	0	24	5
	3	Deflated by MV_{it}	8	0	1	4	5	0	0	3	4	0	0	3	2	0	1	0	21	10

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}.
Hence RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation.
Numbers are in t-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs. Details are in **Table 5.12.**

Table 5.8b - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 illions and r = 15%

Year	No	Type	ω_{11} (RI_{it})		ω_{12} (OA_{it})		ω_{13} (CI_{it})		ω_{14} (RD_{it})		ω_{15} (HR_{it})		ω_{16} (DC_{it})		ω_{17} (TD_{it})		ω_{18} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	1	No deflation	8	0	0	7	3	0	0	5	0	4	3	0	0	1	1	0	15	17
	2	Deflated by BV_{it}	8	0	0	0	0	0	5	0	0	0	2	0	0	2	1	0	16	2
	3	Deflated by MV_{it}	8	0	0	7	6	0	0	0	4	0	1	0	2	0	1	0	22	7
1992	1	No deflation	8	0	1	1	0	3	0	4	3	0	3	0	0	0	1	0	16	8
	2	Deflated by BV_{it}	8	0	6	0	0	6	5	0	0	1	0	3	0	0	1	0	20	10
	3	Deflated by MV_{it}	8	0	0	7	5	0	0	0	3	0	0	2	2	0	1	0	19	9
1993	1	No deflation	8	0	5	1	6	0	5	0	0	3	3	0	2	0	1	0	30	4
	2	Deflated by BV_{it}	8	0	6	0	5	0	2	0	4	0	2	0	0	1	1	0	28	1
	3	Deflated by MV_{it}	8	0	1	0	6	0	0	0	0	0	0	0	0	0	1	0	16	0
1994	1	No deflation	8	0	0	5	6	0	5	0	2	0	0	3	0	1	1	0	22	9
	2	Deflated by BV_{it}	8	0	5	2	4	0	3	1	3	0	3	0	2	0	1	0	29	3
	3	Deflated by MV_{it}	8	0	5	1	0	2	0	0	0	3	0	0	2	0	1	0	16	6
1995	1	No deflation	8	0	5	1	4	0	5	0	0	4	3	0	2	0	1	0	28	5
	2	Deflated by BV_{it}	8	0	6	0	6	0	0	4	4	0	3	0	0	0	1	0	28	4
	3	Deflated by MV_{it}	8	0	5	1	0	6	0	5	1	0	3	0	2	0	1	0	20	12
1996	1	No deflation	8	0	0	6	4	0	5	0	4	0	3	0	0	2	0	1	24	9
	2	Deflated by BV_{it}	8	0	6	0	6	0	0	1	4	0	0	0	0	0	1	0	25	1
	3	Deflated by MV_{it}	8	0	6	0	0	5	5	0	4	0	0	3	0	1	1	0	24	9
1997	1	No deflation	8	0	6	0	0	3	5	0	4	0	0	3	2	0	1	0	26	6
	2	Deflated by BV_{it}	8	0	5	2	6	0	5	0	3	0	3	0	2	0	1	0	33	2
	3	Deflated by MV_{it}	8	0	5	1	0	0	0	0	1	1	0	3	2	0	1	0	17	5
1998	1	No deflation	8	0	0	2	0	0	5	0	0	4	3	0	2	0	0	0	18	6
	2	Deflated by BV_{it}	8	0	0	7	0	6	1	0	4	0	3	0	2	0	1	0	19	13
	3	Deflated by MV_{it}	8	0	0	7	0	6	0	0	0	4	0	0	2	0	1	0	11	17
1999	1	No deflation	8	0	5	2	0	6	4	0	0	3	2	0	1	0	1	0	21	11
	2	Deflated by BV_{it}	1	4	6	0	6	0	0	5	0	1	0	3	1	0	1	0	15	13
	3	Deflated by MV_{it}	8	0	2	4	6	0	0	5	0	1	0	3	0	2	1	0	17	15
Total	1	No deflation	72	0	22	25	23	12	34	9	13	18	20	6	9	4	7	1	200	75
	2	Deflated by BV_{it}	65	4	40	11	33	12	21	11	22	2	16	6	7	3	9	0	213	49
	3	Deflated by MV_{it}	72	0	24	28	23	19	5	10	13	9	4	11	12	3	9	0	162	80
Pool	1	No deflation	8	0	0	6	0	6	5	0	2	1	3	0	2	0	1	0	21	13
	2	Deflated by BV_{it}	8	0	6	1	6	0	0	1	3	0	0	3	0	0	1	0	24	5
	3	Deflated by MV_{it}	8	0	0	7	4	1	0	3	4	0	0	3	2	0	1	0	19	14

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}.
Hence RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} and DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation.
Numbers are in t-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs. Details are in **Table 5.12.**

Table 5.8c - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and $r = 20\%$

Year	No	Type	ω_{11} (RI_{it})		ω_{12} (OA_{it})		ω_{13} (CI_{it})		ω_{14} (RD_{it})		ω_{15} (HR_{it})		ω_{16} (DC_{it})		ω_{17} (TD_{it})		ω_{18} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	1	No deflation	8	0	0	7	4	0	0	5	0	4	3	0	1	1	1	0	17	17
	2	Deflated by BV_{it}	8	0	0	0	0	0	5	0	0	0	2	0	0	2	1	0	16	2
	3	Deflated by MV_{it}	8	0	0	7	6	0	0	0	4	0	1	0	2	0	1	0	22	7
1992	1	No deflation	8	0	0	4	0	4	0	5	0	1	3	0	0	0	1	0	12	14
	2	Deflated by BV_{it}	8	0	6	0	0	6	5	0	0	0	0	3	0	0	1	0	20	9
	3	Deflated by MV_{it}	8	0	0	7	5	0	0	0	3	0	0	3	2	0	1	0	19	10
1993	1	No deflation	8	0	4	2	6	0	5	0	0	4	3	0	2	0	1	0	29	6
	2	Deflated by BV_{it}	8	0	6	0	5	0	2	0	4	0	2	0	0	1	1	0	28	1
	3	Deflated by MV_{it}	8	0	1	2	6	0	0	0	0	0	0	0	2	0	1	0	18	2
1994	1	No deflation	8	0	0	6	6	0	5	0	0	1	0	3	0	1	1	0	20	11
	2	Deflated by BV_{it}	8	0	5	2	4	0	3	1	3	0	3	0	2	0	1	0	29	3
	3	Deflated by MV_{it}	8	0	5	2	0	4	0	0	0	4	0	0	2	0	1	0	16	10
1995	1	No deflation	8	0	5	2	3	0	5	0	0	4	3	0	2	0	1	0	27	6
	2	Deflated by BV_{it}	8	0	6	0	6	0	0	4	4	0	3	0	0	0	1	0	28	4
	3	Deflated by MV_{it}	8	0	5	2	0	6	0	5	0	0	3	0	2	0	1	0	19	13
1996	1	No deflation	8	0	0	7	5	0	5	0	1	0	3	0	0	2	0	1	22	10
	2	Deflated by BV_{it}	8	0	6	0	6	0	0	1	4	0	0	0	0	0	1	0	25	1
	3	Deflated by MV_{it}	8	0	6	1	0	6	5	0	3	0	0	3	0	1	1	0	23	11
1997	1	No deflation	8	0	6	0	0	3	5	0	0	0	0	3	2	0	1	0	22	6
	2	Deflated by BV_{it}	8	0	5	2	6	0	5	0	3	0	3	0	2	0	1	0	33	2
	3	Deflated by MV_{it}	8	0	5	1	0	0	0	0	0	1	0	3	2	0	1	0	16	5
1998	1	No deflation	8	0	0	7	0	0	5	0	0	4	3	0	2	0	0	0	18	11
	2	Deflated by BV_{it}	8	0	0	7	0	6	1	0	4	0	3	0	2	0	1	0	19	13
	3	Deflated by MV_{it}	8	0	0	7	0	6	0	0	0	4	0	0	2	0	1	0	11	17
1999	1	No deflation	8	0	4	2	0	6	4	0	0	3	2	0	2	0	1	0	21	11
	2	Deflated by BV_{it}	0	5	6	0	6	0	0	5	0	1	0	3	1	0	1	0	14	14
	3	Deflated by MV_{it}	8	0	1	5	6	0	0	5	0	1	0	3	0	2	1	0	16	16
Total	1	No deflation	72	0	19	37	24	13	34	10	1	21	20	6	11	4	7	1	188	92
	2	Deflated by BV_{it}	64	5	40	11	33	12	21	11	22	1	16	6	7	3	9	0	212	49
	3	Deflated by MV_{it}	72	0	23	34	23	22	5	10	10	10	4	12	14	3	9	0	160	91
Pool	1	No deflation	8	0	0	7	0	6	5	0	2	2	3	0	2	0	1	0	21	15
	2	Deflated by BV_{it}	8	0	6	1	6	0	0	1	3	0	0	3	0	0	1	0	24	5
	3	Deflated by MV_{it}	8	0	0	7	0	2	0	3	4	0	0	3	2	0	1	0	15	15

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}.
Hence RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation.
Numbers are in t-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs. Details are in **Table 5.12.**

Table 5.9 - Intercepts and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	RModel 1	RModel 2	RModel 3	RModel 4	RModel 5	RModel 6	RModel 7	RModel 8	Tot NS*		
														Not	10%	5%
1991	1	No deflation	962	0.401	Coeff	-5,748,689	1,920,203	1,820,498	2,249,617	5,719,133	7,554,029	7,520,798	7,516,118			
					Std. Err	2,766,748	2,560,492	2,558,825	2,452,450	2,463,069	2,344,874	2,345,092	2,292,107			
					t-Stat	**(-2.078)	(0.750)	(0.711)	(0.917)	**(2.322)	***(3.222)	***(3.207)	***(3.279)	3	3	5
	2	Deflated by BV_{it}	962	0.229	Coeff	-0.011	0.001	0.005	-0.008	-0.012	-0.016	-0.022	-0.053			
					Std. Err	0.013	0.016	0.017	0.017	0.018	0.018	0.018	0.019			
					t-Stat	(-0.794)	(0.082)	(0.273)	(-0.483)	(-0.694)	(-0.912)	(-1.242)	***(-2.787)	7	7	7
	3	Deflated by MV_{it}	956	0.58	Coeff	-0.037	-0.004	0.014	0.011	-0.009	-0.010	0.007	-0.035			
					Std. Err	0.019	0.018	0.018	0.018	0.018	0.018	0.018	0.019			
					t-Stat	**(-1.964)	(-0.248)	(0.804)	(0.628)	(-0.512)	(-0.571)	(0.380)	*(-1.829)	6	7	8
1992	1	No deflation	940	0.234	Coeff	8,214,474	2,148,241	1,826,012	1,491,206	-2,002,663	-1,227,035	-1,297,035	-556,001			
					Std. Err	3,035,331	3,030,431	3,034,887	3,011,481	3,036,697	3,010,296	3,004,854	2,748,124			
					t-Stat	***(2.706)	(0.709)	(0.602)	(0.495)	(-0.659)	(-0.408)	(-0.432)	(-0.202)	7	7	7
	2	Deflated by BV_{it}	940	0.143	Coeff	0.019	-0.009	0.013	0.003	0.018	0.018	0.015	-0.040			
					Std. Err	0.016	0.020	0.020	0.021	0.022	0.022	0.022	0.023			
					t-Stat	(1.185)	(-0.458)	(0.629)	(0.152)	(0.831)	(0.811)	(0.688)	*(-1.733)	7	8	
	3	Deflated by MV_{it}	936	0.498	Coeff	-0.017	0.002	0.014	0.011	-0.003	0.004	0.008	-0.091			
					Std. Err	0.026	0.026	0.026	0.027	0.027	0.028	0.028	0.028			
					t-Stat	(-0.637)	(0.073)	(0.515)	(0.412)	(-0.112)	(0.158)	(0.275)	***(-3.278)	7	7	7
1993	1	No deflation	998	0.528	Coeff	7,533,123	67,020	-2,845,815	-3,153,372	-3,614,831	-2,680,669	-2,595,920	-1,624,782			
					Std. Err	2,538,418	2,353,736	2,282,366	2,153,012	2,192,025	2,130,621	2,079,606	1,911,583			
					t-Stat	***(2.968)	(0.028)	(-1.247)	(-1.465)	*(-1.649)	(-1.258)	(-1.248)	(-0.850)	6	7	7
	2	Deflated by BV_{it}	998	0.047	Coeff	0.062	-0.005	-0.018	-0.021	-0.058	-0.063	-0.071	-0.117			
					Std. Err	0.013	0.015	0.016	0.016	0.016	0.016	0.016	0.016			
					t-Stat	***(4.778)	(-0.333)	(-1.173)	(-1.363)	***(-3.669)	***(-4.031)	***(-4.416)	***(-7.557)	3	3	3
	3	Deflated by MV_{it}	994	0.269	Coeff	-0.006	-0.015	-0.016	-0.016	-0.017	-0.017	-0.016	-0.026			
					Std. Err	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.009			
					t-Stat	(-0.804)	*(-1.905)	**(-2.067)	**(-2.072)	**(-2.114)	**(-2.026)	**(-1.977)	***(-3.058)	1	2	7
1994	1	No deflation	1,061	0.7	Coeff	4,788,681	4,307,946	442,150	557,311	-474,950	-1,051,807	-1,055,473	-1,101,435			
					Std. Err	2,099,759	2,136,300	1,897,976	1,893,696	1,929,689	1,896,149	1,897,112	1,864,116			
					t-Stat	**(2.281)	**(2.017)	(0.233)	(0.294)	(-0.246)	(-0.555)	(-0.556)	(-0.591)	6	6	8
	2	Deflated by BV_{it}	1,061	0.212	Coeff	0.052	-0.029	-0.027	-0.029	-0.052	-0.055	-0.020	-0.067			
					Std. Err	0.013	0.015	0.014	0.014	0.014	0.014	0.015	0.014			
					t-Stat	***(4.048)	*(-1.959)	*(-1.863)	**(-2.037)	***(-3.624)	***(-3.833)	(-1.292)	***(-4.792)	1	3	4
	3	Deflated by MV_{it}	1,058	0.181	Coeff	-0.013	-0.027	-0.026	-0.027	-0.025	-0.024	-0.021	-0.040			
					Std. Err	0.008	0.007	0.007	0.007	0.008	0.008	0.008	0.008			
					t-Stat	(-1.564)	***(-3.801)	***(-3.637)	***(-3.655)	***(-3.316)	***(-3.133)	***(-2.731)	***(-5.180)	1	1	1

Table 5.9 - Intercepts and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	RModel 1	RModel 2	RModel 3	RModel 4	RModel 5	RModel 6	RModel 7	RModel 8	Tot NS*		
														Not	10%	5%
1995	1	No deflation	1,114	0.676	Coeff	-1,297,231	-5,056,053	-5,443,664	-5,377,241	-526,133	1,629,376	1,955,809	1,831,740			
					Std. Err	2,577,854	2,581,608	2,539,893	2,520,364	2,493,101	2,259,851	2,165,964	2,147,191			
					t-Stat	(-0.503)	*(-1.958)	**(-2.143)	**(-2.134)	(-0.211)	(0.721)	(0.903)	(0.853)	5	6	8
	2	Deflated by BV_{it}	1,114	0.26	Coeff	0.025	-0.019	-0.035	-0.034	-0.051	-0.054	-0.053	-0.072			
					Std. Err	0.010	0.012	0.012	0.012	0.013	0.013	0.014	0.013			
					t-Stat	**(2.551)	(-1.546)	***(-2.877)	***(-2.711)	***(-3.941)	***(-4.164)	***(-3.942)	***(-5.448)	1	1	2
	3	Deflated by MV_{it}	1,112	0.43	Coeff	0.010	-0.001	0.004	0.008	0.004	-0.002	0.000	-0.015			
					Std. Err	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006			
					t-Stat	*(1.782)	(-0.206)	(0.691)	(1.351)	(0.645)	(-0.293)	(-0.047)	**(-2.448)	6	7	8
1996	1	No deflation	1,157	0.705	Coeff	1,218,479	1,099,169	330,328	-531,836	-5,322,059	-2,645,325	-2,395,879	-3,123,677			
					Std. Err	2,655,608	2,737,929	2,730,047	2,654,574	2,594,342	2,213,901	2,193,023	2,180,304			
					t-Stat	(0.459)	(0.401)	(0.121)	(-0.200)	**(-2.051)	(-1.195)	(-1.093)	(-1.433)	7	7	8
	2	Deflated by BV_{it}	1,157	0.128	Coeff	0.064	0.021	0.008	0.010	-0.019	-0.020	-0.023	-0.041			
					Std. Err	0.013	0.015	0.015	0.015	0.016	0.016	0.016	0.015			
					t-Stat	***(5.045)	(1.412)	(0.569)	(0.649)	(-1.203)	(-1.240)	(-1.435)	***(-2.651)	6	6	6
	3	Deflated by MV_{it}	1,155	0.444	Coeff	-0.007	-0.025	-0.025	-0.032	-0.035	-0.027	-0.032	-0.047			
					Std. Err	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.007			
					t-Stat	(-0.963)	***(-3.623)	***(-3.648)	***(-4.579)	***(-4.977)	***(-4.006)	***(-4.530)	***(-7.117)	1	1	1
1997	1	No deflation	1,124	0.496	Coeff	7,390,021	-904,863	-1,007,430	-2,282,621	-6,560,236	-6,795,680	-7,056,179	-7,169,186			
					Std. Err	2,991,123	2,912,322	2,907,768	2,771,158	2,806,785	2,727,794	2,702,030	2,645,085			
					t-Stat	**(2.471)	(-0.311)	(-0.346)	(-0.824)	**(-2.337)	**(-2.491)	***(-2.611)	***(-2.710)	3	3	6
	2	Deflated by BV_{it}	1,124	0.016	Coeff	0.051	-0.014	-0.033	-0.063	-0.093	-0.097	-0.030	-0.034			
					Std. Err	0.018	0.019	0.019	0.018	0.019	0.019	0.019	0.019			
					t-Stat	***(2.878)	(-0.766)	*(-1.731)	***(-3.400)	***(-4.895)	***(-5.218)	(-1.538)	*(-1.772)	2	4	4
	3	Deflated by MV_{it}	1,122	0.202	Coeff	-0.028	-0.046	-0.045	-0.045	-0.046	-0.043	-0.034	-0.057			
					Std. Err	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.009			
					t-Stat	***(-2.757)	***(-5.247)	***(-5.117)	***(-4.917)	***(-5.015)	***(-4.644)	***(-3.618)	***(-6.387)	0	0	0
1998	1	No deflation	1,025	0.508	Coeff	5,189,841	1,436,173	1,507,481	816,878	4,644,026	6,025,501	4,077,234	3,866,553			
					Std. Err	3,750,056	3,788,216	3,797,930	3,792,214	3,864,139	3,625,384	3,522,357	3,538,338			
					t-Stat	(1.384)	(0.379)	(0.397)	(0.215)	(1.202)	*(1.662)	(1.158)	(1.093)	7	8	
	2	Deflated by BV_{it}	1,025	0.379	Coeff	0.019	0.082	0.074	0.066	0.021	0.016	0.047	0.021			
					Std. Err	0.018	0.020	0.020	0.020	0.020	0.020	0.022	0.021			
					t-Stat	(1.063)	***(3.989)	***(3.653)	***(3.241)	(1.071)	(0.814)	**(2.134)	(0.971)	4	4	5
	3	Deflated by MV_{it}	1,024	0.296	Coeff	0.011	0.038	0.037	0.039	0.053	0.053	0.055	0.038			
					Std. Err	0.010	0.009	0.009	0.009	0.010	0.010	0.010	0.010			
					t-Stat	(1.094)	***(4.092)	***(4.032)	***(4.111)	***(5.476)	***(5.402)	***(5.586)	***(3.871)	1	1	1

Table 5.9 - Intercepts and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	RModel 1	RModel 2	RModel 3	RModel 4	RModel 5	RModel 6	RModel 7	RModel 8	Tot NS*		
														Not	10%	5%
1999	1	No deflation	921	0.043	Coeff	-7,856,711	27,795,478	7,414,054	2,566,214	5,389,168	7,318,347	6,952,688	13,483,439			
					Std. Err	17,393,282	10,380,119	8,451,221	8,152,762	8,445,530	8,311,804	8,315,656	7,277,007			
					t-Stat	(-0.452)	***(2.678)	(0.877)	(0.315)	(0.638)	(0.880)	(0.836)	*(1.853)	6	7	7
	2	Deflated by BV_{it}	921	0.004	Coeff	0.081	-0.135	-0.172	-0.137	-0.178	-0.250	-0.178	-0.425			
					Std. Err	0.064	0.069	0.064	0.065	0.064	0.063	0.069	0.059			
					t-Stat	(1.281)	*(-1.953)	***(-2.687)	**(-2.122)	***(-2.775)	***(-4.004)	***(-2.586)	***(-7.188)	1	2	3
	3	Deflated by MV_{it}	920	0.464	Coeff	-0.015	-0.015	-0.014	-0.009	-0.005	0.004	-0.003	-0.003			
					Std. Err	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009			
					t-Stat	*(-1.759)	*(-1.778)	(-1.601)	(-1.079)	(-0.602)	(0.457)	(-0.370)	(-0.298)	6	8	
Pool	1	No deflation	9,302	0.231	Coeff	2,921,925	17,060,057	10,613,699	8,769,737	2,071,876	2,970,049	2,089,552	2,776,586			
					Std. Err	1,953,572	1,688,914	1,477,854	1,439,246	1,463,967	1,451,246	1,414,744	1,387,432			
					t-Stat	(1.496)	***(10.101)	***(7.182)	***(6.093)	(1.415)	**(2.047)	(1.477)	**(2.001)	3	3	5
	2	Deflated by BV_{it}	9,302	0.04	Coeff	0.045	-0.004	-0.015	-0.016	-0.020	-0.022	-0.019	-0.085			
					Std. Err	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.010			
					t-Stat	***(5.551)	(-0.456)	(-1.625)	*(-1.695)	**(-2.178)	**(-2.318)	*(-1.900)	***(-8.706)	2	4	6
	3	Deflated by MV_{it}	9,277	0.395	Coeff	-0.011	-0.013	-0.012	-0.011	-0.017	-0.014	-0.005	-0.026			
					Std. Err	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005			
					t-Stat	**(-2.502)	***(-2.896)	***(-2.691)	**(-2.436)	***(-3.774)	***(-3.106)	(-1.022)	***(-5.596)	1	1	3

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID

RModel 1 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it+1}$

RModel 2 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + e_{it+1}$

RModel 3 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + e_{it+1}$

RModel 4 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + e_{it+1}$

RModel 5 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + e_{it+1}$

RModel 6 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it+1}$

RModel 7 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + e_{it+1}$

RModel 8 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it+1}$

* NS = Number of intercepts that are not 10% and 5% statistically significant respectively.

Information of this table is extracted from **Tables 5.12**, and **Appendix 5.1**.

Table 5.10 - Mean Residual Sum of Squares from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	RModel 1	RModel 2	RModel 3	RModel 4	RModel 5	RModel 6	RModel 7	RModel 8	Mean
1991	1	No deflation	962	7.16×10^{15}	5.86×10^{15}	5.85×10^{15}	5.36×10^{15}	5.14×10^{15}	4.63×10^{15}	4.62×10^{15}	4.41×10^{15}	5.38×10^{15}
	2	Deflated by BV_{it}	962	0.083	0.083	0.082	0.081	0.081	0.081	0.081	0.079	0.081
	3	Deflated by MV_{it}	956	0.283	0.237	0.231	0.23	0.219	0.219	0.213	0.205	0.230
1992	1	No deflation	940	8.6×10^{15}	8.03×10^{15}	8.01×10^{15}	7.88×10^{15}	7.64×10^{15}	7.47×10^{15}	7.44×10^{15}	6.21×10^{15}	7.66×10^{15}
	2	Deflated by BV_{it}	940	0.119	0.119	0.117	0.116	0.115	0.113	0.113	0.108	0.115
	3	Deflated by MV_{it}	936	0.489	0.476	0.467	0.467	0.464	0.463	0.461	0.411	0.462
1993	1	No deflation	998	6.32×10^{15}	5.18×10^{15}	4.77×10^{15}	4.24×10^{15}	4.24×10^{15}	3.99×10^{15}	3.79×10^{15}	3.2×10^{15}	4.47×10^{15}
	2	Deflated by BV_{it}	998	0.084	0.079	0.078	0.077	0.072	0.07	0.07	0.061	0.074
	3	Deflated by MV_{it}	994	0.048	0.044	0.043	0.043	0.043	0.043	0.043	0.042	0.044
1994	1	No deflation	1,061	4.5×10^{15}	4.55×10^{15}	3.54×10^{15}	3.52×10^{15}	3.49×10^{15}	3.36×10^{15}	3.36×10^{15}	3.24×10^{15}	3.70×10^{15}
	2	Deflated by BV_{it}	1,061	0.085	0.077	0.076	0.074	0.071	0.07	0.067	0.054	0.072
	3	Deflated by MV_{it}	1,058	0.052	0.041	0.041	0.041	0.041	0.041	0.04	0.037	0.042
1995	1	No deflation	1,114	7.18×10^{15}	6.88×10^{15}	6.65×10^{15}	6.54×10^{15}	6.09×10^{15}	4.99×10^{15}	4.57×10^{15}	4.49×10^{15}	5.92×10^{15}
	2	Deflated by BV_{it}	1,114	0.051	0.049	0.047	0.047	0.046	0.046	0.046	0.043	0.047
	3	Deflated by MV_{it}	1,112	0.028	0.026	0.026	0.025	0.025	0.025	0.024	0.023	0.025
1996	1	No deflation	1,157	8×10^{15}	8×10^{15}	7.9×10^{15}	7.45×10^{15}	6.87×10^{15}	4.98×10^{15}	4.88×10^{15}	4.79×10^{15}	6.61×10^{15}
	2	Deflated by BV_{it}	1,157	0.091	0.089	0.087	0.087	0.084	0.084	0.084	0.077	0.085
	3	Deflated by MV_{it}	1,155	0.05	0.041	0.04	0.04	0.039	0.037	0.037	0.032	0.040
1997	1	No deflation	1,124	9.89×10^{15}	8.82×10^{15}	8.78×10^{15}	7.95×10^{15}	7.68×10^{15}	7.24×10^{15}	7.1×10^{15}	6.79×10^{15}	8.03×10^{15}
	2	Deflated by BV_{it}	1,124	0.176	0.165	0.163	0.147	0.143	0.135	0.126	0.122	0.147
	3	Deflated by MV_{it}	1,122	0.094	0.068	0.068	0.068	0.068	0.067	0.066	0.056	0.069
1998	1	No deflation	1,025	1.40×10^{16}	1.37×10^{16}	1.37×10^{16}	1.36×10^{16}	1.33×10^{16}	1.17×10^{16}	1.10×10^{16}	1.1×10^{16}	1.28×10^{16}
	2	Deflated by BV_{it}	1,025	0.168	0.162	0.158	0.157	0.143	0.142	0.14	0.131	0.150
	3	Deflated by MV_{it}	1,024	0.074	0.064	0.064	0.064	0.062	0.062	0.062	0.058	0.064
1999	1	No deflation	921	2.72×10^{17}	9.61×10^{16}	6.29×10^{16}	5.82×10^{16}	5.81×10^{16}	5.61×10^{16}	5.6×10^{16}	4.27×10^{16}	5.72×10^{16}
	2	Deflated by BV_{it}	921	1.959	1.858	1.59	1.573	1.52	1.418	1.408	0.993	1.540
	3	Deflated by MV_{it}	920	0.053	0.052	0.051	0.051	0.051	0.049	0.047	0.046	0.050
Pool	1	No deflation	9,302	3.48×10^{16}	2.55×10^{16}	1.94×10^{16}	1.83×10^{16}	1.77×10^{16}	1.74×10^{16}	1.65×10^{16}	1.50×10^{16}	2.06×10^{16}
	2	Deflated by BV_{it}	9,302	0.303	0.299	0.293	0.293	0.293	0.292	0.292	0.258	0.290
	3	Deflated by MV_{it}	9,277	0.143	0.143	0.143	0.143	0.142	0.141	0.139	0.131	0.141

Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}. The RSS are calculated from RModel 1 to 8 which is equivalent to measuring the errors from the addition of the variable RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it}.

Table 5.11 - Adjusted R^2, AIC and F-tests from Cross-sectional Estimations for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	Obs	Stat	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})
1991	2	Deflated by BV_{it}	962	$A\text{-}R^2$	0.229	*0.230	*0.230	*0.239	0.238	*0.240	*0.244	*0.258
				AIC	0.351	0.352	0.353	*0.342	0.343	*0.342	*0.338	*0.320
				F-Test	143.732	1.783	1.003	***12.287	0.646	***3.455	***5.722	***19.456
	3	Deflated by MV_{it}	956	$A\text{-}R^2$	0.580	*0.647	*0.657	0.657	*0.674	0.673	*0.682	*0.693
				AIC	1.582	*1.409	*1.381	1.383	*1.334	1.336	*1.310	*1.275
				F-Test	660.304	***183.019	***28.345	0.706	***49.305	0.182	***27.159	***35.818
1992	2	Deflated by BV_{it}	940	$A\text{-}R^2$	0.143	*0.148	*0.159	*0.167	*0.169	*0.185	*0.185	*0.222
				AIC	0.718	*0.714	*0.701	*0.694	*0.692	*0.674	0.675	*0.630
				F-Test	79.621	***6.047	***13.725	***9.188	***3.588	***19.124	1.107	***44.895
	3	Deflated by MV_{it}	936	$A\text{-}R^2$	0.498	*0.511	*0.520	0.520	*0.522	*0.523	*0.524	*0.576
				AIC	2.129	*2.105	*2.087	2.088	*2.085	*2.084	*2.082	*1.969
				F-Test	465.636	***25.013	***19.156	0.204	***5.477	**2.580	***3.618	***113.439
1993	2	Deflated by BV_{it}	998	$A\text{-}R^2$	0.047	*0.105	*0.113	*0.126	*0.181	*0.198	*0.201	*0.306
				AIC	0.365	*0.304	*0.296	*0.282	*0.218	*0.197	*0.195	*0.055
				F-Test	25.710	***65.469	***9.569	***16.334	***66.789	***23.091	***3.987	***151.009
	3	Deflated by MV_{it}	994	$A\text{-}R^2$	0.269	*0.328	*0.353	0.352	0.352	0.351	0.351	*0.360
				AIC	-0.187	*-0.270	*-0.307	-0.305	-0.303	-0.302	-0.300	*-0.313
				F-Test	183.550	***87.714	***39.863	0.068	0.189	0.177	0.343	***15.058
1994	2	Deflated by BV_{it}	1,061	$A\text{-}R^2$	0.212	*0.277	*0.295	*0.304	*0.333	*0.349	*0.372	*0.490
				AIC	0.373	*0.287	*0.264	*0.251	*0.209	*0.187	*0.152	*-0.056
				F-Test	143.293	***97.429	***26.825	***15.347	***47.282	***26.038	***39.936	***244.852
	3	Deflated by MV_{it}	1,058	$A\text{-}R^2$	0.181	*0.356	*0.357	0.357	0.356	0.356	*0.369	*0.413
				AIC	-0.114	*-0.354	*-0.355	-0.353	-0.351	-0.350	*-0.370	*-0.441
				F-Test	117.750	***289.010	2.118	0.194	0.547	0.533	***22.834	***79.226
1995	2	Deflated by BV_{it}	1,114	$A\text{-}R^2$	0.260	*0.279	*0.310	*0.311	*0.322	*0.326	0.325	*0.371
				AIC	-0.142	*-0.168	*-0.211	-0.211	*-0.227	*-0.231	-0.230	*-0.300
				F-Test	196.031	***31.302	***51.347	1.670	***19.972	***6.800	0.009	***82.083
	3	Deflated by MV_{it}	1,112	$A\text{-}R^2$	0.430	*0.473	*0.481	*0.489	*0.491	*0.497	*0.504	*0.540
				AIC	-0.727	*-0.806	*-0.820	*-0.834	*-0.837	*-0.849	*-0.861	*-0.937
				F-Test	419.269	***93.243	***17.133	***17.857	***5.766	***15.262	***15.069	***89.382
1996	2	Deflated by BV_{it}	1,157	$A\text{-}R^2$	0.128	*0.149	*0.164	0.164	*0.190	0.189	*0.189	*0.261
				AIC	0.447	*0.423	*0.406	0.407	*0.376	0.378	0.378	*0.287
				F-Test	85.501	***29.460	***22.721	0.325	***37.902	0.139	1.384	***111.790

Table 5.11 - Adjusted R^2, AIC and F-tests from Cross-sectional Estimations for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	Obs	Stat	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})
	3	Deflated by MV_{it}	1,155	$A\text{-}R^2$	0.444	*0.551	*0.551	*0.559	*0.565	*0.584	*0.587	*0.642
				AIC	-0.148	*-0.361	-0.360	*-0.378	*-0.390	*-0.434	*-0.440	*-0.584
				F-Test	461.696	***274.786	1.655	***22.281	***16.275	***53.482	***8.717	***179.967
1997	2	Deflated by BV_{it}	1,124	$A\text{-}R^2$	0.016	*0.076	*0.086	*0.176	*0.196	*0.241	*0.293	*0.316
				AIC	1.105	*1.043	*1.033	*0.931	*0.906	*0.850	*0.780	*0.748
				F-Test	10.275	***73.889	***13.248	***122.802	***29.704	***66.486	***83.668	***37.642
	3	Deflated by MV_{it}	1,122	$A\text{-}R^2$	0.202	*0.419	*0.423	0.422	*0.423	*0.427	*0.432	*0.520
				AIC	0.478	*0.161	*0.156	0.158	*0.158	*0.151	*0.143	*-0.024
				F-Test	143.255	***419.765	***6.880	0.009	**2.502	***10.041	***10.440	***204.068
1998	2	Deflated by BV_{it}	1,025	$A\text{-}R^2$	0.379	*0.399	*0.414	*0.418	*0.469	*0.472	*0.477	*0.510
				AIC	1.057	*1.025	*1.000	*0.996	*0.904	*0.900	*0.891	*0.826
				F-Test	313.567	***35.602	***27.188	***6.955	***99.506	***6.357	***11.706	***69.613
	3	Deflated by MV_{it}	1,024	$A\text{-}R^2$	0.296	*0.386	*0.388	0.388	*0.403	0.402	*0.406	*0.443
				AIC	0.237	*0.100	*0.097	0.099	*0.076	0.078	*0.071	*0.009
				F-Test	215.731	***152.192	***4.308	0.649	***25.507	0.123	***8.499	***67.508
1999	2	Deflated by BV_{it}	921	$A\text{-}R^2$	0.004	*0.055	*0.190	*0.198	*0.224	*0.275	*0.279	*0.491
				AIC	3.517	*3.466	*3.312	*3.304	*3.272	*3.205	*3.200	*2.852
				F-Test	2.940	***49.917	***154.745	***9.768	***31.754	***65.827	***6.332	***381.516
	3	Deflated by MV_{it}	920	$A\text{-}R^2$	0.464	*0.469	*0.477	*0.480	*0.481	*0.501	*0.517	*0.531
				AIC	-0.100	*-0.108	*-0.123	*-0.127	*-0.128	*-0.167	*-0.198	*-0.225
				F-Test	399.308	***9.327	***15.214	***6.044	**2.551	***38.464	***31.270	***27.095
Pool	2	Deflated by BV_{it}	9,302	$A\text{-}R^2$	0.040	*0.052	*0.071	0.071	*0.072	*0.074	0.074	*0.181
				AIC	1.644	*1.631	*1.611	1.611	*1.610	*1.608	1.608	*1.485
				F-Test	192.521	***118.828	***196.222	0.459	***7.026	***26.363	0.355	***1215.824
	3	Deflated by MV_{it}	9,277	$A\text{-}R^2$	0.395	*0.396	*0.398	0.398	*0.401	*0.402	*0.412	*0.447
				AIC	0.895	*0.894	*0.891	0.891	*0.886	*0.884	*0.867	*0.806
				F-Test	3,029.954	***12.013	***31.201	0.935	***50.353	***21.667	***158.773	***580.887

Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by *BVit* (3) deflated by *MVit*. in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}.

* indicates the validity of adding an additional independent variable, and applies to $A\text{-}R^2$ and AIC only. ** , *** = significant at the 5% and 1% level respectively under H_0: additional variable contributes nothing to the equation, and applies to F-tests only.

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1991	2	Deflated by BV_{it}	Coeff	-152,623	-0.011	0.519								0.229	962
			t-Stat	(-0.856)	(-0.794)	***(16.573)									
			h-Stat	(-0.789)	(-0.674)	***(2.684)									
	3	Deflated by MV_{it}	Coeff	119,043	-0.037	1.155								0.580	956
			t-Stat	(0.906)	**(-1.964)	***(36.061)									
			h-Stat	(0.336)	**(-2.183)	***(3.759)									
1992	2	Deflated by BV_{it}	Coeff	54,204.7	0.019	0.399								0.143	940
			t-Stat	(0.255)	(1.185)	***(12.581)									
			h-Stat	(0.288)	(1.430)	***(3.175)									
	3	Deflated by MV_{it}	Coeff	-156,362	-0.017	0.403								0.498	936
			t-Stat	(-0.665)	(-0.637)	***(30.064)									
			h-Stat	(-0.396)	(-0.818)	***(8.517)									
1993	2	Deflated by BV_{it}	Coeff	-280,845	0.062	0.117								0.047	998
			t-Stat	(-1.573)	***(4.778)	***(6.862)									
			h-Stat	(-1.418)	***(5.280)	(1.211)									
	3	Deflated by MV_{it}	Coeff	282,716	-0.006	0.377								0.269	994
			t-Stat	***(2.905)	(-0.804)	***(19.141)									
			h-Stat	(0.679)	(-0.479)	***(2.962)									
1994	2	Deflated by BV_{it}	Coeff	-242,765	0.052	0.337								0.212	1,061
			t-Stat	(-1.369)	***(4.048)	***(16.870)									
			h-Stat	(-1.105)	***(3.457)	**(2.078)									
	3	Deflated by MV_{it}	Coeff	274,215	-0.013	0.264								0.181	1,058
			t-Stat	***(2.696)	(-1.564)	***(15.015)									
			h-Stat	(0.520)	(-0.721)	**(1.982)									
1995	2	Deflated by BV_{it}	Coeff	129,062	0.025	0.525								0.260	1,114
			t-Stat	(0.947)	**(2.551)	***(19.789)									
			h-Stat	(0.790)	**(2.504)	***(4.706)									
	3	Deflated by MV_{it}	Coeff	-252,769	0.010	0.714								0.430	1,112
			t-Stat	***(-3.446)	*(1.782)	***(28.781)									
			h-Stat	(-1.006)	(1.301)	***(4.335)									
1996	2	Deflated by BV_{it}	Coeff	-604,967	0.064	0.343								0.128	1,157
			t-Stat	***(-3.330)	***(5.045)	***(12.410)									
			h-Stat	***(-3.022)	***(4.326)	***(2.931)									
	3	Deflated by MV_{it}	Coeff	393,489	-0.007	0.518								0.444	1,155
			t-Stat	***(4.048)	(-0.963)	***(29.962)									
			h-Stat	(0.952)	(-0.612)	***(3.873)									
1997	2	Deflated by BV_{it}	Coeff	-502,971	0.051	0.105								0.016	1,124
			t-Stat	*(-1.930)	***(2.878)	***(3.937)									
			h-Stat	**(-2.055)	**(2.366)	(0.600)									
	3	Deflated by MV_{it}	Coeff	630,520	-0.028	0.375								0.202	1,122
			t-Stat	***(4.859)	***(-2.757)	***(16.876)									
			h-Stat	(1.032)	*(-1.674)	(1.608)									

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	Obs
1998	2	Deflated by BV_{it}	Coeff	9,097	0.019	0.748								0.379	1,025
			t-Stat	(0.036)	(1.063)	***(24.810)									
			h-Stat	(0.025)	(0.698)	***(3.741)									
	3	Deflated by MV_{it}	Coeff	-1,099,993	0.011	0.495								0.296	1,024
			t-Stat	***(-10.325)	(1.094)	***(17.490)									
			h-Stat	***(-3.788)	(1.101)	***(4.572)									
1999	2	Deflated by BV_{it}	Coeff	-1,963,579	0.081	-0.124								0.004	921
			t-Stat	**(-2.081)	(1.281)	(-1.378)									
			h-Stat	**(-2.190)	(0.986)	(-0.322)									
	3	Deflated by MV_{it}	Coeff	-461,617	-0.015	0.618								0.464	920
			t-Stat	***(-3.840)	*(-1.759)	***(27.131)									
			h-Stat	(-1.622)	(-1.479)	***(3.654)									
1991	2	Deflated by BV_{it}	Coeff	-148,741	0.001	0.513	-0.007							0.230	962
			t-Stat	(-0.835)	(0.082)	***(16.204)	(-1.335)								
			h-Stat	(-0.771)	(0.046)	***(2.693)	(-0.444)								
	3	Deflated by MV_{it}	Coeff	1,132,619	-0.004	1.198	-0.050							0.647	956
			t-Stat	***(7.989)	(-0.248)	***(40.560)	***(-13.521)								
			h-Stat	**(2.561)	(-0.229)	***(5.177)	***(-2.626)								
1992	2	Deflated by BV_{it}	Coeff	42,066	-0.009	0.409	0.017							0.148	940
			t-Stat	(0.198)	(-0.458)	***(12.834)	**(2.458)								
			h-Stat	(0.225)	(-0.378)	***(3.324)	(1.096)								
	3	Deflated by MV_{it}	Coeff	415,749	0.002	0.334	-0.033							0.511	936
			t-Stat	(1.606)	(0.073)	***(17.589)	***(-4.999)								
			h-Stat	(0.836)	(0.040)	***(2.747)	(-0.674)								
1993	2	Deflated by BV_{it}	Coeff	-272,199	-0.005	0.146	0.041							0.105	998
			t-Stat	(-1.573)	(-0.333)	***(8.604)	***(8.087)								
			h-Stat	(-1.367)	(-0.197)	(1.587)	**(2.476)								
	3	Deflated by MV_{it}	Coeff	-292,985	-0.015	0.350	0.027							0.328	994
			t-Stat	***(-2.621)	*(-1.905)	***(18.287)	***(9.361)								
			h-Stat	(-0.892)	(-1.459)	***(2.802)	**(2.576)								
1994	2	Deflated by BV_{it}	Coeff	-276,791	-0.029	0.362	0.051							0.277	1,061
			t-Stat	(-1.630)	*(-1.959)	***(18.769)	***(9.866)								
			h-Stat	(-1.226)	(-0.743)	***(2.955)	**(2.103)								
	3	Deflated by MV_{it}	Coeff	-604,846	-0.027	0.241	0.041							0.356	1,058
			t-Stat	***(-5.818)	***(-3.801)	***(15.428)	***(16.992)								
			h-Stat	***(-2.909)	***(-2.586)	***(4.516)	***(3.551)								
1995	2	Deflated by BV_{it}	Coeff	141,806	-0.019	0.530	0.028							0.279	1,114
			t-Stat	(1.054)	(-1.546)	***(20.239)	***(5.592)								
			h-Stat	(0.876)	(-1.079)	***(5.108)	**(2.579)								
	3	Deflated by MV_{it}	Coeff	-639,291	-0.001	0.613	0.023							0.473	1,112
			t-Stat	***(-7.886)	(-0.206)	***(23.504)	***(9.652)								
			h-Stat	***(-3.089)	(-0.149)	***(6.022)	***(2.923)								

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1996	2	Deflated by BV_{it}	Coeff	-567,730	0.021	0.340	0.026							0.149	1,157
			t-Stat	***(-3.161)	(1.412)	***(12.428)	***(5.425)								
			h-Stat	***(-2.863)	(0.885)	***(3.292)	(1.476)								
	3	Deflated by MV_{it}	Coeff	-511,992	-0.025	0.279	0.043							0.551	1,155
			t-Stat	***(-4.967)	***(-3.623)	***(13.175)	***(16.569)								
			h-Stat	**(-2.513)	**(-2.107)	***(2.639)	***(3.353)								
1997	2	Deflated by BV_{it}	Coeff	-322,840	-0.014	0.211	0.032							0.076	1,124
			t-Stat	(-1.274)	(-0.766)	***(7.366)	***(8.592)								
			h-Stat	(-1.444)	(-0.572)	(1.304)	***(2.674)								
	3	Deflated by MV_{it}	Coeff	-734,603	-0.046	0.157	0.057							0.419	1,122
			t-Stat	***(-5.685)	***(-5.247)	***(7.233)	***(20.479)								
			h-Stat	***(-4.047)	***(-5.085)	(1.190)	***(5.941)								
1998	2	Deflated by BV_{it}	Coeff	-196,356	0.082	0.686	-0.030							0.399	1,025
			t-Stat	(-0.774)	***(3.989)	***(21.814)	***(-5.964)								
			h-Stat	(-0.752)	(1.161)	***(5.350)	(-0.724)								
	3	Deflated by MV_{it}	Coeff	-429,567	0.038	0.657	-0.038							0.386	1,024
			t-Stat	***(-3.790)	***(4.092)	***(22.269)	***(-12.331)								
			h-Stat	(-1.430)	***(3.749)	***(8.296)	***(-4.293)								
1999	2	Deflated by BV_{it}	Coeff	-1,899,030	-0.135	-0.229	0.116							0.055	921
			t-Stat	**(-2.066)	*(-1.953)	***(-2.582)	***(7.061)								
			h-Stat	**(-2.049)	(-0.402)	(-0.475)	(0.564)								
	3	Deflated by MV_{it}	Coeff	-698,497	-0.015	0.611	0.006							0.469	920
			t-Stat	***(-4.897)	*(-1.778)	***(26.785)	***(3.052)								
			h-Stat	***(-3.293)	*(-1.783)	***(3.487)	(1.331)								
1991	2	Deflated by BV_{it}	Coeff	-149,601	0.005	0.520	-0.007	-0.040						0.230	962
			t-Stat	(-0.840)	(0.273)	***(16.001)	(-1.314)	(-1.001)							
			h-Stat	(-0.772)	(0.153)	***(2.665)	(-0.438)	(-0.554)							
	3	Deflated by MV_{it}	Coeff	1,097,942	0.014	1.082	-0.074	0.230						0.657	956
			t-Stat	***(7.846)	(0.804)	***(29.848)	***(-12.754)	***(5.321)							
			h-Stat	**(2.502)	(0.696)	***(4.241)	***(-2.831)	(1.313)							
1992	2	Deflated by BV_{it}	Coeff	46,122	0.013	0.426	0.020	-0.158						0.159	940
			t-Stat	(0.219)	(0.629)	***(13.309)	***(2.845)	***(-3.703)							
			h-Stat	(0.241)	(0.334)	***(3.377)	(1.460)	(-1.006)							
	3	Deflated by MV_{it}	Coeff	622,745	0.014	0.313	-0.064	0.244						0.520	936
			t-Stat	**(2.388)	(0.515)	***(16.091)	***(-6.639)	***(4.374)							
			h-Stat	(0.984)	(0.330)	***(2.660)	(-0.940)	(0.613)							
1993	2	Deflated by BV_{it}	Coeff	-277,278	-0.018	0.128	0.041	0.081						0.113	998
			t-Stat	(-1.609)	(-1.173)	***(7.146)	***(8.096)	***(3.092)							
			h-Stat	(-1.395)	(-0.621)	(1.307)	**(2.505)	(1.515)							
	3	Deflated by MV_{it}	Coeff	-187,348	-0.016	0.312	0.011	0.156						0.353	994
			t-Stat	*(-1.689)	**(-2.067)	***(15.866)	***(2.761)	***(6.311)							
			h-Stat	(-0.576)	*(-1.745)	**(2.321)	(0.893)	*(1.797)							

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1994	2	Deflated by BV_{it}	Coeff	-321,754	-0.027	0.267	0.046	0.062						0.295	1,061
			t-Stat	*(-1.915)	*(-1.863)	***(10.092)	***(8.717)	***(5.177)							
			h-Stat	(-1.402)	(-0.927)	**(2.328)	***(2.583)	(1.390)							
	3	Deflated by MV_{it}	Coeff	-589,517	-0.026	0.267	0.042	-0.022						0.357	1,058
			t-Stat	***(-5.645)	***(-3.637)	***(11.212)	***(17.063)	(-1.455)							
			h-Stat	***(-2.826)	**(-2.418)	***(4.476)	***(3.559)	(-0.604)							
1995	2	Deflated by BV_{it}	Coeff	110,714	-0.035	0.502	0.024	0.106						0.310	1,114
			t-Stat	(0.841)	***(-2.877)	***(19.380)	***(5.011)	***(7.162)							
			h-Stat	(0.679)	**(-1.969)	***(5.025)	**(2.234)	***(4.656)							
	3	Deflated by MV_{it}	Coeff	-611,032	0.004	0.621	0.024	-0.072						0.481	1,112
			t-Stat	***(-7.564)	(0.691)	***(23.935)	***(10.345)	***(-4.137)							
			h-Stat	***(-3.045)	(0.397)	***(6.065)	***(3.077)	(-0.963)							
1996	2	Deflated by BV_{it}	Coeff	-550,551	0.008	0.335	0.021	0.073						0.164	1,157
			t-Stat	***(-3.093)	(0.569)	***(12.355)	***(4.403)	***(4.765)							
			h-Stat	***(-2.814)	(0.328)	***(3.283)	(1.427)	**(1.962)							
	3	Deflated by MV_{it}	Coeff	-521,450	-0.025	0.290	0.045	-0.012						0.551	1,155
			t-Stat	***(-5.048)	***(-3.648)	***(12.771)	***(14.650)	(-1.286)							
			h-Stat	**(-2.563)	**(-2.157)	**(2.363)	***(2.639)	(-0.283)							
1997	2	Deflated by BV_{it}	Coeff	-317,492	-0.033	0.227	0.033	0.080						0.086	1,124
			t-Stat	(-1.260)	*(-1.731)	***(7.856)	***(8.881)	***(3.638)							
			h-Stat	(-1.433)	(-1.343)	(1.517)	***(2.582)	(0.984)							
	3	Deflated by MV_{it}	Coeff	-734,064	-0.045	0.146	0.051	0.047						0.423	1,122
			t-Stat	***(-5.696)	***(-5.117)	***(6.577)	***(14.031)	***(2.622)							
			h-Stat	***(-4.136)	***(-4.733)	(1.105)	***(4.937)	(1.068)							
1998	2	Deflated by BV_{it}	Coeff	-111,152	0.074	0.689	-0.016	-0.064						0.414	1,025
			t-Stat	(-0.443)	***(3.653)	***(22.181)	***(-2.812)	***(-5.212)							
			h-Stat	(-0.423)	(1.273)	***(5.568)	(-0.528)	(-1.088)							
	3	Deflated by MV_{it}	Coeff	-424,954	0.037	0.678	-0.033	-0.036						0.388	1,024
			t-Stat	***(-3.755)	***(4.032)	***(21.783)	***(-8.308)	**(-2.075)							
			h-Stat	(-1.400)	***(3.505)	***(7.557)	**(-2.565)	(-0.598)							
1999	2	Deflated by BV_{it}	Coeff	-1,720,248	-0.172	-0.088	0.054	0.532						0.190	921
			t-Stat	**(-2.022)	***(-2.687)	(-1.057)	***(3.418)	***(12.433)							
			h-Stat	*(-1.943)	(-0.550)	(-0.214)	(0.354)	(1.497)							
	3	Deflated by MV_{it}	Coeff	-653,432	-0.014	0.591	-0.005	0.083						0.477	920
			t-Stat	***(-4.601)	(-1.601)	***(25.490)	(-1.436)	***(3.898)							
			h-Stat	***(-3.162)	*(-1.660)	***(3.376)	(-0.732)	**(2.066)							
1991	2	Deflated by BV_{it}	Coeff	-137,955	-0.008	0.509	-0.006	-0.031	0.644					0.239	962
			t-Stat	(-0.779)	(-0.483)	***(15.687)	(-1.271)	(-0.776)	***(3.503)						
			h-Stat	(-0.727)	(-0.278)	***(2.627)	(-0.422)	(-0.426)	***(3.864)						
	3	Deflated by MV_{it}	Coeff	1,100,167	0.011	1.083	-0.074	0.228	0.338					0.657	956
			t-Stat	***(7.859)	(0.628)	***(29.850)	***(-12.774)	***(5.253)	(0.840)						
			h-Stat	**(2.505)	(0.541)	***(4.246)	***(-2.840)	(1.300)	(0.478)						

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1992	2	Deflated by BV_{it}	Coeff	88,636	0.003	0.435	0.020	-0.172	0.531					0.167	940
			t-Stat	(0.422)	(0.152)	***(13.593)	***(2.870)	***(-4.024)	***(3.030)						
			h-Stat	(0.452)	(0.085)	***(3.399)	(1.504)	(-1.083)	**(2.295)						
	3	Deflated by MV_{it}	Coeff	627,592	0.011	0.313	-0.064	0.243	0.258					0.520	936
			t-Stat	**(2.404)	(0.412)	***(16.049)	***(-6.645)	***(4.334)	(0.451)						
			h-Stat	(0.987)	(0.268)	***(2.655)	(-0.941)	(0.609)	(0.562)						
1993	2	Deflated by BV_{it}	Coeff	-246,927	-0.021	0.133	0.038	0.076	0.307					0.126	998
			t-Stat	(-1.443)	(-1.363)	***(7.474)	***(7.570)	***(2.924)	***(4.039)						
			h-Stat	(-1.220)	(-0.720)	(1.333)	**(2.525)	(1.440)	*(1.762)						
	3	Deflated by MV_{it}	Coeff	-185,995	-0.016	0.312	0.011	0.155	0.075					0.352	994
			t-Stat	*(-1.674)	**(-2.072)	***(15.858)	***(2.734)	***(6.279)	(0.261)						
			h-Stat	(-0.572)	*(-1.753)	**(2.321)	(0.887)	*(1.791)	(0.280)						
1994	2	Deflated by BV_{it}	Coeff	-311,511	-0.029	0.279	0.043	0.047	0.449					0.304	1,061
			t-Stat	*(-1.866)	**(-2.037)	***(10.542)	***(8.140)	***(3.736)	***(3.916)						
			h-Stat	(-1.362)	(-1.077)	***(2.583)	***(2.705)	(1.231)	*(1.729)						
	3	Deflated by MV_{it}	Coeff	-594,678	-0.027	0.267	0.042	-0.022	0.113					0.357	1,058
			t-Stat	***(-5.657)	***(-3.655)	***(11.209)	***(17.037)	(-1.465)	(0.440)						
			h-Stat	***(-2.842)	**(-2.377)	***(4.473)	***(3.562)	(-0.610)	(0.286)						
1995	2	Deflated by BV_{it}	Coeff	119,869	-0.034	0.497	0.024	0.110	-0.100					0.311	1,114
			t-Stat	(0.910)	***(-2.711)	***(18.971)	***(4.938)	***(7.273)	(-1.292)						
			h-Stat	(0.730)	*(-1.815)	***(4.944)	**(2.154)	***(4.294)	(-0.560)						
	3	Deflated by MV_{it}	Coeff	-602,224	0.008	0.592	0.026	-0.072	-0.670					0.489	1,112
			t-Stat	***(-7.509)	(1.351)	***(22.220)	***(10.912)	***(-4.146)	***(-4.224)						
			h-Stat	***(-2.934)	(0.721)	***(6.236)	***(3.309)	(-0.951)	(-1.558)						
1996	2	Deflated by BV_{it}	Coeff	-544,853	0.010	0.334	0.021	0.073	-0.057					0.164	1,157
			t-Stat	***(-3.056)	(0.649)	***(12.327)	***(4.366)	***(4.790)	(-0.570)						
			h-Stat	***(-2.741)	(0.382)	***(3.273)	(1.413)	**(1.967)	(-0.399)						
	3	Deflated by MV_{it}	Coeff	-566,566	-0.032	0.295	0.044	-0.011	1.065					0.559	1,155
			t-Stat	***(-5.511)	***(-4.579)	***(13.128)	***(14.404)	(-1.130)	***(4.718)						
			h-Stat	***(-2.835)	**(-2.515)	**(2.380)	***(2.720)	(-0.258)	*(1.768)						
1997	2	Deflated by BV_{it}	Coeff	-306,095	-0.063	0.324	0.035	0.058	0.866					0.176	1,124
			t-Stat	(-1.279)	***(-3.400)	***(11.258)	***(9.918)	***(2.789)	***(11.077)						
			h-Stat	(-1.453)	*(-1.842)	***(3.441)	***(2.856)	(1.118)	(1.328)						
	3	Deflated by MV_{it}	Coeff	-732,990	-0.045	0.146	0.051	0.047	-0.029					0.422	1,122
			t-Stat	***(-5.664)	***(-4.917)	***(6.575)	***(14.017)	***(2.620)	(-0.097)						
			h-Stat	***(-4.231)	***(-4.249)	(1.106)	***(4.927)	(1.067)	(-0.089)						
1998	2	Deflated by BV_{it}	Coeff	-128,593	0.066	0.695	-0.016	-0.066	0.253					0.418	1,025
			t-Stat	(-0.513)	***(3.241)	***(22.383)	***(-2.805)	***(-5.404)	***(2.636)						
			h-Stat	(-0.487)	(1.157)	***(5.549)	(-0.541)	(-1.139)	(0.735)						
	3	Deflated by MV_{it}	Coeff	-420,054	0.039	0.674	-0.033	-0.035	-0.147					0.388	1,024
			t-Stat	***(-3.706)	***(4.111)	***(21.449)	***(-8.313)	**(-1.994)	(-0.805)						
			h-Stat	(-1.371)	***(3.543)	***(7.363)	**(-2.547)	(-0.569)	(-0.577)						

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1999	2	Deflated by BV_{it}	Coeff	-1,646,292	-0.137	-0.072	0.057	0.508	-1.083					0.198	921
			t-Stat	*(-1.943)	**(-2.122)	(-0.867)	***(3.587)	***(11.721)	***(-3.124)						
			h-Stat	*(-1.811)	(-0.420)	(-0.169)	(0.368)	(1.372)	(-0.738)						
	3	Deflated by MV_{it}	Coeff	-636,330	-0.009	0.584	-0.005	0.087	-0.545					0.480	920
			t-Stat	***(-4.487)	(-1.079)	***(25.004)	(-1.473)	***(4.078)	**(-2.457)						
			h-Stat	***(-3.101)	(-0.988)	***(3.410)	(-0.747)	**(2.165)	*(-1.838)						
1991	2	Deflated by BV_{it}	Coeff	-164,116	-0.012	0.508	-0.007	-0.030	0.620	0.009				0.238	962
			t-Stat	(-0.911)	(-0.694)	***(15.605)	(-1.360)	(-0.754)	***(3.332)	(0.803)					
			h-Stat	(-0.842)	(-0.408)	***(2.609)	(-0.449)	(-0.407)	***(3.716)	(0.554)					
	3	Deflated by MV_{it}	Coeff	807,109	-0.009	1.028	-0.097	0.323	-0.010	0.106				0.674	956
			t-Stat	***(5.652)	(-0.512)	***(28.350)	***(-14.841)	***(7.270)	(-0.025)	***(7.018)					
			h-Stat	**(2.291)	(-0.514)	***(4.334)	***(-2.996)	(1.564)	(-0.015)	***(2.639)					
1992	2	Deflated by BV_{it}	Coeff	173,757	0.018	0.426	0.020	-0.160	0.609	-0.033				0.169	940
			t-Stat	(0.809)	(0.831)	***(13.170)	***(2.961)	***(-3.709)	***(3.387)	*(-1.893)					
			h-Stat	(0.709)	(0.342)	***(3.544)	(1.632)	(-1.134)	**(1.994)	(-0.713)					
	3	Deflated by MV_{it}	Coeff	337,481	-0.003	0.300	-0.074	0.274	-0.074	0.070				0.522	936
			t-Stat	(1.170)	(-0.112)	***(14.945)	***(-7.047)	***(4.769)	(-0.125)	**(2.339)					
			h-Stat	(0.583)	(-0.072)	**(2.458)	(-1.042)	(0.699)	(-0.167)	(0.829)					
1993	2	Deflated by BV_{it}	Coeff	-429,678	-0.058	0.187	0.031	0.065	0.067	0.086				0.181	998
			t-Stat	**(-2.569)	***(-3.669)	***(10.150)	***(6.219)	**(2.557)	(0.841)	***(8.168)					
			h-Stat	**(-2.172)	(-1.552)	**(1.997)	***(2.823)	(1.278)	(0.429)	**(2.342)					
	3	Deflated by MV_{it}	Coeff	-201,956	-0.017	0.315	0.010	0.155	0.053	0.006				0.352	994
			t-Stat	*(-1.725)	**(-2.114)	***(15.245)	**(2.391)	***(6.243)	(0.181)	(0.434)					
			h-Stat	(-0.544)	**(-2.041)	**(2.269)	(0.918)	*(1.744)	(0.173)	(0.160)					
1994	2	Deflated by BV_{it}	Coeff	-478,129	-0.052	0.291	0.034	0.024	0.276	0.074				0.333	1,061
			t-Stat	***(-2.895)	***(-3.624)	***(11.208)	***(6.492)	*(1.886)	**(2.396)	***(6.873)					
			h-Stat	**(-2.067)	**(-1.983)	***(2.863)	***(2.622)	(0.751)	(1.275)	***(3.785)					
	3	Deflated by MV_{it}	Coeff	-563,617	-0.025	0.266	0.042	-0.020	0.138	-0.009				0.356	1,058
			t-Stat	***(-4.977)	***(-3.316)	***(11.114)	***(15.609)	(-1.358)	(0.533)	(-0.739)					
			h-Stat	**(-2.325)	**(-2.167)	***(4.508)	***(3.518)	(-0.581)	(0.380)	(-0.321)					
1995	2	Deflated by BV_{it}	Coeff	3,454	-0.051	0.485	0.023	0.107	-0.141	0.037				0.322	1,114
			t-Stat	(0.026)	***(-3.941)	***(18.554)	***(4.768)	***(7.100)	*(-1.817)	***(4.467)					
			h-Stat	(0.021)	***(-2.707)	***(4.823)	**(2.012)	***(4.094)	(-0.794)	***(3.168)					
	3	Deflated by MV_{it}	Coeff	-656,365	0.004	0.599	0.023	-0.075	-0.787	0.024				0.491	1,112
			t-Stat	***(-7.894)	(0.645)	***(22.396)	***(9.147)	***(-4.330)	***(-4.754)	**(2.400)					
			h-Stat	***(-3.105)	(0.336)	***(6.408)	***(3.228)	(-1.009)	*(-1.840)	(1.052)					
1996	2	Deflated by BV_{it}	Coeff	-671,630	-0.019	0.354	0.016	0.061	-0.151	0.066				0.190	1,157
			t-Stat	***(-3.800)	(-1.203)	***(13.149)	***(3.423)	***(4.019)	(-1.527)	***(6.154)					
			h-Stat	***(-3.247)	(-0.585)	***(3.923)	(1.238)	*(1.807)	(-1.045)	**(2.322)					
	3	Deflated by MV_{it}	Coeff	-648,647	-0.035	0.308	0.039	-0.044	0.903	0.044				0.565	1,155
			t-Stat	***(-6.229)	***(-4.977)	***(13.634)	***(11.728)	***(-3.485)	***(3.964)	***(4.032)					
			h-Stat	***(-3.190)	***(-2.683)	***(2.677)	**(2.051)	(-1.212)	(1.622)	(1.463)					

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	Obs
1997	2	Deflated by BV_{it}	Coeff	-494,370	-0.093	0.291	0.030	0.064	0.741	0.070				0.196	1,124
			t-Stat	**(-2.070)	***(-4.895)	***(10.012)	***(8.378)	***(3.105)	***(9.207)	***(5.448)					
			h-Stat	**(-2.139)	**(-2.241)	***(3.091)	***(2.657)	(1.256)	(1.259)	**(2.292)					
	3	Deflated by MV_{it}	Coeff	-735,629	-0.046	0.150	0.047	0.036	-0.076	0.017				0.423	1,122
			t-Stat	***(-5.687)	***(-5.015)	***(6.716)	***(10.434)	*(1.917)	(-0.251)	(1.581)					
			h-Stat	***(-4.242)	***(-4.448)	(1.118)	***(2.625)	(0.751)	(-0.219)	(0.477)					
1998	2	Deflated by BV_{it}	Coeff	-486,647	0.021	0.629	-0.028	-0.071	0.060	0.114				0.469	1,025
			t-Stat	**(-2.012)	(1.071)	***(20.691)	***(-5.107)	***(-6.038)	(0.637)	***(9.970)					
			h-Stat	*(-1.846)	(0.421)	***(5.381)	(-1.083)	(-1.278)	(0.212)	***(4.207)					
	3	Deflated by MV_{it}	Coeff	-247,752	0.053	0.673	-0.026	-0.030	-0.068	-0.070				0.403	1,024
			t-Stat	**(-2.116)	***(5.476)	***(21.670)	***(-6.204)	*(-1.767)	(-0.376)	***(-5.048)					
			h-Stat	(-0.834)	***(3.839)	***(7.065)	*(-1.938)	(-0.475)	(-0.253)	*(-1.931)					
1999	2	Deflated by BV_{it}	Coeff	-892,958	-0.178	0.020	0.132	0.478	-0.853	-0.155				0.224	921
			t-Stat	(-1.058)	***(-2.775)	(0.241)	***(6.427)	***(11.131)	**(-2.483)	***(-5.632)					
			h-Stat	(-1.213)	(-0.607)	(0.046)	(0.941)	(1.340)	(-0.540)	(-0.928)					
	3	Deflated by MV_{it}	Coeff	-583,355	-0.005	0.575	-0.002	0.085	-0.524	-0.023				0.481	920
			t-Stat	***(-4.009)	(-0.602)	***(24.030)	(-0.369)	***(3.993)	**(-2.360)	(-1.596)					
			h-Stat	***(-2.637)	(-0.559)	***(3.406)	(-0.231)	**(2.149)	*(-1.747)	(-0.942)					
1991	2	Deflated by BV_{it}	Coeff	-192,042	-0.016	0.505	-0.008	-0.035	0.585	0.006	0.051			0.240	962
			t-Stat	(-1.064)	(-0.912)	***(15.524)	(-1.503)	(-0.879)	***(3.132)	(0.563)	*(1.858)				
			h-Stat	(-0.977)	(-0.549)	***(2.598)	(-0.487)	(-0.477)	***(3.578)	(0.381)	**(2.181)				
	3	Deflated by MV_{it}	Coeff	785,575	-0.010	1.028	-0.097	0.325	-0.002	0.106	0.017			0.673	956
			t-Stat	***(5.184)	(-0.571)	***(28.336)	***(-14.823)	***(7.278)	(-0.006)	***(6.916)	(0.426)				
			h-Stat	**(2.318)	(-0.568)	***(4.323)	***(-2.997)	(1.570)	(-0.003)	***(2.644)	(0.339)				
1992	2	Deflated by BV_{it}	Coeff	222,698	0.018	0.409	0.024	-0.132	0.570	-0.015	-0.127			0.185	940
			t-Stat	(1.046)	(0.811)	***(12.686)	***(3.533)	***(-3.057)	***(3.195)	(-0.874)	***(-4.371)				
			h-Stat	(0.865)	(0.358)	***(3.610)	**(2.069)	(-1.151)	**(2.007)	(-0.469)	(-1.269)				
	3	Deflated by MV_{it}	Coeff	450,578	0.004	0.299	-0.075	0.272	-0.094	0.078	-0.108			0.523	936
			t-Stat	(1.518)	(0.158)	***(14.872)	***(-7.142)	***(4.741)	(-0.160)	**(2.561)	(-1.605)				
			h-Stat	(0.796)	(0.108)	**(2.461)	(-1.061)	(0.696)	(-0.214)	(0.886)	(-0.973)				
1993	2	Deflated by BV_{it}	Coeff	-459,881	-0.063	0.220	0.027	0.066	0.115	0.072	0.108			0.198	998
			t-Stat	***(-2.778)	***(-4.031)	***(11.289)	***(5.400)	***(2.652)	(1.448)	***(6.633)	***(4.803)				
			h-Stat	**(-2.305)	*(-1.684)	***(2.677)	**(2.470)	(1.362)	(0.856)	*(1.912)	**(2.260)				
	3	Deflated by MV_{it}	Coeff	-192,571	-0.017	0.312	0.010	0.155	0.054	0.007	-0.012			0.351	994
			t-Stat	(-1.615)	**(-2.026)	***(14.327)	**(2.347)	***(6.236)	(0.185)	(0.515)	(-0.420)				
			h-Stat	(-0.493)	**(-2.021)	**(2.232)	(0.916)	*(1.741)	(0.176)	(0.198)	(-0.209)				
1994	2	Deflated by BV_{it}	Coeff	-513,436	-0.055	0.290	0.029	0.017	0.223	0.063	0.121			0.349	1,061
			t-Stat	***(-3.142)	***(-3.833)	***(11.299)	***(5.439)	(1.323)	*(1.954)	***(5.731)	***(5.100)				
			h-Stat	**(-2.205)	**(-2.246)	***(2.966)	**(2.519)	(0.558)	(1.112)	***(3.644)	***(2.710)				
	3	Deflated by MV_{it}	Coeff	-538,479	-0.024	0.265	0.042	-0.021	0.132	-0.007	-0.022			0.356	1,058
			t-Stat	***(-4.548)	***(-3.133)	***(11.069)	***(15.136)	(-1.366)	(0.508)	(-0.554)	(-0.729)				
			h-Stat	**(-2.121)	**(-2.171)	***(4.491)	***(3.497)	(-0.584)	(0.361)	(-0.239)	(-0.517)				

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1995	2	Deflated by BV_{it}	Coeff	-22,391	-0.054	0.479	0.022	0.104	-0.161	0.034	0.049			0.326	1,114
			t-Stat	(-0.168)	***(-4.164)	***(18.322)	***(4.494)	***(6.932)	**(-2.064)	***(4.060)	***(2.607)				
			h-Stat	(-0.133)	***(-2.918)	***(4.839)	**(2.109)	***(4.065)	(-0.915)	***(2.869)	*(1.711)				
	3	Deflated by MV_{it}	Coeff	-718,807	-0.002	0.609	0.024	-0.074	-0.744	0.016	0.089			0.497	1,112
			t-Stat	***(-8.542)	(-0.293)	***(22.813)	***(9.542)	***(-4.265)	***(-4.508)	(1.586)	***(3.905)				
			h-Stat	***(-3.440)	(-0.172)	***(6.564)	***(3.357)	(-0.997)	*(-1.905)	(0.698)	**(2.477)				
1996	2	Deflated by BV_{it}	Coeff	-672,896	-0.020	0.353	0.016	0.061	-0.153	0.065	0.009			0.189	1,157
			t-Stat	***(-3.805)	(-1.240)	***(13.109)	***(3.356)	***(3.998)	(-1.549)	***(5.988)	(0.372)				
			h-Stat	***(-3.240)	(-0.582)	***(3.911)	(1.261)	*(1.810)	(-1.072)	**(2.359)	(0.218)				
	3	Deflated by MV_{it}	Coeff	-533,974	-0.027	0.322	0.033	-0.032	0.752	0.081	-0.198			0.584	1,155
			t-Stat	***(-5.182)	***(-4.006)	***(14.535)	***(9.986)	**(-2.551)	***(3.362)	***(6.892)	***(-7.310)				
			h-Stat	**(-2.430)	**(-2.477)	***(2.933)	**(2.019)	(-0.982)	(1.556)	***(2.780)	***(-2.925)				
1997	2	Deflated by BV_{it}	Coeff	-450,376	-0.097	0.298	0.026	0.063	0.469	0.036	0.208			0.241	1,124
			t-Stat	*(-1.940)	***(-5.218)	***(10.539)	***(7.515)	***(3.113)	***(5.514)	***(2.761)	***(8.150)				
			h-Stat	**(-2.051)	***(-2.633)	***(3.110)	**(2.203)	(1.402)	(1.133)	**(2.012)	*(1.881)				
	3	Deflated by MV_{it}	Coeff	-733,373	-0.043	0.147	0.044	0.045	-0.103	0.041	-0.111			0.427	1,122
			t-Stat	***(-5.693)	***(-4.644)	***(6.618)	***(9.811)	**(2.372)	(-0.341)	***(3.094)	***(-3.167)				
			h-Stat	***(-4.047)	***(-4.632)	(1.138)	***(2.851)	(0.894)	(-0.317)	(1.385)	*(-1.720)				
1998	2	Deflated by BV_{it}	Coeff	-476,557	0.016	0.623	-0.030	-0.069	0.012	0.108	0.069			0.472	1,025
			t-Stat	**(-1.975)	(0.814)	***(20.483)	***(-5.368)	***(-5.900)	(0.129)	***(9.275)	**(2.520)				
			h-Stat	*(-1.814)	(0.326)	***(5.354)	(-1.154)	(-1.267)	(0.046)	***(4.307)	*(1.732)				
	3	Deflated by MV_{it}	Coeff	-250,013	0.053	0.674	-0.026	-0.030	-0.068	-0.072	0.010			0.402	1,024
			t-Stat	**(-2.131)	***(5.402)	***(21.576)	***(-6.187)	*(-1.733)	(-0.376)	***(-4.846)	(0.350)				
			h-Stat	(-0.847)	***(3.607)	***(7.032)	*(-1.933)	(-0.468)	(-0.253)	**(-2.098)	(0.174)				
1999	2	Deflated by BV_{it}	Coeff	-758,901	-0.250	0.186	0.154	0.486	-0.828	0.015	-0.543			0.275	921
			t-Stat	(-0.930)	***(-4.004)	**(2.247)	***(7.702)	***(11.709)	**(-2.495)	(0.435)	***(-8.109)				
			h-Stat	(-1.054)	(-0.831)	(0.496)	(1.072)	(1.423)	(-0.521)	(0.119)	*(-1.721)				
	3	Deflated by MV_{it}	Coeff	-562,947	0.004	0.554	-0.004	0.074	-0.553	0.005	-0.151			0.501	920
			t-Stat	***(-3.946)	(0.457)	***(23.408)	(-0.905)	***(3.500)	**(-2.539)	(0.349)	***(-6.199)				
			h-Stat	***(-2.756)	(0.365)	***(3.616)	(-0.576)	*(1.863)	*(-1.922)	(0.211)	***(-2.673)				
1991	2	Deflated by BV_{it}	Coeff	-215,787	-0.022	0.490	0.011	-0.034	0.588	0.009	0.047	-0.034		0.244	962
			t-Stat	(-1.196)	(-1.242)	***(14.793)	(1.149)	(-0.874)	***(3.156)	(0.783)	*(1.740)	**(-2.391)			
			h-Stat	(-1.043)	(-0.856)	**(2.569)	(0.794)	(-0.476)	***(3.522)	(0.517)	**(2.079)	(-0.774)			
	3	Deflated by MV_{it}	Coeff	1,016,282	0.007	1.010	-0.161	0.299	0.048	0.095	0.068	0.105		0.682	956
			t-Stat	***(6.518)	(0.380)	***(28.073)	***(-11.613)	***(6.758)	(0.124)	***(6.216)	*(1.666)	***(5.209)			
			h-Stat	***(2.819)	(0.308)	***(4.445)	***(-3.010)	(1.494)	(0.069)	**(2.284)	(1.099)	*(1.760)			
1992	2	Deflated by BV_{it}	Coeff	208,326	0.015	0.400	0.033	-0.132	0.573	-0.014	-0.127	-0.019		0.185	940
			t-Stat	(0.976)	(0.688)	***(12.020)	***(2.979)	***(-3.049)	***(3.210)	(-0.793)	***(-4.379)	(-1.052)			
			h-Stat	(0.811)	(0.310)	***(3.528)	**(1.982)	(-1.151)	**(2.025)	(-0.436)	(-1.280)	(-0.599)			
	3	Deflated by MV_{it}	Coeff	616,888	0.008	0.331	-0.108	0.250	-0.167	0.082	-0.085	0.057		0.524	936
			t-Stat	**(1.997)	(0.275)	***(12.697)	***(-5.290)	***(4.271)	(-0.284)	***(2.700)	(-1.253)	*(1.901)			
			h-Stat	(0.831)	(0.188)	***(2.714)	(-0.981)	(0.677)	(-0.395)	(0.907)	(-0.734)	(0.623)			

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1993	2	Deflated by BV_{it}	Coeff	-478,224	-0.071	0.209	0.044	0.062	0.133	0.076	0.108	-0.031		0.201	998
			t-Stat	***(-2.889)	***(-4.416)	***(10.355)	***(4.432)	**(2.495)	*(1.673)	***(6.890)	***(4.773)	**(-1.996)			
			h-Stat	**(-2.325)	(-1.645)	***(2.592)	(1.577)	(1.315)	(1.020)	*(1.910)	**(2.200)	(-0.824)			
	3	Deflated by MV_{it}	Coeff	-180,250	-0.016	0.314	0.005	0.155	0.052	0.008	-0.011	0.008		0.351	994
			t-Stat	(-1.489)	**(-1.977)	***(14.267)	(0.647)	***(6.245)	(0.175)	(0.567)	(-0.380)	(0.586)			
			h-Stat	(-0.473)	*(-1.950)	**(2.238)	(0.317)	*(1.747)	(0.167)	(0.216)	(-0.185)	(0.241)			
1994	2	Deflated by BV_{it}	Coeff	-442,318	-0.020	0.335	-0.025	0.005	0.154	0.048	0.124	0.090		0.372	1,061
			t-Stat	***(-2.750)	(-1.292)	***(12.789)	**(-2.494)	(0.405)	(1.365)	***(4.387)	***(5.327)	***(6.317)			
			h-Stat	**(-2.041)	(-0.810)	***(3.692)	(-1.176)	(0.182)	(0.813)	***(2.999)	***(2.978)	***(2.841)			
	3	Deflated by MV_{it}	Coeff	-405,235	-0.021	0.257	0.011	-0.007	0.187	-0.009	-0.004	0.050		0.369	1,058
			t-Stat	***(-3.364)	***(-2.731)	***(10.808)	(1.627)	(-0.467)	(0.728)	(-0.702)	(-0.151)	***(4.776)			
			h-Stat	(-1.616)	**(-1.989)	***(4.421)	(0.585)	(-0.211)	(0.539)	(-0.299)	(-0.107)	*(1.657)			
1995	2	Deflated by BV_{it}	Coeff	-22,489	-0.053	0.479	0.021	0.104	-0.161	0.034	0.050	0.001		0.325	1,114
			t-Stat	(-0.169)	***(-3.942)	***(18.295)	**(2.331)	***(6.901)	**(-2.064)	***(4.011)	***(2.584)	(0.095)			
			h-Stat	(-0.134)	**(-2.255)	***(4.846)	(0.894)	***(4.089)	(-0.914)	***(3.054)	*(1.898)	(0.046)			
	3	Deflated by MV_{it}	Coeff	-645,395	0.000	0.606	0.008	-0.073	-0.660	0.015	0.094	0.029		0.504	1,112
			t-Stat	***(-7.528)	(-0.047)	***(22.861)	(1.553)	***(-4.232)	***(-3.989)	(1.495)	***(4.160)	***(3.880)			
			h-Stat	***(-3.086)	(-0.028)	***(6.515)	(0.666)	(-1.004)	*(-1.938)	(0.676)	***(2.705)	(1.632)			
1996	2	Deflated by BV_{it}	Coeff	-670,482	-0.023	0.344	0.025	0.063	-0.155	0.066	0.006	-0.017		0.189	1,157
			t-Stat	***(-3.792)	(-1.435)	***(12.308)	***(2.778)	***(4.115)	(-1.566)	***(6.044)	(0.241)	(-1.176)			
			h-Stat	***(-3.243)	(-0.641)	***(3.791)	(1.223)	*(1.881)	(-1.077)	**(2.335)	(0.149)	(-0.615)			
	3	Deflated by MV_{it}	Coeff	-630,829	-0.032	0.324	0.049	-0.021	0.666	0.090	-0.198	-0.030		0.587	1,155
			t-Stat	***(-5.851)	***(-4.530)	***(14.685)	***(7.871)	(-1.637)	***(2.963)	***(7.446)	***(-7.333)	***(-2.951)			
			h-Stat	***(-2.734)	***(-2.617)	***(2.877)	**(2.134)	(-0.710)	(1.569)	***(3.191)	***(-3.047)	(-1.141)			
1997	2	Deflated by BV_{it}	Coeff	-371,934	-0.030	0.385	-0.070	0.059	0.436	0.030	0.232	0.117		0.293	1,124
			t-Stat	*(-1.659)	(-1.538)	***(13.330)	***(-6.330)	***(3.051)	***(5.308)	**(2.345)	***(9.369)	***(9.143)			
			h-Stat	*(-1.734)	(-0.764)	***(4.728)	**(-2.366)	*(1.819)	(1.135)	*(1.756)	**(2.166)	***(4.057)			
	3	Deflated by MV_{it}	Coeff	-515,327	-0.034	0.162	0.023	0.039	-0.036	0.015	-0.124	0.044		0.432	1,122
			t-Stat	***(-3.555)	***(-3.618)	***(7.177)	***(2.806)	**(2.019)	(-0.118)	(0.989)	***(-3.535)	***(3.230)			
			h-Stat	**(-2.093)	**(-2.503)	(1.164)	(0.648)	(0.717)	(-0.110)	(0.644)	*(-1.935)	(1.068)			
1998	2	Deflated by BV_{it}	Coeff	-475,914	0.047	0.613	-0.057	-0.070	-0.026	0.095	0.062	0.035		0.477	1,025
			t-Stat	**(-1.983)	**(2.134)	***(20.182)	***(-5.896)	***(-6.037)	(-0.273)	***(7.796)	**(2.279)	***(3.420)			
			h-Stat	*(-1.821)	(0.962)	***(5.340)	*(-1.802)	(-1.262)	(-0.096)	***(3.637)	*(1.723)	(1.114)			
	3	Deflated by MV_{it}	Coeff	-178,118	0.055	0.656	-0.043	-0.035	-0.092	-0.077	0.011	0.041		0.406	1,024
			t-Stat	(-1.491)	***(5.586)	***(20.632)	***(-5.938)	**(-2.017)	(-0.509)	***(-5.174)	(0.383)	***(2.914)			
			h-Stat	(-0.543)	***(3.847)	***(7.992)	*(-1.807)	(-0.557)	(-0.337)	**(-2.408)	(0.189)	(0.960)			
1999	2	Deflated by BV_{it}	Coeff	-712,403	-0.178	0.165	0.075	0.489	-0.885	-0.028	-0.567	0.125		0.279	921
			t-Stat	(-0.876)	***(-2.586)	**(1.986)	**(2.016)	***(11.810)	***(-2.668)	(-0.743)	***(-8.403)	**(2.515)			
			h-Stat	(-1.015)	(-0.628)	(0.436)	(0.566)	(1.432)	(-0.560)	(-0.246)	*(-1.773)	*(1.942)			
	3	Deflated by MV_{it}	Coeff	-792,797	-0.003	0.571	0.044	0.081	-0.525	0.013	-0.147	-0.098		0.517	920
			t-Stat	***(-5.421)	(-0.370)	***(24.310)	***(4.665)	***(3.886)	**(-2.451)	(0.858)	***(-6.127)	***(-5.589)			
			h-Stat	***(-3.866)	(-0.337)	***(3.900)	**(2.343)	**(2.043)	**(-1.974)	(0.544)	***(-2.749)	**(-2.220)			

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	$\omega_{11}(RI_{it})$	$\omega_{12}(OA_{it})$	$\omega_{13}(CI_{it})$	$\omega_{14}(RD_{it})$	$\omega_{15}(HR_{it})$	$\omega_{16}(DC_{it})$	$\omega_{17}(TD_{it})$	$\omega_{18}(DIV_{it})$	$A\text{-}R^2$	Obs
1991	2	Deflated by BV_{it}	Coeff	-96,136	-0.053	0.445	0.001	-0.036	0.420	0.001	0.026	-0.028	0.714	0.258	962
			t-Stat	(-0.532)	***(-2.787)	***(12.964)	(0.086)	(-0.913)	**(2.228)	(0.135)	(0.936)	*(-1.931)	***(4.409)		
			h-Stat	(-0.520)	(-1.643)	**(2.252)	(0.054)	(-0.492)	***(2.794)	(0.093)	(0.947)	(-0.615)	*(1.663)		
	3	Deflated by MV_{it}	Coeff	1,135,779	-0.035	0.907	-0.196	0.240	-0.165	0.103	0.031	0.127	1.761	0.693	956
			t-Stat	***(7.354)	*(-1.829)	***(23.058)	***(-13.222)	***(5.382)	(-0.428)	***(6.875)	(0.765)	***(6.304)	***(5.982)		
			h-Stat	***(3.165)	(-1.238)	***(3.893)	***(-3.413)	(1.398)	(-0.240)	***(2.604)	(0.500)	**(2.188)	*(1.833)		
1992	2	Deflated by BV_{it}	Coeff	456,456	-0.040	0.305	0.010	-0.140	0.286	-0.033	-0.176	-0.001	1.508	0.222	940
			t-Stat	**(2.155)	*(-1.733)	***(8.583)	(0.909)	***(-3.322)	(1.591)	*(-1.860)	***(-6.016)	(-0.052)	***(6.697)		
			h-Stat	*(1.937)	(-0.801)	***(2.607)	(0.730)	(-1.244)	(1.078)	(-1.030)	*(-1.826)	(-0.031)	***(5.163)		
	3	Deflated by MV_{it}	Coeff	1,054,383	-0.091	0.198	-0.168	0.063	-0.307	0.051	-0.213	0.085	5.188	0.576	936
			t-Stat	***(3.578)	***(-3.278)	***(7.178)	***(-8.356)	(1.078)	(-0.551)	*(1.761)	***(-3.250)	***(2.972)	***(10.645)		
			h-Stat	X(1.141)	*(-1.801)	(1.536)	(-1.392)	(0.221)	(-0.694)	(0.560)	*(-1.723)	(0.917)	**(2.128)		
1993	2	Deflated by BV_{it}	Coeff	-78,009	-0.117	0.128	0.003	0.030	-0.012	0.033	0.039	0.019	1.765	0.306	998
			t-Stat	(-0.495)	***(-7.557)	***(6.452)	(0.329)	(1.281)	(-0.156)	***(3.003)	*(1.772)	(1.252)	***(12.282)		
			h-Stat	(-0.400)	***(-3.312)	(1.546)	(0.213)	(0.633)	(-0.118)	(1.428)	(0.854)	(0.771)	***(5.973)		
	3	Deflated by MV_{it}	Coeff	-134,654	-0.026	0.289	-0.005	0.118	-0.091	-0.002	-0.012	0.011	0.868	0.360	994
			t-Stat	(-1.115)	***(-3.058)	***(12.650)	(-0.565)	***(4.440)	(-0.308)	(-0.155)	(-0.440)	(0.867)	***(3.879)		
			h-Stat	(-0.361)	***(-2.874)	**(1.973)	(-0.303)	(1.367)	(-0.263)	(-0.053)	(-0.214)	(0.367)	*(1.790)		
1994	2	Deflated by BV_{it}	Coeff	-135,398	-0.067	0.223	-0.059	0.011	-0.300	0.014	0.063	0.105	1.779	0.490	1,061
			t-Stat	(-0.926)	***(-4.792)	***(9.070)	***(-6.354)	(1.012)	***(-2.840)	(1.344)	***(2.958)	***(8.158)	***(15.640)		
			h-Stat	(-0.685)	***(-3.232)	***(3.243)	***(-3.365)	(0.545)	**(-1.973)	(1.147)	*(1.940)	***(4.492)	***(5.923)		
	3	Deflated by MV_{it}	Coeff	-291,698	-0.040	0.206	-0.017	-0.009	0.109	-0.029	0.006	0.055	1.543	0.413	1,058
			t-Stat	**(-2.495)	***(-5.180)	***(8.732)	**(-2.257)	(-0.632)	(0.439)	**(-2.319)	(0.203)	***(5.465)	***(8.897)		
			h-Stat	(-1.230)	***(-3.078)	***(3.672)	(-1.132)	(-0.294)	(0.203)	(-0.793)	(0.136)	**(2.344)	***(3.257)		
1995	2	Deflated by BV_{it}	Coeff	31,913	-0.072	0.380	0.010	0.092	-0.265	0.027	0.032	0.008	0.632	0.371	1,114
			t-Stat	(0.248)	***(-5.448)	***(13.801)	(1.104)	***(6.289)	***(-3.481)	***(3.314)	*(1.714)	(0.675)	***(9.056)		
			h-Stat	(0.196)	***(-3.641)	***(4.017)	(0.553)	***(4.053)	(-1.513)	***(2.625)	(1.313)	(0.395)	***(3.453)		
	3	Deflated by MV_{it}	Coeff	-579,316	-0.015	0.422	-0.016	-0.069	-0.724	-0.005	0.075	0.036	1.299	0.540	1,112
			t-Stat	***(-6.998)	**(-2.448)	***(13.123)	***(-2.892)	***(-4.203)	***(-4.544)	(-0.475)	***(3.412)	***(5.031)	***(9.450)		
			h-Stat	***(-3.344)	*(-1.839)	***(4.233)	(-1.549)	(-1.046)	**(-2.219)	(-0.235)	**(2.411)	***(2.978)	***(3.553)		
1996	2	Deflated by BV_{it}	Coeff	-494,197	-0.041	0.262	0.008	0.041	-0.221	0.045	-0.036	-0.013	0.903	0.261	1,157
			t-Stat	***(-2.912)	***(-2.651)	***(9.397)	(0.879)	***(2.757)	**(-2.327)	***(4.251)	(-1.462)	(-0.941)	***(10.568)		
			h-Stat	**(-2.251)	(-1.386)	***(3.155)	(0.388)	*(1.817)	*(-1.745)	(1.571)	(-0.895)	(-0.515)	***(3.549)		
	3	Deflated by MV_{it}	Coeff	-698,174	-0.047	0.214	0.002	0.007	0.470	0.080	-0.153	-0.009	1.607	0.642	1,155
			t-Stat	***(-6.954)	***(-7.117)	***(9.647)	(0.286)	(0.607)	**(2.240)	***(7.070)	***(-6.040)	(-0.900)	***(13.409)		
			h-Stat	***(-3.973)	***(-4.816)	**(2.347)	(0.111)	(0.391)	(1.113)	***(2.861)	***(-2.637)	(-0.362)	***(3.619)		
1997	2	Deflated by BV_{it}	Coeff	-252,362	-0.034	0.281	-0.084	0.064	0.368	0.008	0.181	0.121	0.622	0.316	1,124
			t-Stat	(-1.139)	*(-1.772)	***(8.493)	***(-7.595)	***(3.329)	***(4.507)	(0.598)	***(7.041)	***(9.612)	***(6.133)		
			h-Stat	(-1.225)	(-0.824)	***(3.194)	***(-2.727)	**(1.984)	(0.973)	(0.475)	*(1.671)	***(4.027)	***(2.628)		
	3	Deflated by MV_{it}	Coeff	-208,330	-0.057	0.085	-0.069	0.016	-0.146	-0.016	-0.071	0.123	2.444	0.520	1,122
			t-Stat	(-1.543)	***(-6.387)	***(3.970)	***(-7.030)	(0.890)	(-0.525)	(-1.147)	**(-2.196)	***(9.003)	***(14.279)		
			h-Stat	(-1.019)	***(-6.333)	(0.894)	*(-1.906)	(0.338)	(-0.587)	(-0.818)	(-1.398)	***(2.855)	***(4.115)		

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	Obs
1998	2	Deflated by BV_{it}	Coeff	-336,725	0.021	0.557	-0.061	-0.063	-0.066	0.071	0.044	0.025	0.666	0.510	1,025
			t-Stat	(-1.446)	(0.971)	***(18.467)	***(-6.535)	***(-5.551)	(-0.710)	***(5.839)	*(1.664)	**(2.494)	***(8.339)		
			h-Stat	(-1.358)	(0.501)	***(4.914)	**(-2.317)	(-1.311)	(-0.256)	***(3.000)	(1.370)	(0.895)	*(1.862)		
	3	Deflated by MV_{it}	Coeff	-85,108	0.038	0.495	-0.066	-0.064	-0.233	-0.108	0.008	0.045	1.438	0.443	1,024
			t-Stat	(-0.732)	***(3.871)	***(13.556)	***(-8.668)	***(-3.748)	(-1.325)	***(-7.243)	(0.292)	***(3.330)	***(8.212)		
			h-Stat	(-0.270)	***(3.245)	***(5.649)	***(-3.168)	(-1.206)	(-0.888)	***(-3.071)	(0.141)	(1.231)	***(3.045)		
1999	2	Deflated by BV_{it}	Coeff	-137,223	-0.425	-0.155	0.027	0.469	-1.408	-0.010	-0.475	0.020	4.972	0.491	921
			t-Stat	(-0.201)	***(-7.188)	**(-2.169)	(0.850)	***(13.472)	***(-5.030)	(-0.320)	***(-8.350)	(0.477)	***(19.522)		
			h-Stat	(-0.235)	(-1.532)	(-0.505)	(0.248)	*(1.859)	(-1.092)	(-0.176)	**(-2.262)	(0.311)	***(2.714)		
	3	Deflated by MV_{it}	Coeff	-725,778	-0.003	0.527	0.029	0.113	-0.561	-0.004	-0.148	-0.096	0.392	0.531	920
			t-Stat	***(-5.013)	(-0.298)	***(21.386)	***(3.039)	***(5.289)	***(-2.652)	(-0.248)	***(-6.256)	***(-5.523)	***(5.202)		
			h-Stat	***(-3.611)	(-0.273)	***(3.691)	*(1.675)	***(3.082)	**(-2.097)	(-0.156)	***(-2.767)	**(-2.213)	**(1.968)		
Pool	2	Deflated by BV_{it}	Coeff	429,265	0.045	0.262								0.04	9,302
			t-Stat	***(-3.788)	***(5.551)	***(18.891)									
			h-Stat	***(-3.406)	***(3.990)	***(3.175)									
	3	Deflated by MV_{it}	Coeff	119,516	-0.011	0.464								0.395	9,277
			t-Stat	**(-2.504)	**(-2.502)	***(77.194)									
			h-Stat	(-0.832)	**(-2.137)	***(8.344)									
	2	Deflated by BV_{it}	Coeff	-391,089	-0.004	0.287	0.028							0.052	9,302
			t-Stat	***(-3.471)	(-0.456)	***(20.565)	***(10.900)								
			h-Stat	***(-3.461)	(-0.082)	***(4.136)	(0.836)								
	3	Deflated by MV_{it}	Coeff	-204203	-0.013	0.467	0.004							0.396	9,277
			t-Stat	***(-3.810)	***(-2.896)	***(76.945)	***(3.466)								
			h-Stat	(-1.152)	*(-1.935)	***(8.855)	(0.460)								
	2	Deflated by BV_{it}	Coeff	-414,164	-0.015	0.260	0.020	0.114						0.071	9,302
			t-Stat	***(-3.714)	(-1.625)	***(18.604)	***(7.913)	***(14.007)							
			h-Stat	***(-3.283)	(-0.242)	***(2.813)	(0.760)	(0.920)							
	3	Deflated by MV_{it}	Coeff	-176,395	-0.012	0.456	-0.002	0.045						0.398	9,277
			t-Stat	***(-3.282)	***(-2.691)	***(71.822)	(-1.190)	***(5.585)							
			h-Stat	(-0.901)	*(-1.728)	***(9.826)	(-0.133)	(0.807)							
	2	Deflated by BV_{it}	Coeff	-414,658	-0.016	0.261	0.020	0.114	0.036					0.071	9,302
			t-Stat	***(-3.719)	*(-1.695)	***(18.597)	***(7.891)	***(13.918)	(0.677)						
			h-Stat	***(-3.293)	(-0.262)	***(2.789)	(0.755)	(0.907)	(0.101)						
	3	Deflated by MV_{it}	Coeff	-174121.832	-0.011	0.456	-0.002	0.046	-0.117					0.398	9,277
			t-Stat	***(-3.237)	**(-2.436)	***(71.799)	(-1.163)	***(5.607)	(-0.967)						
			h-Stat	(-0.893)	(-1.547)	***(9.821)	(-0.130)	(0.811)	(-0.591)						
	2	Deflated by BV_{it}	Coeff	-457,035	-0.020	0.257	0.018	0.113	0.008	0.015				0.072	9,302
			t-Stat	***(-4.058)	**(-2.178)	***(18.240)	***(6.819)	***(13.815)	(0.143)	***(2.651)					
			h-Stat	***(-2.678)	(-0.277)	***(2.855)	(0.808)	(0.906)	(0.020)	(0.228)					
	3	Deflated by MV_{it}	Coeff	-280,453	-0.017	0.449	-0.007	0.037	-0.216	0.039				0.401	9,277
			t-Stat	***(-5.035)	***(-3.774)	***(70.129)	***(-3.800)	***(4.543)	*(-1.779)	***(7.096)					
			h-Stat	(-1.534)	**(-2.410)	***(9.448)	(-0.421)	(0.676)	(-1.052)	(1.544)					

Table 5.12 - Coefficients and associated statistics from Cross-sectional & Pool Estimations of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
Pool	2	Deflated by BV_{it}	Coeff	-449,639	-0.022	0.260	0.021	0.113	0.038	0.028	-0.067			0.074	9,302
			t-Stat	***(-3.998)	**(-2.318)	***(18.439)	***(7.575)	***(13.814)	(0.692)	***(4.516)	***(-5.134)				
			h-Stat	***(-2.650)	(-0.301)	***(2.902)	(0.866)	(0.907)	(0.096)	(0.520)	(-0.633)				
	3	Deflated by MV_{it}	Coeff	-238,505	-0.014	0.447	-0.008	0.040	-0.247	0.049	-0.065			0.402	9,277
			t-Stat	***(-4.231)	***(-3.106)	***(69.640)	***(-4.512)	***(4.814)	**(-2.030)	***(8.329)	***(-4.654)				
			h-Stat	(-1.269)	**(-1.995)	***(9.470)	(-0.504)	(0.712)	(-1.195)	*(1.820)	*(-1.940)				
	2	Deflated by BV_{it}	Coeff	-446,424	-0.019	0.261	0.018	0.113	0.036	0.027	-0.067	0.004		0.074	9,302
			t-Stat	***(-3.965)	*(-1.900)	***(18.364)	***(3.201)	***(13.796)	(0.656)	***(4.252)	***(-5.155)	(0.596)			
			h-Stat	***(-2.680)	(-0.276)	***(2.857)	(0.570)	(0.904)	(0.090)	(0.518)	(-0.644)	(0.140)			
	3	Deflated by MV_{it}	Coeff	18,585	-0.005	0.478	-0.047	0.018	-0.163	0.036	-0.060	0.070		0.412	9,277
			t-Stat	(0.312)	(-1.022)	***(70.051)	***(-13.223)	**(2.133)	(-1.349)	***(6.156)	***(-4.309)	***(12.600)			
			h-Stat	(0.080)	(-0.628)	***(9.229)	*(-1.785)	(0.346)	(-0.809)	(1.473)	*(-1.835)	***(2.605)			
	2	Deflated by BV_{it}	Coeff	-102,825	-0.085	0.108	-0.012	0.108	-0.204	-0.006	-0.108	0.010	1.867	0.181	9,302
			t-Stat	(-0.967)	***(-8.706)	***(7.668)	**(-2.343)	***(14.033)	***(-3.902)	(-1.001)	***(-8.798)	(1.515)	***(34.867)		
			h-Stat	(-0.737)	(-1.131)	(0.900)	(-0.633)	(0.956)	(-0.546)	(-0.156)	(-1.134)	(0.465)	***(2.896)		
	3	Deflated by MV_{it}	Coeff	176,124	-0.026	0.408	-0.091	0.009	-0.287	0.032	-0.062	0.093	1.639	0.447	9,277
			t-Stat	***(3.032)	***(-5.596)	***(56.358)	***(-23.293)	(1.163)	**(-2.445)	***(5.581)	***(-4.607)	***(16.945)	***(24.100)		
			h-Stat	(0.721)	***(-2.884)	***(8.489)	***(-2.715)	(0.203)	(-1.508)	(1.453)	**(-2.020)	***(3.203)	***(3.124)		

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID

(1) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$, (2) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + e_{it}$, (3) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + e_{it}$ (4) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + e_{it}$ (5) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + e_{it}$

(6) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it}$ (7) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + e_{it}$

(8) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}. 1 = $1/BV_{it}$ or $1/MV_{it}$

*, **, *** = 90%, 95%, 99% confidence level respectively. Results for Undeflated Equations in **Appendix 5.1.**

Table 5.13 - Medians and Percentiles of Estimated Coefficients, and Adj. R^2 from Cross-sectional and Pool Estimations of Equations deflated by *BVit* and *MVit* for Sample where $BV \geq$ £5 Millions and r = 10%

	Statistics	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2
Deflated by BV_{it}										
Cross-sectional	Median	0.34	0.02	0.06	0.12	0.03	0.05	0.01	0.90	0.23
	25% Percentile	0.22	-0.00	-0.04	-0.15	0.01	-0.02	-0.02	0.67	0.17
	75% Percentile	0.49	0.03	0.08	0.45	0.07	0.09	0.08	1.77	0.31
Pool	Median	0.26	0.02	0.11	0.04	0.02	-0.07	0.01	1.87	0.07
	25% Percentile	0.26	0.02	0.11	0.01	0.01	-0.09	0.01	1.87	0.07
	75% Percentile	0.26	0.02	0.11	0.04	0.03	-0.07	0.01	1.87	0.07
Deflated by MV_{it}										
Cross-sectional	Median	0.36	0.01	0.04	-0.07	0.01	0.01	0.04	1.54	0.48
	25% Percentile	0.29	-0.04	-0.03	-0.23	-0.01	-0.14	0.01	1.30	0.39
	75% Percentile	0.61	0.04	0.16	0.11	0.07	0.01	0.06	1.76	0.53
Pool	Median	0.46	-0.01	0.04	-0.22	0.04	-0.06	0.08	1.64	0.40
	25% Percentile	0.45	-0.03	0.02	-0.25	0.04	-0.06	0.08	1.64	0.40
	75% Percentile	0.48	-0.00	0.05	-0.19	0.04	-0.06	0.08	1.54	0.44

Annual cross-sectional sample (1991-1999) consists of 920 to 1,157 observations and pooled sample consisting of 9,277 to 9,302 observations. Regressions are run from Prop-LID:

RModel 1 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it+1}$

RModel 2 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + e_{it+1}$

RModel 3 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + e_{it+1}$

RModel 4 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + e_{it+1}$

RModel 5 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + e_{it+1}$

RModel 6 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it+1}$

RModel 7 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + e_{it+1}$

RModel 8 $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it+1}$

The medians and Percentiles are calculated from data in **Tables 5.12.**

Table 5.14 - Number of h -Statistically Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	ω_{11} (RI_{it})		ω_{12} (OA_{it})		ω_{13} (CI_{it})		ω_{14} (RD_{it})		ω_{15} (HR_{it})		ω_{16} (DC_{it})		ω_{17} (TD_{it})		ω_{18} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	1	No deflation	8	0	0	6	0	0	0	0	0	3	3	0	0	0	0	0	11	9
	2	Deflated by BV_{it}	8	0	0	0	0	0	5	0	0	0	2	0	0	0	1	0	16	0
	3	Deflated by MV_{it}	8	0	0	7	0	0	0	0	4	0	0	0	2	0	1	0	15	7
1992	1	No deflation	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	8	0
	2	Deflated by BV_{it}	8	0	2	0	0	0	4	0	0	0	0	1	0	0	1	0	15	1
	3	Deflated by MV_{it}	7	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	8	1
1993	1	No deflation	8	0	1	0	1	0	4	0	0	1	2	0	0	0	1	0	17	1
	2	Deflated by BV_{it}	3	0	5	0	0	0	1	0	3	0	2	0	0	0	1	0	15	0
	3	Deflated by MV_{it}	8	0	1	0	5	0	0	0	0	0	0	0	0	0	1	0	15	0
1994	1	No deflation	8	0	0	0	6	0	0	0	0	0	0	2	0	0	0	0	14	2
	2	Deflated by BV_{it}	8	0	5	1	0	0	1	1	3	0	3	0	2	0	1	0	23	2
	3	Deflated by MV_{it}	8	0	5	0	0	0	0	0	0	0	0	0	2	0	1	0	16	0
1995	1	No deflation	8	0	0	0	0	0	4	0	0	4	3	0	2	0	0	0	17	4
	2	Deflated by BV_{it}	8	0	5	0	6	0	0	0	4	0	2	0	0	0	1	0	26	0
	3	Deflated by MV_{it}	8	0	5	0	0	0	0	4	0	0	3	0	1	0	1	0	18	4
1996	1	No deflation	8	0	0	1	0	0	1	0	2	0	3	0	0	0	0	0	14	1
	2	Deflated by BV_{it}	8	0	0	0	6	0	0	1	3	0	0	0	0	0	1	0	18	1
	3	Deflated by MV_{it}	8	0	6	0	0	0	1	0	3	0	0	3	0	0	1	0	19	3
1997	1	No deflation	8	0	1	0	0	0	5	0	0	0	0	3	0	0	0	0	14	3
	2	Deflated by BV_{it}	5	0	5	2	2	0	0	0	3	0	3	0	2	0	1	0	21	2
	3	Deflated by MV_{it}	0	0	5	1	0	0	0	0	0	0	0	2	1	0	1	0	7	3
1998	1	No deflation	8	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	11	3
	2	Deflated by BV_{it}	8	0	0	2	0	0	0	0	4	0	2	0	0	0	1	0	15	2
	3	Deflated by MV_{it}	8	0	0	7	0	0	0	0	0	4	0	0	0	0	1	0	9	11
1999	1	No deflation	7	0	0	1	0	5	4	0	0	1	0	0	0	0	1	0	12	7
	2	Deflated by BV_{it}	0	0	0	0	1	0	0	0	0	0	0	3	1	0	1	0	3	3
	3	Deflated by MV_{it}	8	0	2	0	6	0	0	5	0	0	0	3	0	2	1	0	17	10
Total	1	No deflation	70	0	2	8	7	5	18	0	2	12	14	5	2	0	3	0	118	30
	2	Deflated by BV_{it}	56	0	22	5	15	0	11	2	20	0	14	4	5	0	9	0	152	11
	3	Deflated by MV_{it}	63	0	24	15	11	0	1	9	7	4	3	9	6	2	9	0	124	39
Pool	1	No deflation	8	0	0	3	0	6	5	0	2	0	3	0	2	0	1	0	21	9
	2	Deflated by BV_{it}	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	8	0
	3	Deflated by MV_{it}	8	0	0	2	0	0	0	0	1	0	0	3	2	0	1	0	12	5

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}. Hence RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation. Numbers are in White's adjusted h-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs. Details are in **Table 5.12.**

Table 5.15 - Chow's Prediction Test on Stability from the Full and Half Samples where $BV \geq$ £5 millions and r = 10%

Year	No	Type	Obs (Full/Half)		ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})
1991	2	Deflated by BV_{it}	962	481	***2.546	***2.551	***2.544	***2.542	***2.564	***2.557	***2.591	***2.533
	3	Deflated by MV_{it}	956	480	0.728	0.717	0.674	0.671	1.098	1.117	1.095	1.029
1992	2	Deflated by BV_{it}	940	470	***2.715	***2.794	***2.766	***2.827	***2.832	***2.768	***2.761	***3.189
	3	Deflated by MV_{it}	936	469	0.404	0.455	0.972	0.970	0.957	0.952	1.049	1.099
1993	2	Deflated by BV_{it}	998	499	***3.433	***3.64	***3.719	***4.012	***3.85	***3.747	***3.746	***3.57
	3	Deflated by MV_{it}	994	498	1.220	1.210	**1.76	**1.87	***2.289	***2.284	***2.28	***2.244
1994	2	Deflated by BV_{it}	1,061	530	***2.53	***2.586	***2.545	***2.537	***2.449	***2.663	***2.552	***2.298
	3	Deflated by MV_{it}	1,058	529	***2.355	1.190	1.250	**1.35	***2.009	***2.004	1.230	***1.968
1995	2	Deflated by BV_{it}	1,114	557	***2.263	***2.286	***2.372	***2.408	***2.364	***2.339	***2.344	***2.202
	3	Deflated by MV_{it}	1,112	557	***2.084	***2.118	***2.078	***2.051	***2.033	1.160	1.070	***1.83
1996	2	Deflated by BV_{it}	1,157	578	***1.579	***1.942	***1.972	***1.976	***2.22	***2.228	***2.288	***2.276
	3	Deflated by MV_{it}	1,155	577	***4.421	***3.458	***3.787	***3.733	***3.689	***3.735	***3.735	***3.769
1997	2	Deflated by BV_{it}	1,124	562	***2.683	***3.003	***3.009	***2.632	***2.622	***2.506	***2.739	***2.695
	3	Deflated by MV_{it}	1,122	561	1.280	1.037	1.130	1.246	1.233	1.210	1.249	1.201
1998	2	Deflated by BV_{it}	1,025	512	1.207	1.174	1.216	**1.451	***1.534	***1.516	***1.55	**1.445
	3	Deflated by MV_{it}	1,024	512	***2.188	1.231	1.217	1.192	***2.057	***2.055	***2.05	**1.4
1999	2	Deflated by BV_{it}	921	460	0.367	1.093	***1.962	***1.968	***1.92	***1.733	***1.748	**1.408
	3	Deflated by MV_{it}	920	460	***2.308	**1.47	***2.553	***2.535	***2.534	1.214	***2.44	***2.453
Pool	2	Deflated by BV_{it}	9,302	4,651	***5.867	***5.917	***5.841	***5.956	***6.06	***6.079	***6.078	***5.774
	3	Deflated by MV_{it}	9,277	4,634	0.316	0.315	0.318	0.317	0.314	0.312	0.324	0.381

The F-statistic is $$F = \frac{\frac{RSS_{BV \geq 5m} - RSS_{BV \geq 5m/2}}{n_{BV \geq 5m} - n_{BV \geq 5m/2}}}{\frac{RSS_{BV \geq 5m/2}}{n_{BV \geq 5m/2} - k - 1}}$$

where:
* $RSS_{BV \geq £5m}$ = Residual Sum of Squares from regression based on full sample
* $RSS_{BV \geq £5m/2}$ = Residual Sum of Squares from regression based on half of the full sample

, * = Rejection of parameter stability at 5% and 1% significant level respectively.

5.3.2 Analysis of the Ability to Predict Future Residual Income (*RI*) for the Variables chosen

So far, all the testing for the LID are carried out in the US. Except for the *RI* parameter, the parameters of the conservative, capital investment and other information parameters, v_t estimated from the LID are of the wrong signs and/or are noisy as evidenced by the low R^2 for their respective models. Some studies did not even operationalise v_t, which suggests that the models specified violate the internal consistency of the OFF. Researchers that have included v_t in their models appear to use a single ad hoc variable to proxy forv_t, and this may be a limitation of their research, and the use of multiple measures using a comprehensive set of variables (CSV) may be more appropriate in identifying performance measures that can predict future *RI*. Moreover, different methodologies and estimating techniques were used in these studies. However, cross-sectional and pooling of time-series and cross-sectional data are increasingly being used to investigate the OFF.

Therefore, the analysis of this subsection is to investigate and address the issues identified in past studies that used the OFF by using UK data and models based on an integrated OFF to estimate an information dynamic prediction model for *RI*, identifying which of these non-earnings accounting variables (CSV) are significant in the prediction model. Tests for the value-relevant of the CSV will be covered in the next chapter. The non-earnings variables considered are based on previous studies which suggest that these variables might be relevant in predicting future financial performance of firms in the form of residual income. This analysis serves as the **main issues/hypotheses of this chapter**, which is to determine whether (1) the proposed Prop-LID model is econometrically (statistically) valid; (2) the comprehensive set of non-earnings variables (CSV) are able to predict future *RI*; and (3) scale-effect and heteroscedasticity are issues in the regressions. Analysis will be made in reference to only the deflated equations as the undeflated equations cannot be validly accepted in cross-sectional and pool estimations in view of their biased standard errors due to scale or/and heteroscedasticity and likely omission of relevant variables (see section 5.3.1).

The first analysis of the results obtained in this subsection is to determine whether the specification of the proposed *RI* model (Prop-LID) is econometrically (statistically) valid. This analysis starts from the simple equation (ie RModel 1) and extends to the full Prop-LID multiple regression model by observing the validity of adding new variable at

each stage of the estimation process. This is equivalent to testing whether a relevant variable has been omitted from an equation. The testing for the validity of adding new variables in CMRA is traditionally based on R^2 or $\overline{R}^2$. When new variables are added to a regression equation, R^2 always increase while $\overline{R}^2$ may rise or fall. The indication is that, the addition of a new variable to a regression will cause $\overline{R}^2$ to rise if and only if its *t*-statistic is > 1 or < –1. Hence, a rise in $\overline{R}^2$ when a new variable is added does not necessarily mean that its coefficient is significantly different from 0, which means that the specification has not improved. Relatedly, Brown et al. (1999) demonstrate that $\overline{R}^2$ or R^2 simply increases in levels equations where scale effect is unaccounted for. Interpretation of R^2 is difficult when a model is specified to have the intercept constrained to 0 because the $\frac{ESS}{TSS}$ need not lie within 0 and 1 (Pindyck and Rubinfeld, 1998, p. 89). Due to this, both R^2 and $\overline{R}^2$ have lost their creditability as a prominent interpretive value for multiple regressions over the years, since even a poorly specified regression model may yield a high $\overline{R}^2$ or R^2 (see Dougherty, 1992, p. 166; Maddala, 1992, p. 132; Greene, 2003, p. 34). **Appendix 5.2** provides the mathematical relation between the *t*- and *F-statistic*, R^2 and $\overline{R}^2$.

Hence, when analysing multiple regressions it is necessary to analyse a whole range of statistical measures in addition to $\overline{R}^2$ such as *t*-ratios (or standard errors), *F-statistic*, *p*-value, etc. To determine the validity of the addition of new variables, or the likelihood of omitted variables for the proposed RI models, three analyses will be used (1) $\overline{R}^2$; (2) Akaike Information Criterion (AIC); and (3) *F*-test. The AIC is defined as:

$$AIC = In\left(\frac{\sum e_i^2}{n}\right) + \frac{2k}{n} \tag{5.1}$$

where:

- *ln* = logarithm
- k = Number of parameters to be estimated
- n = Number of observations

The AIC enables us to determine whether the inclusion of an additional variable is valid. The criterion is to include an extra variable only if it decreases the AIC. Like the $\overline{R}^2$, the AIC depends on the residual sum of squares, $\sum e_i^2$ that occurs when an extra explanatory variable is included but it may not necessarily lead to a fall in the AIC. When an extra variable is included, k increases, and this push up the AIC. The AIC only falls if the drop in $\sum e_i^2$ is sufficient to outweigh the effect of the rise in k (Thomas, 1997, p. 181).

When using the *F*-test to determine whether or not, the joint marginal contribution of a group of variables is significant is essentially testing for the 'improvement in the fit' when an additional explanatory variable is added to the existing variable. However, the *F*-test formula has to be modified to take into account of the reduction in residual variance (RSS) and the using up an additional degree of freedom due to the addition of the variable:

$$F = \frac{\dfrac{Improvement\ in\ fit}{Extra\ df\ used\ up}}{\dfrac{RSS\ remaining}{df\ remaining}} \tag{5.2}$$

The 'Improvement in the Fit' can be formulated in terms of the total number of explanatory variables in the new regression (*M)* and the number of explanatory variables in the old regression (*k),* and expressing them in terms of residual variance (RSS):

$$RSS_M = TSS - ESS_M \qquad \text{and} \qquad RSS_k = TSS - ESS_k$$

The 'improvement in the fit' when the additional explanatory variables are added, $ESS_M - ESS_k$ is equivalent to the reduction in residual variance given by $RSS_k - RSS_M$:

$$F = \frac{\dfrac{RSS_k - RSS_M}{(M - k)}}{\dfrac{RSS_M}{n - M - 1}} \tag{5.3}$$

Instead of looking at the *F*-statistic as the 'improvement in the fit' when additional variables are added, it can also be viewed as the 'deterioration in the fit' due to the omission of variables. This test can be conducted under the null hypothesis that the additional variables contribute nothing to the equation. If the *F-statistic* > *F*-critical value, we can reject the null hypothesis, and conclude that the additional variables contribute to the improvement in the fit of the equation.

The annual cross-sectional results of $\overline{R}^2$, AIC and *F*-tests from estimating RModel 1 to 8 are depicted in Table 5.10. As long as any two of the three criterions is satisfied, the inclusion of additional variable in the regression is considered justifiable. A weak criterion is when only one of the three criterions is satisfied[3]. For the EDBV, the inclusion of *RI* and *DIV* is justifiable in every case, except for *TD* (weak justifications in 1992 and 1996, and no justification in 1995), *DC* (no justification in 1996), *HR* (no justification in 1991), *RD*

[3] This is based on my judgment as the use of the combination of $\overline{R}^2$, AIC and *F*-tests to justify the addition of new variable in a regression are not found in the literature on CMRA.

(weak justification in 1995, and no justification in 1996), *CI* (weak justification in 1991), *OA* (weak justification in 1991). Hence, there are only four cases of no justification for the inclusion of variables, and moreover, these exceptional cases of no/weak validity of inclusion only appear in one to three years, and there is no weak/no validity of inclusion of variables from 1997 onwards. Results of most of the *F*-tests show that they are 1% significant, and the $\overline{R}^2$s average between 0.2 and 0.3 with a few exceeding 0.4 and there are several that are less than 0.2. Thus, the $\overline{R}^2$s for the EDBV are much higher than those obtained in return models using cross-sectional estimations as they rarely exceed 0.1 (see Lev, 1989; Lev and Zarowin, 1999)[4]. On the whole, the inclusion of all eight independent variables (ie *RI, OA, CI, RD, HR, DC, TD* and *DIV*) in the EDBV is valid.

For the EDMV, the inclusion of *RI, OA*, and *DIV* is justifiable in every year, except for *TD* (no justification in 1993), *DC* (no justification in 1991, 1993, 1994 and 1998), *HR* (no justification in 1993 and 1994), *RD* (no justifications in 1991, 1992, 1993, 1994, 1997 and 1998), and *CI* (weak justification in 1996). Encouragingly, none of those variables that exhibit weak/no validity of the inclusion of additional variables in the equations deflated by *MV* occurs on a regular basis, and there are only four times in which the variables exhibit no/weak validity of the inclusion of additional variable from 1994 onwards. Results of most of the *F*-tests show that they are 1% significant, and the $\overline{R}^2$s are high, particularly for cross-sectional estimations ($\overline{R}^2$s averaging 0.4 and 0.5 with many exceeding 0.6). This result is much better than EDBV and is also better than the $R^2 = 0.35$ obtained by Dechow et al. (1999) for their models deflated by *MV*. On the whole, even though *RD* appears to be a little suspect cross-sectionally, the inclusion of all eight independent variables (ie *RI, OA, CI, RD, HR, DC, TD* and *DIV*) in the EDMV is valid.

Tests using *F*-tests, AIC and $\overline{R}^2$ for EDBV and EDMV on the cross-sectional and pool properties of alternative specifications were also carried out (see Chapter 4, section 4.2.4.1). Though not reported, the results are not as impressive as those reported for the order contained in Table 5.10. For instance, (1) when *HR* is added to *RI, OA* and *CI*, there is no justification for EDMV for 1992 to 1995 vs. 1993 and 1994 for the reported order per Table 5.10; and (2) when *DIV* instead of *TD* is added to *RI, OA, CI, RD, HR* and *DC*, EDBV has more no justification (ie 1991 and 1997 vs. 1995 for the order per Table 5.10.

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[4] Econometrically, direct comparison between my models and return models is not possible as the dependent variables between the models are not the same, however, by referring to results of $\overline{R}^2$ in return models gives an indication of how well my models perform in relation to other models.

Thus, cross-sectional and pooled results in terms of F-tests, AIC and $\overline{R}^2$ for EDBV and EDMV are impressive as these tests show that all eight variables that made up the comprehensive set of non-earnings accounting variables for estimating a prediction model and a valuation model are still valid. This implies that the carefully selected variables that are theoretically and empirically based on the OFF, GAAP and previous studies to measure (1) value creation; (2) conservatism; (3) current +NPV projects; (4) intangibles; and (5) expectations of future profitability, in predicting future residual income are valid.

The next analysis of this subsection concerns the economic, accounting and financial rationale for the proposed RI models. The estimated coefficients for all the scaled variables are contained in Table 5.12 and the medians and percentiles for the estimated coefficients of the deflated equations are contained in Table 5.13. Analysis will first be made to interpret the t-statistics. The analysis begins by evaluating how well the evolution of *RI* as described by Ohlson and Feltham's information dynamics is captured in the Prop-LID. Except for 1991 (EDMV) and 1999 (EDBV) in which some of $\omega_{11} < 0$ or $\omega_{11} \geq 0$, the rest of the estimated coefficients of *RI* lie $0 \leq \omega_{11} < 1$ (see Table 5.12) with cross-sectional and pool medians of 0.34 and 0.36 for EDBV and EDMV respectively (Table 5.13) suggesting that *RI* is only moderately persistent but nevertheless, as expected it **reflects the economic rationale of the *RI* model in the OFF**.

In the OFF, the coefficient of *OA* (ω_{12}) represents either unbiased ($\omega_{12} = 0$) or conservative ($\omega_{12} > 0$) accounting. Results for EDBV from cross-sectional and pool estimations are consistent [number of statistically significant coefficients with correct (incorrect) signs is 40 (11) and 6 (1) respectively (Table 5.8a)] and medians of $\omega_{12} = 0.02$ and 0.26 for cross-section and pool data respectively (Table 5.13). While there are more statistically positively significant ω_{12} from cross-sectional estimations [30 positives vs. 24 negatives, there are more negatively significant coefficients from the pool estimation (1 positive vs. 4 negatives) (Table 5.8a) for the EDMV and medians of $\omega_{12} = 0.26$ and –0.01 for cross-section and pool data respectively (Table 5.13). Except for the EDMV in the pool data, the evidence of ω_{12} is consistent with my hypothesis and the OFF in which ω_{12} **captures conservatism for the Prop-LID.**

The total numbers of statistically significant coefficients with the correct (incorrect) signs of *CI* (ω_{13}) for the EDBV from cross-sectional and pool estimations are 32 (12) and 6

(0) respectively (Tables 5.8a) with medians of ω_{13} = 0.06 and 0.02 respectively (Table 5.13). The corresponding numbers for the EDMV from cross-sectional and pool estimations are 28 (14) and 5 (0) respectively (Table 5.8a) with medians of 0.04 (Table 5.13) for both cross-sectional and pool data[5]. Basing on sign alone, while 57% and 48% of ω_{13} estimated cross-sectionally for EDBV and EDMV are positives respectively, the pool result indicates that 100% of EDBV and EDMV are positives (Table 5.12). The evidence strongly supports my hypothesis and the OFF that ***CI* is able to predict future *RI***.

Since this study uses *RD, HR* and *DC* (proxy for *AD*[6]) as surrogates for intangibles and as such, these three variables are analysed together. For EDBV, the total numbers of statistically significant coefficients with the correct (incorrect) signs for *RD* (ω_{14}), *HR* (ω_{15}), and *DC* (ω_{16}) are 20 (11), 22 (3), and 17 (6) respectively, estimated cross-sectionally, and when estimated by pooling, the corresponding figures are 0 (1), 3 (0), and 0 (3) respectively (Table 5.8a). The medians for ω_{14}, ω_{15}, and ω_{16} estimated cross-sectionally are 0.12, 0.03, and 0.05 respectively, and 0.11, 0.04, and 0.02 by pooling respectively, ie they are all positives, but the values are low where most of them are < 1 (Table 5.12). Thus, on the balance of probability for EDBV, ω_{14} is clearly positive, ω_{15} is weakly positive while ω_{16} is mixed. For EDMV, the total number of statistically significant coefficients with the correct (incorrect) signs of *RD, HR* and *DC* estimated cross-sectionally and by pooling are 5 (10) and 0 (3), 14 (5) and 5 (0), 4 (10) and 0 (3) (Table 5.8a). The cross-sectional and pool medians for ω_{14}, ω_{15} and ω_{16} are –0.07 and –0.22, 0.01 and 0.04, 0.01 and –0.06 respectively but all the values are low, most of them < 1 (Table 5.12). Thus, in terms of sign, *RD* (EDBV), *HR* and *DC* conform to expectations, suggesting that ***RD, HR* and *DC* have abilities in predicting future *RI***.

The total numbers of statistically significant coefficients with the correct (incorrect) signs for *TD* and *DIV* for both equations estimated cross-sectionally and by pooling are positives [*TD/BV* = 7 (3), 0 (0), *DIV/BV* = 9 (0), 1 (0); *TD/MV* = 12 (3), 2 (0); *DIV/MV* = 9 (0), 1 (0)] (Table 5.8a). All the medians of ω_{17} and ω_{18} for EDMV estimated cross-sectionally and by pooling are positives with 0.04 and 0.08 for ω_{17} and 1.54 and 1.64 for ω_{18} respectively (Table 5.13). While EDBV estimated cross-sectionally and by pooling

[5] Approximately 70% of coefficients are positive but are low, rarely exceeding 0.1.

[6] Since advertising costs are not readily available for UK firms.

have positive medians of $\omega_{18} = 0.9$ and 0.01 respectively, and $\omega_{17} = 0.01$ cross-sectionally, the pool median for ω_{17} is slightly negative (–0.07) (Table 5.13). Basing on sign alone, 62% and 80% of ω_{17} estimated cross-sectionally for EDBV and EDMV are positives respectively, while the pool result indicates that they are all positives (Table 5.12). The results for ω_{18} are positives, regardless whether they are estimated cross-sectionally or by pooling, or by EDBV or EDMV, which are impressive. This evidence clearly shows that *TD* and in particular, ***DIV*** are both **significant in relating to future *RI***, and they ought to be included as predictors for future *RI*, consistent to my hypothesis.

Overall, the evidence shows that every coefficient is positive and significant in some years (pool). The coefficients of *DIV* and *RI* are highly positively significant for all years (including pool), with *CI, TD* and *HR* fairly highly positively significant in most years (including pool). While *OA* (EDMV-pool), *RD* (EDMV), and *DC* (EDMV) have more negative significant coefficients, there are more positively significant coefficients for these variables for EDBV. Thus, with this evidence, all variables for EDBV support my hypothesis that these variables can predict future *RI*. For EDMV, except for *RD, DC* and *OA* (mixed), all other variables support my hypothesis that these variables can predict future *RI*. Since all variables for EDBV strongly support my hypothesis, this suggests that **all the eight variables that comprise the CSV have ability to predict one-year ahead *RI*,** and hence, they ought to be included in the proposed *RI* model (Prop-LID). It also shows that the independent variables ***(OA, CI, RD, HR, DC, TD, DIV)* have incremental information content beyond current *RI*** in relation to one-year ahead *RI*. The explanatory power for Prop-LID improves when *RD, HR, DC, TD* and *DIV* are included in the regressions, eg 0.398 to 0.447 (pool) for EDMV (Table 5.12) or $\overline{RSS}$ declines from 1.59 to 0.993 (1999) for EDBV, suggesting that the CSV approach instead of a single variable improves the usefulness of other information contained in the LID.

The third and final analysis for this subsection is to investigate the effect of **scale and heteroscedasticity** on regressions since many of the equations for this study are estimated cross-sectionally. Besides scaling, this study also uses White's heteroskedasticity consistent covariance test (*h*-stat) in mitigating heteroskedasticity. Details of *t*- and *h*-statistics of the estimated coefficients from cross-sectional and pool estimations for sample where $BV \geq$ £5 millions are depicted in Table 5.12. The number of statistically significant coefficients based on *h*-stat is depicted in Table 5.14. Notice that the number of significant

coefficients (either signs) based on *h*-stat (Table 5.14) is far fewer than that obtained for the *t*-stat (Table 5.8a). The most pronounced difference in the total number of significant coefficients with the correct signs based on *t*- and *h*-stat relates to the undeflated equations (cross-section), in which the number declined from 211 (*t*-stat) to 118 (*h*-stat) or 152 vs. 88 after netting off the number of significant coefficients with incorrect signs. Less substantial drop in the number of statistically significant coefficients with correct (incorrect) signs due to the use of *h*-stat are recorded for the deflated equations. The drop in the total number of statistically significant coefficients with correct (incorrect) signs based on *t*- and *h*-stat (cross-section) for EDBV and EDMV are 213 (48) vs. 152 (11), and 174 (66) vs. 124 (39) respectively. In general, the drop in the magnitudes from *t*- to *h*-stat is tremendous as the *h*-stat wipes out many significant coefficients that are based on *t*-stat. For example, a significant coefficient of 16.876 (*t*-stat) declines to insignificant of 1.608 (*h*-stat) for *RI/MV* using RModel 1 in 1997, and a significant of 11.077 (*t-stat.*) to an insignificant of 1.328 (*h*-stat) for *RD/BV* using RModel 4 in 1997 (Table 5.12). Also, the number of 1% significant coefficients drops substantially in both cross-sectional and pooled data for both EDBV and EDMV, eg the number of cross-sectional statistically significant coefficients with 1% level for EDBV drops from 176 (*t*-stat) to 82 (*h*-stat), a 55% drop! Obviously, the evidence suggests that heteroscedasticity is more serious in the undeflated equations using the White's test. This evidence is substantiated by the exceptionally large $\overline{RSS}$ in the undeflated equations suggesting that these equations are affected by scale or heteroscedasticity (Barth and Kallipur, 1996; Easton and Sommer, 2002) (see earlier analysis in section 5.3.1). Consistent with Sougiannis (1994), the evidence in this study supports the view that in addition to scaling and the White's test, residual analysis should also be used in mitigating scale-effect and heteroscedasticity. Hence, studies that estimate unscaled equations and without residual analysis cross-sectionally such as Bernard (1995); and Hand and Landsman (1999) in which high R^2 were reported should be viewed with caution[7].

5.3.3 Analysis of Other Issues

This analysis examines the (1) likelihood of multicollinearity in regressions; (2) parameters stability; and (3) choice of scalar that may have an impact on the results obtained. These are the **secondary objectives** of this chapter.

[7] Using valuation models, Bernard, and Hand and Landsman report R^2 = 68% and 95% respectively.

A likely problem that may encounter in such a large regression equation for the Prop-LID is multicollinearity and considering that the correlation between *OA* and *TD* is highly correlated when the variables are deflated by *MV* (see earlier analysis on correlation matrix). Pindyck and Rubinfeld (1998, p. 97) indicate that a number of tests for multicollinearity have been proposed over the years but none has found widespread acceptance, and they, among others advocate detection methods as the most effective solution to the multicollinearity problem. The following are the indications of multicollinearity advocated by Maddala (1992); Dougherty (1992); Thomas (1997); Pindyck and Rubinfeld (1998); and Greene (2003).

(1) An estimated model with high standard errors and low *t*-statistics. But, it could also suggest that the underlying model is a poor one. The low *t*-ratios prevent us from rejecting hypothesis of the type $\beta_j = 0$; and hence, our usual significance tests are unable to tell us whether or not explanatory variables really influence the dependent variable.

(2) A relatively high R^2 with few significant *t*-statistics or that the *F*-statistic is highly significant while none or few of the individual variables are significant.

(3) Test for stability of the estimated coefficients when some observations are deleted, and examine the predictions from the model-if multicollinearity is a serious problem, the predictions from the model would be worse than those from a model that includes only a subset of the set of explanatory variables.

While Pindyck and Rubinfeld (1998, p. 98) consider relatively high simple correlation between a pair of explanatory variables as indication of multicollinearity, Maddala (1992, p. 279) argues that *t*-ratios and predictive test for stability provide more robust indications of multicollinearity than correlation coefficients between the explanatory variables.

This study adopts all the above [ie (1), (2), and (3)] in detecting multicollinearity. Results of *t*-statistics and $\bar{R}^2$ from cross-sectional and pooled estimations are found in Tables 5.12, 5.7, **Appendix 5.1**. Though not reported, with the exception of *RD* (eg 0.211 for EDMV in 1999), the standard errors for all independent variables for the scaled equations are small (hardly exceeding 0.06). Result from *t*-tests indicates that except for *OA/MV*, there are more statistically significant than insignificant ones and most of the significant coefficients are of the correct sign (Table 5.8a). In general, there are nearly four times more significant coefficients than insignificant ones for *TD* suggesting that *OA* and *TD* are not affected by multicollinearity, even though the correlation matrix suggests that *RD/MV* is highly correlated with *TD/MV*. There are relatively few high $\bar{R}^2$ with few

significant *t*-statistics, in fact, the $\bar{R}^2$ rarely exceeds 0.5 for all samples. Thus, analysis using (1) and (2) indicate that multicollinearity is not an issue for the Prop-LID.

To conduct (3), the full sample with n observations must first be split into two subsamples, n_1 and n_2 based on some acceptable criteria. We use the first n_1 observations to estimate the regression equation and use it to get predictions for the next n_2 observations. A necessary condition for the test is that it can be used in $n_2 > k$, ie the second sample must be sufficiently large for it to be possible to calculate the residual sum of squares (RSS). A robust and popular test for parameter stability is the Chow's Test for Predictive Stability (see Chow, 1960) which can be used even when $n_2 < (k + 1)$, in addition to $n_2 > k$. The Chow's test uses a modified *F*-statistic, which is expressed as:

$$F = \frac{\dfrac{RSS - RSS_1}{n_2}}{\dfrac{RSS_1}{n_1 - k - 1}} \tag{5.4}$$

where:

- RSS = Residual Sum of Squares from regression based on $n_1 + n_2$
- RSS_1 = Residual Sum of Squares from regression based on n_1

The test statistic is based on the proportionate increase in the RSS that results from adding the extra n_2 observations to the regression. This test is conducted under the null hypothesis of parameter stability or that the prediction errors have zero mean (ie unbiased). While parameter stability imply predictions with zero mean, it is possible to have unbiased predictions in unstable parameters. Thus, if the *F*-statistic > *F*-critical value, we reject the null hypothesis of parameter stability, implying that the parameters are unstable, a failure to reject the null hypothesis does not indicates that the parameters are stable. Hence, test for parameter stability is not conclusive and neither will it provide a clear indication of multicollinearity in a multiple regression. Nevertheless, as part of a test of robustness for the Prop-LID, the Chow's Test for Predictive Stability is carried out. This is conducted by splitting the full sample (ie $BV \geq$ £5 millions) into two equal samples (n_1 and n_2), for example, for 1991, the full sample of 962 observations is split equally where $n_1 = 1^{st}$ to 481st observations, and $n_2 = 482^{nd}$ to 962nd observations. The *F*-statistic becomes:

$$F = \frac{\dfrac{RSS_{BV\geq 5m} - RSS_{BV\geq 5m/2}}{n_{BV\geq 5m} - n_{BV\geq 5m/2}}}{\dfrac{RSS_{BV\geq 5m/2}}{n_{BV\geq 5m/2} - k - 1}} \tag{5.5}$$

where:

- $RSS_{BV\geq £5m}$ = Residual Sum of Squares from regression based on full sample
- $RSS_{BV\geq £5m/2}$ = Residual Sum of Squares from regression based on half of the full sample

Results from the test for stability of the estimated coefficients for the Prop-LID models are shown in Table 5.15. Except for the pool data, all other years' data indicate that predictive stability of the estimated coefficients for EDBV is rejected. A probable reason for the unstable estimated coefficients for the EDBV is that *BV* may not be stable from year to year. The stability of the estimated coefficients for the EDMV is mixed as there are as many instances of rejection/failure to reject the null hypothesis of predictive stability. Since (1) and (2) are conclusive while (3) is partially conclusive, there is little indication of multicollinearity in the Prop-LID. Nevertheless, multicollinearity does not imply any violation of the classical assumptions, even with a high degree of multicollinearity, the OLS estimators retain all their desired properties of efficiency, consistency, etc.

The third and final analysis of this subsection examines the effect of deflation on regressions. By deflating the level models by either *BV* or *MV*, the intercepts and residuals have greatly reduced, but the fit for the scaled equation deteriorates [$\overline{R}^2$ falls from 1993 to 1999 and the pool (see Tables 5.7, 5.12)]. It appears that deflation has mitigated the scale effect and heteroscedasticity problems, consistent with the studies reviewed. The results show that the signs and magnitude of the estimated coefficients and the number of statistically significant coefficients scaled by *BV* and *MV* are different. For example, *RD* deflated by *MV* is significant but is insignificant when deflated by *BV* in 1996, and on average, the pooled coefficients of *RI* for EDMV are twice the size of EDBV (Table 5.12), but EDBV has substantially larger number of statistically significant coefficients than EDMV [Table 5.8a: 213 (48) vs. 174 (66) (cross-section); 24 (5) vs. 21 (10) (pool)]. Except for a few cases [*OA* (pool), *RD* (cross-section), *DC* (cross-section)], the rest of the coefficients of variables are not affected by the scalar. Thus, while this study shows that statistical results are affected by deflators, it does not substantially affect inferences.

Discussion and summary for entire Section 5.3, I will first discuss the main issues/hypotheses of this chapter. Cross-sectional and pooled results in terms of *F*-tests, AIC and $\overline{R}^2$ reveal that all the variables that made up the CSV that are theoretically and empirically based on the OFF, GAAP and previous studies to measure (1) value creation; (2) conservatism; (3) current +NPV projects; (4) intangibles; and (5) expectations of future profitability, for estimating a prediction model and a valuation model are still valid.

The median of ω_{11} of 0.46 for EDMV is higher than that of 0.39 in Stober (1996) and all of Myer's (1999) specifications [0.234 for O (1995), 0.036 for FO (1995) and 0.167 for FO (1996)], but is lower than the simple regression of 0.61 and 0.62 in Hand and Landsman (1999) and Dechow et al. (1999) respectively. Stober's equations are deflated by the number of shares outstanding, Hand and Landsman use undeflated equations, Dechow et al. use MVE_{it-1} as the deflator while Myers use time-series estimations. The evidence of ω_{11} in this study is consistent to all previous studies and the OFF. Except for EDMV estimated by pooling, there are more positive significant ω_{12} suggesting that *OA* captures conservatism for the Prop-LID. The evidence for this study is inconsistent with the findings of Stober (1996) (70% are negatives), Myers (1999) (60% are negatives), and Ahmed et al. (2000) (mean = –0.041). Like Stober, Ahmed et al. use per share basis for their cross-sectional estimations.

The evidence of ω_{13} for this study is inconsistent with Myers (1999); and Ahmed et al. (2000). I offer two explanations for this difference. Firstly, the definition of *CI* may be different. Since capital investment is not defined in the balance sheet or income statements in major GAAP, this study define *CI* as prescribed in the cash flow statement as it is the only statement that defines *CI*. Myers and Ahmed et al. do not report any definition of *CI*. Secondly, the testing hypotheses of *CI* are different. This study adopts the hypothesis under Feltham and Ohlson (1996). According to FO (1996), if the current investments are zero net value (£0), then expected future investments do not affect the current value of the firm. If the current investments have a positive net value (positive £), then expected future investments increase the current value of the firm. More specifically, $\omega_{13} < 0$ implies negative NPV investments as $\alpha_3 < 0$, coefficient of *CI* in the valuation model, $\omega_{13} = 1$ implies no expected growth ($\alpha_3 = 0$, zero net value investment) while $\omega_{13} > 1$ implies positive expected growth ($\alpha_3 > 0$, positive net value investment). In Myers (1999), ω_{13} are hypothesized to capture the income effect of conservatism. When assets are acquired, accelerated depreciation will overstate the rate of decay of existing assets, thereby reducing current *RI*. Hence, ω_{13} are expected to be negative in Myer's LID, which is inconsistent to the hypothesis of the OFF. Myers obtains median $\omega_{13} = -0.048$, while Ahmed et al. (2000) obtain mean $\omega_{13} = -0.064$ but the later did not provide a hypothesis for their test.

The result indicates that the estimated coefficients of *HR* and *DC* conform to expectations while that for *RD* is mixed, but all the values of the coefficients are low, most

of them < 1, suggesting that *HR, DC* and *RD* have some abilities in predicting future *RI*. The low magnitudes of the coefficients may be due to measurement errors in variables. This argument may be valid as *DC* is noisy as it includes costs such as transportation, warehousing, insurance, freight charges, distribution and related costs in addition to advertising costs, while only 23% of firms in the sample for this study report *RD* costs.

The evidence in this study clearly shows that *TD* and in particular, *DIV* are both able to predict future *RI*. The strong showing by *DIV* is consistent with Hand and Landsman's (1999) LID in which dividends provide strong signals of future profitability and cash flows to the market. While there is no reported use of *TD* in the LID, past studies using market valuation models have found debts to be relevant in explaining share prices (eg Green et al., 1996; Rees, 1997).

The explanatory power for EDBV are reasonably high cross-sectionally (median = 0.23, Table 5.13) but is low in the pool (median = 0.07). The $\overline{R}^2$ are high for EDMV with median > 0.4 (pool and cross-section) and on many occasions, $\overline{R}^2 > 0.6$ (eg 0.693 in 1991, RModel 8). This compares with $\overline{R}^2 = 0.34$ in Dechow et al. (1999) using non-integrated framework and using a single variable to proxy for v_t. Since no other study on the LID that reports $\overline{R}^2$, it is not advisable to form general conclusion but at least it is comforting to know that my hypothesis of using an integrated framework based on the CSV is still valid.

The evidence indicates that the White's consistent standard errors can undermine the true standard errors for deflated equations, consistent with Barth and Kallapur (1996); Stober (1996)[8] and Green et al. (1996) report that the White's test can reduce the number of statistically significant coefficients. While the White's test is widely used as a tool to mitigate heteroscedasticity for cross-sectional and pool estimations, the drop in the test statistics for the estimated coefficients in such a large magnitude that cause many coefficients to become insignificant, and the reported understatement of the true standard errors in past studies using the White's test, is a concern for this study and other studies that adopt the White's test to mitigate heteroscedasticity. The question is on what extent should the White's test be used in conjunction with scaled equations in mitigating heteroscedasticity since the test can severely understate the true standard errors for the deflated equations? Therefore, this research suggests that more research in the use of the

[8] His conclusion is based on specifications with an intercept where the number of shares is used as deflator.

White's test or a better technique in mitigating heteroscedasticity should be an interesting avenue for future research in CMRA.

Overall, *OA, CI, RD, HR. DC, TD* and *DIV* have incremental information content beyond *RI,* and all eight variables (EDBV) and five (EDMV) are able to predict future *RI* and ought to be included in the *RI* model. The findings from a wide range of statistics, econometric, economic and accounting measures for Prop-LID are summarized below:

#	Statistics	EDBV					EDMV				
		Cross-section		Pool		√	Cross-section		Pool		√
1	ω_{11} *(RI)* [1]	66 (2)	0.34	8 (0)	–0.02		72 (0)	0.36	8 (0)	0.46	√
2	ω_{12} *(OA)*	40 (11)	0.02	6 (1)	0.26	√	30 (24)	0.01	1 (4)	–0.01	
3	ω_{13} *(CI)*	32 (12)	0.06	6 (0)	0.02		28 (14)	0.04	5 (0)	0.04	
4	ω_{14} *(RD)*	20 (11)	0.12	0 (1)	0.11	√	5 (10)	–0.07	0 (3)	–0.22	
5	ω_{15} *(HR)*	22 (3)	0.03	3 (0)	0.04		14 (5)	0.01	4 (0)	0.04	
6	ω_{16} *(DC)*	17 (6)	0.05	0 (3)	0.02	√	4 (10)	–0.01	0 (3)	–0.06	
7	ω_{17} *(TD)*	7 (3)	0.01	0 (0)	–0.07		12 (3)	0.04	2 (0)	0.08	√
8	ω_{18} *(DIV)*	9 (0)	0.9	1 (0)	0.01		9 (0)	1.54	1 (0)	1.64	√
9	*t*-stat	213 (48)		24 (5)		√	174 (66)		21 (10)		
10	*h*-stat	151 (11)		8 (0)		√	124 (39)		12 (5)		
11	Median $\overline{R}^2$	0.23		0.07			0.48		0.4		√
12	Intercept ω_0 [2]	32 (34)		2 (6)			29 (33)		1 (3)		
13	Inverse of scale [2] $\frac{1}{BV}$ and $\frac{1}{MV}$	34 (37)		1 (7)		√	11 (60)		1 (7)		
14	$\overline{R}^2$, AIC, *F*-test [3]	41 (3)		5 (0)			35 (1)		6 (0)		
15	Chow's Prediction test of Parameter Stability [4]	5		0			34		8		√
16	$\overline{RSS}$	0.257		0.29			0.113		0.141		√

Table 5.16 – Summary of various Measures for the proposed RI models (Prop-LID) for the two deflated equations. [1] indicates number of statistical significant with correct (incorrect) signs, and median coefficient respectively. [2] indicates number of statistically significant (insignificant) coefficient. [3] indicates clear (weak) validity of adding an additional variable. [4] indicates number of statistically significant coefficients. √ indicates better performer provided the measure of one deflator > 10% than the other.

The discussion that follows forms the secondary issues/hypotheses of this Chapter. What is more amazing with the CSV is that various measures used to detect multicollinearity reveal little indication of multicollinearity in the Prop-LID. Table 5.16 shows that EDBV have more significant *t*-and *h*-stat, higher medians for ω_{12}, ω_{14} and ω_{16} and lower $\frac{1}{BV}$ than EDMV, while EDMV have higher median $\overline{R}^2$s, more stable

parameters, lower $\overline{RSS}$ and higher medians for ω_{11}, ω_{17} and ω_{18} than EDBV, suggesting that statistical results are affected by deflators. Thus, deflating variables using proxies such as total assets, sales, book value of equity, net income, number of shares outstanding, and share price in mitigating coefficient bias only by a small amount, if not at all in Barth and Kallapur (1996) is rejected.

The evidence from samples with and without outliers is unexpected in the sense that the omission of outliers not only does not contribute to an improvement in statistical performance; it has a negative impact on individual independent variables as well as explanatory powers. However, in some extent, this evidence is consistent with Green et al. (1996); Akbar (2000); and Easton and Sommers (2002) where they found that omission of extreme observations/outliers does not improve statistical results. Hence, the question on the deletion of outliers in a sample may be more complex than one would expect.

The other secondary finding indicates that based on the total number of statistically significant coefficients with the correct sign in an equation, the use of 10% cost of capital outperforms that of 15% or 20% in both cross-sectional and pooled data.

Finally, the evidence for both cross-sectional and pool results based on $\overline{R}^2$ contrasts that from *t*-statistics. For instance, EDBV has the most number of significant coefficients with the correct sign from both cross-sectional and pooled estimations, but their $\overline{R}^2$s are low. This suggests that while the variables included in the regressions is valid (based on *t*-statistics), they do not contribute much in explaining one-year ahead *RI*. From this evidence, analysis based on $\overline{R}^2$ is difficult and inconclusive, as a rise in $\overline{R}^2$ when a new variable is added does not necessarily mean that its coefficient is significantly different from 0. From this, any increase in $\overline{R}^2$ does NOT mean that the specification of an equation has improved (see Dougherty, 1992; Maddala, 1992; Pindyck and Rubinfeld, 1998; Greene, 2003; Appendix 5.2). Hence, unlike the traditional view that $\overline{R}^2$ is the most appropriate measure for goodness-of-fit for multiple regressions, this study takes the view that when analysing multiple regressions it is necessary to analyse a whole range of statistical measures in addition to $\overline{R}^2$ such as *t*-ratios (or standard errors), *F*-statistic, $\overline{RSS}$ and the AIC.

5.4. Analysis of the Results from Estimating the Main Regression Equations without an Intercept Term

Both the theoretical LID and the valuation model of the OFF and the proposed models of this research do not contain an intercept. In the previous section, an intercept term is included in all the scaled estimating equations. However, many researchers have operationalised regression models without an intercept, eg the Sougiannis (1994); and Stober (1996). Therefore, the question for the inclusion of an intercept in scaled estimating equations is an unresolved one, and it would be of great interest for this research as well as in CMRA to investigate whether the equation that omit an intercept generates different statistical results from those that include an intercept. Pindyck and Rubinfeld (1998, p. 89); and Greene (2003, p. 37-38) argue that interpretation of R^2 or $\overline{R}^2$ is difficult when a model excludes a constant term because the $\frac{ESS}{TSS}$ need not lie within 0 and 1 and the explanatory power can even be negative. Fortunately, except for the measure of the fit, nothing fundamental has changed in the regression relationship (p. 38).

Since the sample where $BV \geq$ £5 millions and r = 10% for the scaled equations gives the best statistical and econometric result as compared with other samples with/without outliers using r = 15% or 20% in the previous sections, all the tests in this section will be based on this sample estimated using deflated equations. The estimations using OLS on RModel 1 to 8 are ran by including an inverse of size term on (1) equations deflated by closing book values (EDBV); and (2) equations deflated by closing market value of equity (EDMV). The estimations are first carried out by regressing cross-sectionally for each of the sample years from 1991 to 1999 (9 annual cross-sections). The data is then pooled over the entire sample periods to be estimated on a pooling basis. All regressions including the generation of output and statistical analysis are done automatically by specially self-written computer software. The estimation basis and the numbers of regression runs are summarized as follows:

Basis	Estimation Type	Type *X* Equations *X* Years	Total
$BV \geq$ £5 millions,	Annual cross-section (1991-1999)	2 X 8 X 9	144
r = 10%	Pooled entire sample	2 X 8	16
Total			160

Table 5.17 – Estimation Basis, Type, and the Number of Regression Runs

Statistical results from the cross-sectional and pooled estimations are depicted in Tables 5.18 and 5.19 respectively.

Table 5.18 - Medians and Percentiles of Estimated Coefficients, and Adj. R^2 from Cross-sectional and Pool Estimations of Equations (No Intercept) deflated by BV_{it} and MV_{it} for Sample where $BV \geq$ £5 Millions and r = 10%

	Statistics	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2
Deflated by BV_{it}										
Cross-sectional	Median	0.35	0.02	0.04	0.13	0.02	0.04	0.02	0.88	0.23
	25% Percentile	0.21	-0.01	-0.04	-0.16	0.00	-0.02	-0.01	0.62	0.17
	75% Percentile	0.49	0.03	0.07	0.44	0.06	0.09	0.12	1.50	0.31
Pool	Median	0.26	0.02	0.11	0.03	0.02	-0.07	0.02	1.78	0.07
	25% Percentile	0.25	0.01	0.11	-0.00	0.01	-0.09	0.01	1.78	0.07
	75% Percentile	0.26	0.02	0.11	0.03	0.02	-0.07	0.03	1.78	0.07
Deflated by MV_{it}										
Cross-sectional	Median	0.36	0.01	0.05	-0.06	0.01	-0.02	0.04	1.46	0.48
	25% Percentile	0.29	-0.04	-0.03	-0.52	-0.02	-0.15	0.01	1.21	0.38
	75% Percentile	0.61	0.04	0.16	0.07	0.07	0.02	0.06	1.58	0.53
Pool	Median	0.46	-0.01	0.04	-0.30	0.04	-0.07	0.08	1.57	0.40
	25% Percentile	0.45	-0.03	0.02	-0.32	0.03	-0.07	0.08	1.57	0.40
	75% Percentile	0.47	-0.00	0.05	-0.18	0.04	-0.06	0.08	1.58	0.43

Annual cross-sectional sample (1991-1999) consists of 920 to 1,157 observations and pooled sample consisting of 9,277 to 9,302 observations. Regressions are run from Prop-LID:

RModel 1 $$RI_{it+1} = \omega_{11} RI_{it} + e_{it+1}$$

RModel 2 $$RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + e_{it+1}$$

RModel 3 $$RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + e_{it+1}$$

RModel 4 $$RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + e_{it+1}$$

RModel 5 $$RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + e_{it+1}$$

RModel 6 $$RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it+1}$$

RModel 7 $$RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + e_{it+1}$$

RModel 8 $$RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it+1}$$

Table 5.19 - No. of Significant Coefficients from Cross-sectional and Pool Estimations (No Intercept) for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	ω_{11} (RI_{it})		ω_{12} (OA_{it})		ω_{13} (CI_{it})		ω_{14} (RD_{it})		ω_{15} (HR_{it})		ω_{16} (DC_{it})		ω_{17} (TD_{it})		ω_{18} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	2	Deflated by BV_{it}	0	3	0	0	5	0	0	0	1	0	0	2	1	0	0	0	7	5
	3	Deflated by MV_{it}	0	7	6	0	0	0	4	0	1	0	2	0	1	0	0	0	14	7
1992	2	Deflated by BV_{it}	6	0	0	6	4	0	0	2	0	3	0	0	1	0	0	0	11	11
	3	Deflated by MV_{it}	0	7	5	0	0	0	3	0	0	1	2	0	1	0	0	0	11	8
1993	2	Deflated by BV_{it}	6	1	4	0	3	0	3	0	3	0	1	0	1	0	0	0	21	1
	3	Deflated by MV_{it}	5	0	6	0	0	0	0	0	0	0	0	0	1	0	0	0	12	0
1994	2	Deflated by BV_{it}	5	2	4	0	3	1	3	0	3	0	2	0	1	0	0	0	21	3
	3	Deflated by MV_{it}	5	1	0	2	0	0	0	2	0	0	2	0	1	0	0	0	8	5
1995	2	Deflated by BV_{it}	5	1	6	0	0	4	4	0	2	0	1	0	1	0	0	0	19	5
	3	Deflated by MV_{it}	5	1	0	6	0	5	1	0	3	0	2	0	1	0	0	0	12	12
1996	2	Deflated by BV_{it}	6	0	6	0	0	4	4	0	0	1	0	0	1	0	0	0	17	5
	3	Deflated by MV_{it}	6	0	0	2	4	0	4	0	0	3	0	1	1	0	0	0	15	6
1997	2	Deflated by BV_{it}	5	2	6	0	5	0	2	0	3	0	2	0	1	0	0	0	24	2
	3	Deflated by MV_{it}	6	1	5	0	0	1	1	1	0	3	2	0	1	0	0	0	15	6
1998	2	Deflated by BV_{it}	0	5	0	6	1	0	4	0	3	0	2	0	1	0	0	0	11	11
	3	Deflated by MV_{it}	0	7	0	6	0	0	0	4	0	0	2	0	1	0	0	0	3	17
1999	2	Deflated by BV_{it}	5	1	6	0	0	5	0	2	0	3	2	0	1	0	0	0	14	11
	3	Deflated by MV_{it}	3	0	6	0	0	5	0	1	0	3	0	2	1	0	0	0	10	11
Total	2	Deflated by BV_{it}	38	15	32	12	21	14	20	4	15	7	10	2	9	0	0	0	145	54
	3	Deflated by MV_{it}	30	24	28	16	4	11	13	8	4	10	12	3	9	0	0	0	100	72
Pool	2	Deflated by BV_{it}	6	1	6	0	0	1	3	1	0	3	1	0	1	0	0	0	17	6
	3	Deflated by MV_{it}	1	4	5	0	0	3	4	0	0	3	2	0	1	0	0	0	13	10

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) no deflation (2) deflated by BV_{it} (3) deflated by MV_{it}.
Hence RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} and DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation.
Numbers are in t-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

From Table 5.18, cross-sectional and pooled median $\bar{R}^2$s for the main equations that exclude the intercept (NoIntercept) for EDBV and EDMV are 0.23, 0.07 and 0.48, 0.4 respectively, which are identical to that of equations that include an intercept (WithIntercept) (Table 5.13).

For EDBV, cross-sectional coefficients for all variables are positives and the magnitudes of all median coefficients are almost the same in both WithIntercept and NoIntercept (Tables 5.18 and 5.13). However, there is inconsistency as well as the magnitudes of the median coefficients for the coefficients between WithIntercept and NoIntercept for the pooled data, for example, the signs of ω_{11} (RI) = negative in the former but is positive in the later. For EDMV, there is hardly any significant difference in the magnitudes and the signs of the median coefficients for both cross-sectional and pooled data.

Cross-sectional and pooled data for both EDBV and EDMV with intercept indicate that the total number of statistically significant coefficients with the correct (incorrect) signs WithIntercept clearly outperform NoIntercept [EDBV: 213 (48) vs. 145 (54), EDMV: 174 (66) vs. 100 (72) (cross-section), EDBV: 24 (5) vs. 17 (6), EDMV: 21 (10) vs. 13 (10) (pool)] (Tables 5.19 and 5.8a). The evidence clearly shows that scaled equations that include an intercept produce more number of statistically significant coefficients with the expected signs.

In summary, results using medians and percentiles of estimated coefficients and $\bar{R}^2$s contrast that with the number of significant coefficients with the expected (unexpected) signs. While the medians coefficients and $\bar{R}^2$s are almost the same for scaled equations that include/exclude an intercept, the number of significant coefficients of equations with intercept clearly outperform those without an intercept, and thus, the conclusion is that scaled models estimated with an intercept generate better statistical results for individual variables. This evidence reaffirms my belief that scaled equations that include an intercept as well as an inverse of scale term generates more number of statistically positive coefficients than equations that exclude an intercept, and hence, all equations to be estimated in the remainder of this Chapter will include an intercept.

5.5. Analysis of the Results from Estimating the Regression Equations containing current and lagged *Research & Development Expenditures (RD), Human Resource Costs (HR) and Distribution Costs (DC)*

This section examine the impact of current and lagged *RD*, *HR* and *DC* expenditures on one-year ahead *RI*, and to determine whether they can be validly used as proxies for intangibles in the RI model. Since sample where $BV \geq$ £5 millions and $r = 10\%$ for the deflated equations with an intercept generates more number of statistically significant coefficients with the correct sign as compared with other samples with/without outliers using $r = 15\%$ or 20% in the previous sections, all the tests in this section will be based on this sample estimated using deflated equations with an **intercept and inverse of size terms**. Three models: (1) **Model RRD for current and lagged *RD*** from year 1 to 4; (2) **Model RHR for current and lagged *HR*** from year 1 to 4; and (3) **RDC for current and lagged *DC*** from year 1 to 4 are estimated based on different criteria using OLS. Models RRD, RRH and RRD are ran on (1) equations deflated by closing book values (EDBV); and (2) equations deflated by closing market value of equity (EDMV). The estimations are first carried out by regressing cross-sectionally for each of the sample years from 1995 to 1999 (5 annual cross-sections). Years 1991 to 1994 are not used because lag data for these years is not available. The data is then pooled over the entire sample periods to be estimated on a panel series. All regressions including the generation of output and statistical analysis are done automatically by specially self-written computer software. The estimation basis and the numbers of regression runs are summarized as follows:

Basic	Type	Estimation Type	Type *X* Equations *X* Years	Total
$BV \geq$ £5 millions, $r = 10\%$	*RD*	Annual cross-section	2 X 5 X 5	50
	HR	Annual cross-section	2 X 5 X 5	50
	DC	Annual cross-section	2 X 5 X 5	50
	RD	Pooled entire sample	2 X 5	10
	HR	Pooled entire sample	2 X 5	10
	DC	Pooled entire sample	2 X 5	10
Total				180

Table 5.20 – Estimation Basis, Type, and the Number of Regression Runs

Results from medians and percentiles of estimated coefficients and $\overline{R}^2$s, and the number of significant coefficients of current of current and lagged *RD*, *HR* and *DC* are depicted in Tables 5.21a-c and Tables 5.22a-c respectively. The Polynomial distributed lags of *RD*, *HR* and *DC* are depicted in Tables 5.23-c.

Table 5.21a,b,c - Medians and Percentiles of Estimated Coefficients and Adj. R^2 of current and lagged *RD, HR, DC* of Deflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

	Statistics	ω_{RRI} (RI_{it})	ω_{R} (RD_{it})	$\omega_{R\text{-}1}$ $(RD_{it\text{-}1})$	$\omega_{R\text{-}2}$ $(RD_{it\text{-}2})$	$\omega_{R\text{-}3}$ $(RD_{it\text{-}3})$	$\omega_{R\text{-}4}$ $(RD_{it\text{-}4})$	Adj-R^2
Deflated by BV_{it}								
Cross-sectional	Median	0.35	-0.09	0.28	-0.31	1.49	0.96	0.24
	25% Percentile	0.22	-0.55	-1.25	-0.79	0.85	-0.63	0.13
	75% Percentile	0.52	0.12	0.82	0.08	2.12	2.12	0.31
Pool	Median	0.28	0.88	-1.52	-2.00	2.04	1.06	0.06
	25% Percentile	0.28	0.80	-1.87	-2.02	1.79	1.06	0.06
	75% Percentile	0.28	1.26	-1.17	-1.08	2.29	1.06	0.07
Deflated by MV_{it}								
Cross-sectional	Median	0.53	-0.47	1.10	-1.16	2.21	-0.74	0.44
	25% Percentile	0.51	-1.54	0.42	-3.34	1.68	-2.12	0.30
	75% Percentile	0.61	-0.27	1.59	0.08	3.81	2.46	0.47
Pool	Median	0.50	-0.79	1.09	-1.91	1.82	0.66	0.31
	25% Percentile	0.49	-0.94	1.05	-1.93	1.69	0.66	0.31
	75% Percentile	0.50	-0.74	1.16	-1.22	1.95	0.66	0.32

	Statistics	ω_{HRI} (RI_{it})	ω_{H} (HR_{it})	$\omega_{H\text{-}1}$ $(HR_{it\text{-}1})$	$\omega_{H\text{-}2}$ $(HR_{it\text{-}2})$	$\omega_{H\text{-}3}$ $(HR_{it\text{-}3})$	$\omega_{H\text{-}4}$ $(HR_{it\text{-}4})$	Adj-R^2
Deflated by BV_{it}								
Cross-sectional	Median	0.36	0.10	-0.05	0.00	0.05	0.16	0.17
	25% Percentile	0.11	0.07	-0.42	-0.04	-0.12	-0.07	0.12
	75% Percentile	0.51	0.31	0.00	0.12	0.11	0.21	0.27
Pool	Median	0.24	0.20	-0.37	0.05	0.18	0.01	0.04
	25% Percentile	0.24	0.16	-0.38	0.04	0.18	0.01	0.03
	75% Percentile	0.25	0.21	-0.32	0.14	0.19	0.01	0.05
Deflated by MV_{it}								
Cross-sectional	Median	0.13	0.09	0.07	0.12	0.12	0.12	0.44
	25% Percentile	-0.02	-0.02	-0.05	-0.04	-0.04	-0.04	0.38
	75% Percentile	0.61	0.09	0.07	0.13	0.10	-0.02	0.48
Pool	Median	0.44	0.05	0.06	-0.08	-0.01	-0.02	0.34
	25% Percentile	0.44	0.05	0.04	-0.08	-0.01	-0.02	0.33
	75% Percentile	0.45	0.05	0.06	-0.07	-0.00	-0.02	0.41

	Statistics	ω_{DRI} (RI_{it})	ω_{D} (DC_{it})	$\omega_{D\text{-}1}$ $(DC_{it\text{-}1})$	$\omega_{D\text{-}2}$ $(DC_{it\text{-}2})$	$\omega_{D\text{-}3}$ $(DC_{it\text{-}3})$	$\omega_{D\text{-}4}$ $(DC_{it\text{-}4})$	Adj-R^2
Deflated by BV_{it}								
Cross-sectional	Median	0.34	0.08	0.01	-0.00	0.02	-0.01	0.17
	25% Percentile	0.18	0.06	0.01	-0.02	0.01	-0.02	0.13
	75% Percentile	0.52	0.11	0.01	0.00	0.03	0.00	0.27
Pool	Median	0.25	-0.04	-0.01	-0.02	0.01	-0.04	0.03
	25% Percentile	0.25	-0.04	-0.01	-0.02	0.01	-0.04	0.03
	75% Percentile	0.25	-0.04	-0.01	-0.02	0.01	-0.04	0.03
Deflated by MV_{it}								
Cross-sectional	Median	0.58	-0.06	0.00	0.03	-0.03	0.01	0.44
	25% Percentile	0.42	-0.08	-0.01	-0.03	-0.03	-0.04	0.31
	75% Percentile	0.61	0.09	0.02	0.14	-0.02	0.02	0.49
Pool	Median	0.50	0.01	-0.02	0.01	-0.01	-0.03	0.31
	25% Percentile	0.50	0.01	-0.02	0.01	-0.01	-0.03	0.31
	75% Percentile	0.50	0.01	-0.02	0.01	-0.01	-0.03	0.31

Annual cross-sectional sample (1995-1999) consists of 920 to 1,157 observations and pooled sample consisting 5,333 to 5,341 observations. Regressions are run from*:

Eq. 1 $$RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + e_{it+1}$$

Eq. 2 $$RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + e_{it+1}$$

Eq. 3 $$RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + \omega_{R\text{-}2} RD_{it-2} + e_{it+1}$$

Eq. 4 $$RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + \omega_{R\text{-}2} RD_{it-2} + \omega_{R\text{-}3} RD_{it-3} + e_{it+1}$$

Eq. 5 $$RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + \omega_{R\text{-}2} RD_{it-2} + \omega_{R\text{-}3} RD_{it-3} + \omega_{R\text{-}4} RD_{it-4} + e_{it+1}$$

*Due to space constraint and since all specifications are similar, only *RD* models are shown.

Table 5.22a - Number of Significant Coefficients (t-Stat) (top) (h-Stat) of Current and Lagged RD costs for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	ω_{RRI} (RI_{it})		ω_{R} (RD_{it})		$\omega_{R\text{-}1}$ $(RD_{it\text{-}1})$		$\omega_{R\text{-}2}$ $(RD_{it\text{-}2})$		$\omega_{R\text{-}3}$ $(RD_{it\text{-}3})$		$\omega_{R\text{-}4}$ $(RD_{it\text{-}4})$		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	0	4	4	0	1	0	2	0	0	0	12	4
	3	Deflated by MV_{it}	5	0	0	5	1	0	3	0	1	0	0	1	10	6
1996	2	Deflated by BV_{it}	5	0	0	0	0	0	0	3	1	1	1	0	7	4
	3	Deflated by MV_{it}	5	0	1	0	4	0	0	2	2	0	0	0	12	2
1997	2	Deflated by BV_{it}	5	0	5	0	0	4	2	0	2	0	1	0	15	4
	3	Deflated by MV_{it}	5	0	0	4	4	0	0	2	1	0	1	0	11	6
1998	2	Deflated by BV_{it}	5	0	1	0	0	0	0	0	1	0	0	1	7	1
	3	Deflated by MV_{it}	5	0	0	4	3	0	0	0	2	0	0	1	10	5
1999	2	Deflated by BV_{it}	0	0	0	3	2	1	0	2	2	0	0	0	4	6
	3	Deflated by MV_{it}	5	0	0	1	0	0	0	2	1	0	1	0	7	3
Total	2	Deflated by BV_{it}	20	0	6	7	6	5	3	5	8	1	2	1	45	19
	3	Deflated by MV_{it}	25	0	1	14	12	0	3	6	7	0	2	2	50	22
Pool	2	Deflated by BV_{it}	5	0	4	0	0	4	0	2	2	0	1	0	12	6
	3	Deflated by MV_{it}	5	0	0	5	4	0	0	3	2	0	1	0	12	8
1995	2	Deflated by BV_{it}	5	0	0	3	4	0	1	0	2	0	0	0	12	3
	3	Deflated by MV_{it}	5	0	0	3	0	0	0	0	0	0	0	1	5	4
1996	2	Deflated by BV_{it}	5	0	0	0	0	0	0	0	0	0	1	0	6	0
	3	Deflated by MV_{it}	5	0	0	0	0	0	0	2	2	0	0	0	7	2
1997	2	Deflated by BV_{it}	4	0	4	0	0	4	1	0	1	0	1	0	11	4
	3	Deflated by MV_{it}	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	2	Deflated by BV_{it}	5	0	0	0	0	0	0	0	0	0	0	0	5	0
	3	Deflated by MV_{it}	5	0	0	4	1	0	0	0	1	0	0	1	7	5
1999	2	Deflated by BV_{it}	0	0	0	0	0	0	0	2	2	0	0	0	2	2
	3	Deflated by MV_{it}	5	0	0	0	0	0	0	0	0	0	0	0	5	0
Total	2	Deflated by BV_{it}	19	0	4	3	4	4	2	2	5	0	2	0	36	9
	3	Deflated by MV_{it}	20	0	0	7	1	0	0	2	3	0	0	2	24	11
Pool	2	Deflated by BV_{it}	5	0	0	0	0	1	0	2	1	0	0	0	6	3
	3	Deflated by MV_{it}	5	0	0	2	1	0	0	2	1	0	0	0	7	4

Regressions are run from $RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + e_{it}$, $RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + e_{it}$, $RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + \omega_{R\text{-}2} RD_{it-2} + e_{it}$ $RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + \omega_{R\text{-}2} RD_{it-2} + \omega_{R\text{-}3} RD_{it-3} + e_{it}$, $RI_{it+1} = \omega_{R0} + \omega_{RRI} RI_{it} + \omega_{R} RD_{it} + \omega_{R\text{-}1} RD_{it-1} + \omega_{R\text{-}2} RD_{it-2} + \omega_{R\text{-}3} RD_{it-3} + \omega_{R\text{-}4} RD_{it-4} + e_{it}$ in terms of deflated by (1) BV_{it} (2) MV_{it}. Numbers are in t- and h-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 5.22b - Number of Significant Coefficients (t-Stat) (top) (h-Stat) of Current and Lagged HR costs for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	ω_{HRI} (RI_{it})		ω_{H} (HR_{it})		ω_{H-1} (HR_{it-1})		ω_{H-2} (HR_{it-2})		ω_{H-3} (HR_{it-3})		ω_{H-4} (HR_{it-4})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	1	0	0	0	11	0
	3	Deflated by MV_{it}	5	0	1	0	0	0	2	0	0	1	0	1	8	2
1996	2	Deflated by BV_{it}	5	0	5	0	0	1	0	2	1	1	1	0	12	4
	3	Deflated by MV_{it}	5	0	5	0	1	0	1	0	2	0	0	1	14	1
1997	2	Deflated by BV_{it}	5	0	5	0	0	4	3	0	0	1	1	0	14	5
	3	Deflated by MV_{it}	5	0	5	0	0	4	1	0	1	0	1	0	13	4
1998	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	1	1	0	11	1
	3	Deflated by MV_{it}	5	0	0	5	4	0	0	3	0	0	0	0	9	8
1999	2	Deflated by BV_{it}	0	0	3	0	0	3	1	0	2	0	0	1	6	4
	3	Deflated by MV_{it}	5	0	2	0	0	3	3	0	0	2	0	0	10	5
Total	2	Deflated by BV_{it}	20	0	23	0	0	8	4	2	4	3	3	1	54	14
	3	Deflated by MV_{it}	25	0	13	5	5	7	7	3	3	3	1	2	54	20
Pool	2	Deflated by BV_{it}	5	0	5	0	0	4	1	0	2	0	0	0	13	4
	3	Deflated by MV_{it}	5	0	5	0	3	0	0	3	0	0	0	0	13	3
1995	2	Deflated by BV_{it}	5	0	1	0	0	0	0	0	0	0	0	0	6	0
	3	Deflated by MV_{it}	5	0	0	0	0	0	0	0	0	0	0	0	5	0
1996	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it}	5	0	2	0	1	0	0	0	1	0	0	1	9	1
1997	2	Deflated by BV_{it}	0	0	4	0	0	1	0	0	0	1	1	0	5	2
	3	Deflated by MV_{it}	0	0	5	0	0	4	0	0	0	0	1	0	6	4
1998	2	Deflated by BV_{it}	5	0	2	0	0	0	0	0	0	0	0	0	7	0
	3	Deflated by MV_{it}	5	0	0	5	3	0	0	2	0	0	0	0	8	7
1999	2	Deflated by BV_{it}	0	0	2	0	0	2	0	0	1	0	0	0	3	2
	3	Deflated by MV_{it}	5	0	0	0	0	0	0	0	0	0	0	0	5	0
Total	2	Deflated by BV_{it}	15	0	14	0	0	3	0	0	1	1	1	0	31	4
	3	Deflated by MV_{it}	20	0	7	5	4	4	0	2	1	0	1	1	33	12
Pool	2	Deflated by BV_{it}	3	0	3	0	0	3	0	0	0	0	0	0	6	3
	3	Deflated by MV_{it}	5	0	2	0	3	0	0	1	0	0	0	0	10	1

Regressions are run from $RI_{it+1} = \omega_{H0} + \omega_{HRI} RI_{it} + \omega_{H} HR_{it} + e_{it}$, $RI_{it+1} = \omega_{H0} + \omega_{HRI} RI_{it} + \omega_{H} HR_{it} + \omega_{H-1} HR_{it-1} + e_{it}$, $RI_{it+1} = \omega_{H0} + \omega_{HRI} RI_{it} + \omega_{H} HR_{it} + \omega_{H-1} HR_{it-1} + \omega_{H-2} HR_{it-2} + e_{it}$ $RI_{it+1} = \omega_{H0} + \omega_{11} RI_{it} + \omega_{HRI} HR_{it} + \omega_{H-1} HR_{it-1} + \omega_{H-2} HR_{it-2} + \omega_{H-3} HR_{it-3} + e_{it}$, $RI_{it+1} = \omega_{H0} + \omega_{HRI} RI_{it} + \omega_{H} HR_{it} + \omega_{H-1} HR_{it-1} + \omega_{H-2} HR_{it-2} + \omega_{H-3} HR_{it-3} + \omega_{H-4} HR_{it-4} + e_{it}$ in terms of deflated by (1) BV_{it} (2) MV_{it}. Numbers are in t- and h-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 5.22c - Number of Significant Coefficients (t-Stat) (top) (h-Stat) of Current and Lagged DC costs for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	ω_{DRI} (RI_{it})		ω_{D} (DC_{it})		ω_{D-1} (DC_{it-1})		ω_{D-2} (DC_{it-2})		ω_{D-3} (DC_{it-3})		ω_{D-4} (DC_{it-4})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it}	5	0	5	0	0	0	0	3	0	0	0	0	10	3
1996	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it}	5	0	0	3	4	0	3	0	0	0	0	0	12	3
1997	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	2	0	0	10	2
	3	Deflated by MV_{it}	5	0	5	0	0	0	3	0	2	0	0	1	15	1
1998	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it}	5	0	0	5	0	4	0	3	0	2	0	1	5	15
1999	2	Deflated by BV_{it}	0	0	0	5	0	0	0	0	0	0	0	0	0	5
	3	Deflated by MV_{it}	5	0	0	5	3	0	3	0	0	2	0	0	11	7
Total	2	Deflated by BV_{it}	20	0	20	5	0	0	0	0	0	2	0	0	40	7
	3	Deflated by MV_{it}	25	0	10	13	7	4	9	6	2	4	0	2	53	29
Pool	2	Deflated by BV_{it}	5	0	0	5	0	0	0	0	0	0	0	0	5	5
	3	Deflated by MV_{it}	5	0	0	0	0	4	1	0	0	0	0	1	6	5
1995	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it}	5	0	5	0	0	0	0	0	0	0	0	0	10	0
1996	2	Deflated by BV_{it}	5	0	0	0	0	0	0	0	0	0	0	0	5	0
	3	Deflated by MV_{it}	5	0	0	0	2	0	3	0	0	0	0	0	10	0
1997	2	Deflated by BV_{it}	0	0	5	0	0	0	3	0	0	2	0	0	8	2
	3	Deflated by MV_{it}	0	0	3	0	0	0	0	0	0	0	0	0	3	0
1998	2	Deflated by BV_{it}	5	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it}	5	0	0	0	0	4	0	2	0	2	0	0	5	8
1999	2	Deflated by BV_{it}	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	Deflated by MV_{it}	5	0	0	5	0	0	3	0	0	0	0	0	8	5
Total	2	Deflated by BV_{it}	15	0	15	0	0	0	3	0	0	2	0	0	33	2
	3	Deflated by MV_{it}	20	0	8	5	2	4	6	2	0	2	0	0	36	13
Pool	2	Deflated by BV_{it}	5	0	0	0	0	0	0	0	0	0	0	0	5	0
	3	Deflated by MV_{it}	5	0	0	0	0	0	0	0	0	0	0	0	5	0

Regressions are run from $RI_{it+1} = \omega_{D0} + \omega_{DRI} RI_{it} + \omega_{D} DC_{it} + e_{it}$, $RI_{it+1} = \omega_{D0} + \omega_{DRI} RI_{it} + \omega_{D} DC_{it} + \omega_{D-1} DC_{it-1} + e_{it}$, $RI_{it+1} = \omega_{D0} + \omega_{DRI} RI_{it} + \omega_{D} DC_{it} + \omega_{D-1} DC_{it-1} + \omega_{D-2} DC_{it-2} + e_{it}$ $RI_{it+1} = \omega_{D0} + \omega_{DRI} RI_{it} + \omega_{D} DC_{it} + \omega_{D-1} DC_{it-1} + \omega_{D-2} DC_{it-2} + \omega_{D-3} DC_{it-3} + e_{it}$, $RI_{it+1} = \omega_{D0} + \omega_{DRI} RI_{it} + \omega_{D} DC_{it} + \omega_{D-1} DC_{it-1} + \omega_{D-2} DC_{it-2} + \omega_{D-3} DC_{it-3} + \omega_{D-4} DC_{it-4} + e_{it}$ in terms of deflated by (1) BV_{it} (2) MV_{it}. Numbers are in t- and h-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 5.23a,b,c - Polynomial Distributed Lags of *RD, HR, DC* for $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Statistics	$w_{R-2}\ (RD_{it-2})$	$w_{R-3}\ (RD_{it-3})$	$w_{R-4}\ (RD_{it-4})$	$w_{R-5}\ (RD_{it-5})$	Obs
1995	2	Deflated by BV_{it}	Sum of Coeff	-0.145	-0.213	-0.162	-0.141	1,114
			$A\text{-}R^2$	0.259	0.259	0.259	0.258	
	3	Deflated by MV_{it}	Sum of Coeff	-0.491	-0.570	-0.411	-0.232	1,106
			$A\text{-}R^2$	0.432	0.431	0.431	0.431	
1996	2	Deflated by BV_{it}	Sum of Coeff	-0.063	0.017	0.102	0.025	1,157
			$A\text{-}R^2$	0.119	0.118	0.119	0.118	
	3	Deflated by MV_{it}	Sum of Coeff	1.370	1.385	1.524	1.948	1,149
			$A\text{-}R^2$	0.452	0.452	0.451	0.451	
1997	2	Deflated by BV_{it}	Sum of Coeff	0.701	0.687	0.682	0.632	1,124
			$A\text{-}R^2$	0.099	0.097	0.089	0.079	
	3	Deflated by MV_{it}	Sum of Coeff	0.039	-0.243	-0.260	-0.531	1,116
			$A\text{-}R^2$	0.225	0.226	0.224	0.225	
1998	2	Deflated by BV_{it}	Sum of Coeff	0.123	0.173	0.038	0.164	1,025
			$A\text{-}R^2$	0.380	0.380	0.380	0.380	
	3	Deflated by MV_{it}	Sum of Coeff	-0.746	-0.523	-0.550	-0.251	1,020
			$A\text{-}R^2$	0.298	0.297	0.296	0.298	
1999	2	Deflated by BV_{it}	Sum of Coeff	-1.968	-2.231	-2.425	-2.574	921
			$A\text{-}R^2$	0.026	0.026	0.025	0.023	
	3	Deflated by MV_{it}	Sum of Coeff	-0.041	-0.470	-0.533	-0.436	916
			$A\text{-}R^2$	0.466	0.468	0.465	0.464	
Pool	2	Deflated by BV_{it}	Sum of Coeff	0.044	0.019	-0.010	-0.029	5,341
			$A\text{-}R^2$	0.038	0.038	0.038	0.038	
	3	Deflated by MV_{it}	Sum of Coeff	-0.516	-0.707	-0.720	-0.605	5,315
			$A\text{-}R^2$	0.326	0.326	0.326	0.326	

Year	No	Type	Statistics	$w_{H-2}\ (HR_{it-2})$	$w_{H-3}\ (HR_{it-3})$	$w_{H-4}\ (HR_{it-4})$	$w_{H-5}\ (HR_{it-5})$	Obs
1995	2	Deflated by BV_{it}	Sum of Coeff	0.042	0.068	0.064	0.084	1,114
			$A\text{-}R^2$	0.274	0.280	0.270	0.274	
	3	Deflated by MV_{it}	Sum of Coeff	0.013	0.020	0.020	0.024	1,106
			$A\text{-}R^2$	0.426	0.426	0.427	0.425	
1996	2	Deflated by BV_{it}	Sum of Coeff	0.051	0.048	0.050	0.035	1,157
			$A\text{-}R^2$	0.154	0.151	0.147	0.142	
	3	Deflated by MV_{it}	Sum of Coeff	0.070	0.067	0.062	0.066	1,149
			$A\text{-}R^2$	0.505	0.501	0.495	0.491	
1997	2	Deflated by BV_{it}	Sum of Coeff	0.113	0.109	0.090	0.086	1,124
			$A\text{-}R^2$	0.082	0.074	0.070	0.069	
	3	Deflated by MV_{it}	Sum of Coeff	0.102	0.100	0.099	0.101	1,116
			$A\text{-}R^2$	0.458	0.448	0.429	0.411	
1998	2	Deflated by BV_{it}	Sum of Coeff	0.080	0.077	0.091	0.095	1,025
			$A\text{-}R^2$	0.410	0.409	0.410	0.405	
	3	Deflated by MV_{it}	Sum of Coeff	-0.149	-0.148	-0.135	-0.120	1,020
			$A\text{-}R^2$	0.344	0.342	0.334	0.328	
1999	2	Deflated by BV_{it}	Sum of Coeff	-0.001	0.002	0.006	-0.001	921
			$A\text{-}R^2$	-0.000	-0.001	-0.002	-0.002	
	3	Deflated by MV_{it}	Sum of Coeff	-0.013	-0.016	-0.022	-0.028	916
			$A\text{-}R^2$	0.456	0.456	0.456	0.456	
Pool	2	Deflated by BV_{it}	Sum of Coeff	0.039	0.035	0.031	0.027	5,341
			$A\text{-}R^2$	0.042	0.042	0.042	0.042	
	3	Deflated by MV_{it}	Sum of Coeff	0.039	0.035	0.031	0.027	5,315
			$A\text{-}R^2$	0.042	0.042	0.042	0.042	

Table 5.23a,b,c - Polynomial Distributed Lags of *RD, HR, DC* for $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Statistics	ν_{D-2} $(DC_{it-2}$	ν_{D-3} $(DC_{it-3}$	ν_{D-4} $(DC_{it-4}$	ν_{D-5} $(DC_{it-5}$	Obs
1995	2	Deflated by BV_{it}	Sum of Coeff	0.130	0.127	0.125	0.069	1,114
			$A\text{-}R^2$	0.273	0.272	0.272	0.276	
	3	Deflated by MV_{it}	Sum of Coeff	0.096	0.109	0.087	0.050	1,106
			$A\text{-}R^2$	0.427	0.427	0.427	0.428	
1996	2	Deflated by BV_{it}	Sum of Coeff	0.015	-0.032	-0.044	-0.066	1,157
			$A\text{-}R^2$	0.123	0.124	0.124	0.123	
	3	Deflated by MV_{it}	Sum of Coeff	0.001	-0.033	-0.048	-0.049	1,149
			$A\text{-}R^2$	0.436	0.437	0.437	0.437	
1997	2	Deflated by BV_{it}	Sum of Coeff	0.280	0.271	0.240	0.261	1,124
			$A\text{-}R^2$	0.169	0.159	0.145	0.141	
	3	Deflated by MV_{it}	Sum of Coeff	0.195	0.190	0.170	0.173	1,116
			$A\text{-}R^2$	0.304	0.302	0.293	0.288	
1998	2	Deflated by BV_{it}	Sum of Coeff	0.075	0.076	0.060	0.066	1,025
			$A\text{-}R^2$	0.387	0.386	0.385	0.384	
	3	Deflated by MV_{it}	Sum of Coeff	-0.152	-0.133	-0.176	-0.164	1,020
			$A\text{-}R^2$	0.239	0.238	0.239	0.235	
1999	2	Deflated by BV_{it}	Sum of Coeff	-0.049	-0.020	-0.021	0.019	921
			$A\text{-}R^2$	0.025	0.018	0.014	0.008	
	3	Deflated by MV_{it}	Sum of Coeff	-0.138	-0.139	-0.124	-0.104	916
			$A\text{-}R^2$	0.483	0.481	0.478	0.476	
Pool	2	Deflated by BV_{it}	Sum of Coeff	0.957	0.051	0.038	0.052	5,341
			$A\text{-}R^2$	0.040	0.039	0.039	0.038	
	3	Deflated by MV_{it}	Sum of Coeff	-0.027	-0.029	-0.031	-0.016	5,315
			$A\text{-}R^2$	0.400	0.400	0.408	0.408	

The lag structure is estimated using the Almon polynomial method. Lags are run from lag 1 to 5 years with a 2-degree polynomial. Lag 1 and higher degrees polynomial are not possible due to near perfect multicollinearity. The lag models are:

$$RI_{it+1} = \omega_{RRI} RI_{it} + \omega_R RD_{it} + \omega_{R-1} RD_{it-1} + \omega_{R-2} RD_{it-2} + \omega_{R-3} RD_{it-3} + \omega_{R-4} RD_{it-4} + \omega_{R-5} RD_{it-5} + e_{it}$$

$$RI_{it+1} = \omega_{HRI} RI_{it} + \omega_H HR_{it} + \omega_{H-1} HR_{it-1} + \omega_{H-2} HR_{it-2} + \omega_{H-3} HR_{it-3} + \alpha_{H-4} HR_{it-4} + \omega_{H-5} HR_{it-5} + e_{it}$$

$$RI_{it+1} = \omega_{DRI} RI_{it} + \omega_D DC_{it} + \omega_{D-1} DC_{it-1} + \omega_{D-2} DC_{it-2} + \omega_{D-3} DC_{it-3} + \omega_{D-4} DC_{it-4} + \omega_{D-5} DC_{it-5} + e_{it}$$

From Tables 5.21a-c, $\overline{R}^2$ of EDMV from cross-sectional estimations are good and consistent as the median $\overline{R}^2 = 0.44$ for *RD*, *HR* and *DC*, and the pool's median $\overline{R}^2 = 0.31$ for *RD* and *DC*, and median $\overline{R}^2 = 0.34$ for *HR*. For EDBV, cross-sectionally, the median $\overline{R}^2 = 0.24$ for *RD* and median $\overline{R}^2 = 0.17$ for *HR* and *DC* while the median $\overline{R}^2 = 0.03, 0.04$ and 0.06 for *DC*, *HR* and *RD* respectively for the pool.

The medians for the estimated coefficients of *RD* (ω_R, ω_{R-1}, ω_{R-2}, ω_{R-3}, ω_{R-4}) in Table 5.21a appears to be positives in lag 1 and 3 but negatives in the current, lag 2 and 4, ie the signs alternate between years. The medians of ω_{R-3} is high cross-sectionally and the pool (1.49 and 2.04 for EDBV vs. 2.21 and 1.82 for EDMV), suggesting lag 3 *RD* relates best with one-year ahead *RI*, implying that my hypothesis that *RD* is long-lived is still valid. Cross-sectionally, the medians for the estimated coefficients of *HR* (ω_H, ω_{H-1}, ω_{H-2}, ω_{H-3}, ω_{H-4}) in Table 5.21b are positives (but low) in the current, lag 2-4, and negative in lag 1, and most 25% percentiles are negatives. However, the medians of the coefficients are negatives when the equations are deflated by *MV* from lag 2 onwards in the pool. For EDBV, lag 4 has highest median coefficients cross-sectionally but the pool median coefficient is highest in lag 3. The evidence shows that *HR* provides weak predicting capabilities for one-year ahead *RI*, nevertheless, my hypothesis that *HR* is long-lived is still valid. The medians for the estimated coefficients of *DC* (ω_D, ω_{D-1}, ω_{D-2}, ω_{D-3}, ω_{D-4}) in Table 5.21c are erratic with positive or negative signs. It appears that cross-sectionally, only the median of ω_{D-1} is positive for EDBV and EDMV, but the pool medians for both are negatives. This evidence shows that there is little likelihood of *DC* being long-lived.

In Table 5.22a, most of the estimated coefficients of *RD* are significant and of the correct sign (*t*-stat), particularly for ω_{R-3} (8 and 7 for EDBV and EDMV respectively cross-sectionally and 2 for either equation in the pool). ω_{R-1} and ω_{R-2} perform poorly as there are more coefficients with significantly wrong signs. Cross-sectionally, the total numbers of significant coefficients with the correct (incorrect) signs is 45 (19) and 50 (22) for EDBV and EDMV respectively, while the corresponding figures for the pool are 12 (6) and 12 (8) for EDBV and EDMV respectively.

In Table 5.22b, ω_H has the most significantly correct signs (*t*-stat), ie 23 (0) and 13 (5) for EDBV and EDMV respectively cross-sectionally and 5 (0) for both equations from the pool. While cross-sectionally, ω_{H-2} has more significantly correct signs than ω_{H-3} [4 (2)

for EDBV and 7 (3) for EDMV vs. 4 (3) for EDBV and 3 (3) for EDMV], the former has more significantly wrong sign than the later in the pool [1 (0) for EDBV and 0 (3) for EDMV vs. 2 (0) for EDBV and 0 (0) for EDMV]. ω_{H-1} performs poorly cross-sectionally and the pool.

In Table 5.22c, cross-sectionally, the coefficients are erratic, either with positive or negative signs. For example, cross-sectionally the number of significantly correct (incorrect) signs of ω_D for EDBV is 20 (5), but it has more number with significantly negative signs when deflated by *MV*, 10 (13). For the pool, EDBV performs poorly in current *DC* as it has more significant negative coefficients [0 (5)] while EDMV performs poorly in lagged one when it has four significant negative coefficients and no significantly positive coefficient.

As in the main equations, results of estimated coefficients using White's heteroscedasticity test (*h*-stat) overstate the standard errors of coefficients, thereby reducing (increasing) the number of significant coefficients with the correct (incorrect) signs. However, the net effect (ie number of significant coefficients with the correct signs minus the incorrect signs) between *t*- and *h*- stat of *RD* are about the same, the net effect using *h*-stat of *HR* deteriorates while that of *DC* improves.

Results of the estimated coefficients of current and lagged *RD*, *HR* and *DC* reveals that only coefficients of *RD* fully support my hypothesis that *RD* is long-lived which can be used as a proxy for intangibles in the proposed models, while *HR* partially supports my hypothesis that *HR* is long-lived as the magnitudes of ω_{H-2}, ω_{H-3}, and ω_{H-4} are positives but low and the pool medians of these three coefficients for EDMV are negatives. The coefficients of *DC* are erratic, with either low values or negative values, suggesting that at best, *DC* only provides value relevant information up to lag one. Hence, more robust techniques are needed to test for the lagged coefficients for these three variables. Using Almon Polynomials fitted to estimate the lagged *RD*, *HR* and *DC* coefficients shows that the sum of coefficients and $\overline{R}^2$ of (1) *RD* stop increasing in lag 2 (1997, pool) and lag 3 (1996, 1998); (2) *HR* stop increasing in lag 2 (1995, 1996, 1997, 1998, pool) and lag 3 (1995); (3) *DC* stop increasing in lag 2 (all years except 1999) (Tables 5.23a-c). The Polynomials result quite clearly indicates that the appropriate lag for *RD* is 3, and no longer than lag 2 for *HR*. Since lag 1 is not possible due to near perfect multicollinearity,

and that the sum of coefficients and $\overline{R}^2$ of *DC* from 4 out of 5 years stop increasing in lag 2, the more appropriate lag for *DC* is 1. For *HR*, the appropriate lag is between 2 and 3. Tests using Polynomials fully support the results of *t*-stat as analysed earlier. Overall, results using various tests support the hypothesis that current and lagged *RD, HR* and *DC* have information content beyond current *RI*, implying that the *RI* information dynamics ought to include other relevant variables in addition to current *RI*. To affirm the validity of this ascertainment that other relevant variables ought to be included in the *RI* information dynamics, the next section will investigate lagged *RD, HR* and *DC* with the other current variables (*RI, OA, CI, TD* and *DIV*) in the Prop-LID.

Discussion and summary, results from *t*-, *h*- and Polynomials tests support that *RD* and *HR* are long-lived while *DC* is probably short-lived, consistent with findings of short-lived advertising expenditures in the US. The evidence shows that the appropriate lag for *RD* is 3, consistent with an average mean lag of 3.4 years in Sougiannis (1994), and a lag of between 3 to 4 years in Green et al. (1996). At best, *DC* has a lag of one, consistent with the findings that advertising expenditures are short-lived as in Bublitz and Ettredge. The finding here suggests a lag between 2 or 3 for *HR*. Analysis of $\overline{R}^2$ indicates that the explanatory powers for the various equations are good and EDMV have higher $\overline{R}^2$ than EDBV from cross-sectional and pool estimations. Once again, results of estimated coefficients using White's heteroscedasticity test reduced the number of significant coefficients with the correct signs. Results from various tests supports the hypothesis that current and lagged *RD, HR* and *DC* have information content beyond current *RI,* implying once again that the *RI* information dynamics ought to include other relevant variables in addition to current *RI.*

5.6. Analysis of the Results from Estimating the Main Regression Equations with Lagged *Research & Development Expenditures (RD), Human Resource Costs (HR) and Distribution Costs (DC)*

In this final section, lagged *RD, HR* and *DC* expenditures are included with current *RI, OA, CI, TD* and *DIV* in the Prop-LID to determine whether or not, lagged *RD, HR* and *DC* expenditures have an impact on one-year ahead *RI*. Since sample where $BV \geq$ £5 millions and $r = 10\%$ for the deflated equations with an intercept is the most appropriate in terms of the number of significant coefficients with the correct sign as compared with other samples with/without outliers using $r = 10\%$, 15% or 20% in the previous sections, all the tests in this section will be based on this sample estimated using deflated equations with an intercept and inverse of size terms. Tests are conducted using three models: (1) **RModel 8** (full Prop-LID) with current *RI, OA, CI, TD, DIV, RD, HR* and *DC;* (2) **Model RL1** with current *RI, OA, CI, TD, DIV*, lag 3 *RD, HR* and lag 1 *DC*; and (3) **Model RL2** with current *RI, OA, CI, TD, DIV*, lag 3 *RD*, lag 2 *HR* and lag 1 *DC*. The reason why (2) and (3) are used is because results from *t*- and *h*-tests as well as Polynomial Almon tests show that the appropriate lag for *HR* is between 2 and 3. As usual, the models are ran on (1) equations deflated by closing book values (EDBV); and (2) equations deflated by closing market value of equity (EDMV). The estimations are first carried out by regressing cross-sectionally for each of the sample years from 1995 to 1999 (5 annual cross-sections). The data is then pooled over the entire sample periods to be estimated on a panel series. All regressions including the generation of output and statistical analysis are done automatically by specially self-written computer programs. The estimation basis and the numbers of regression runs are summarized as follows:

Basic	Type	Estimation Type	Type *X* Equations *X* Years	Total
$BV \geq$ £5 millions	RL1	Annual cross-section	2 X 5	10
	RL2	Annual cross-section	2 X 5	10
	RL1	Pooled entire sample	2	2
	RL2	Pooled entire sample	2	2
Total				24

Table 5.24 – Estimation Basis, Type, and the Number of Regression Runs

Results from median and percentiles of estimated coefficients and $\overline{R}^2$s, coefficients and associated statistics of current and lagged *RD, HR* and *DC* are depicted in Tables 5.25 and 5.26. The number of statistically significant coefficients of varying *RD, HR* and *DC* are depicted in Table 5.27.

Table 5.25a,b,c - Medians and Percentiles of Estimated Coefficients and Adj. R^2 of current *RD, HR* and *DC* for RModel 8 (Full Prop-LID) (top), RL1 (middle) & RL2 for Sample where $BV \geq$ £5 Millions and r = 10%

	Statistics	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$
Deflated by BV_{it}										
Cross-sectional	Median	0.28	0.01	0.06	-0.22	0.03	0.03	0.02	0.67	0.37
	25% Percentile	0.28	0.01	0.06	-0.22	0.03	0.03	0.02	0.67	0.37
	75% Percentile	0.28	0.01	0.06	-0.22	0.03	0.03	0.02	0.67	0.37
Pool	Median	0.11	-0.01	0.11	-0.20	-0.01	-0.11	0.01	1.87	0.17
	25% Percentile	0.11	-0.01	0.11	-0.20	-0.01	-0.11	0.01	1.87	0.17
	75% Percentile	0.11	-0.01	0.11	-0.20	-0.01	-0.11	0.01	1.87	0.18
Deflated by MV_{it}										
Cross-sectional	Median	0.42	-0.02	0.01	-0.23	-0.01	-0.07	0.04	1.44	0.52
	25% Percentile	0.42	-0.04	0.01	-0.26	-0.00	-0.07	0.04	1.52	0.52
	75% Percentile	0.42	-0.02	0.01	-0.23	-0.01	-0.07	0.04	1.44	0.53
Pool	Median	0.41	-0.09	0.01	-0.29	0.03	-0.06	0.09	1.64	0.45
	25% Percentile	0.41	-0.09	0.01	-0.29	0.03	-0.06	0.09	1.64	0.45
	75% Percentile	0.41	-0.09	0.01	-0.29	0.03	-0.06	0.09	1.64	0.45

	Statistics	ω_{L1} (RI_{it})	ω_{L2} (OA_{it})	ω_{L3} (CI_{it})	ω_{LR3} (RD_{it-3})	ω_{LH3} (HR_{it-3})	ω_{LD1} (DC_{it-1})	ω_{L7} (TD_{it})	ω_{L8} (DIV_{it})	$A\text{-}R^2$
Deflated by BV_{it}										
Cross-sectional	Median	0.26	0.01	0.07	-0.19	0.02	0.01	0.00	0.94	0.37
	25% Percentile	0.26	0.01	0.07	-0.19	0.02	0.01	0.00	0.94	0.37
	75% Percentile	0.26	0.01	0.07	-0.19	0.02	0.01	0.00	0.94	0.37
Pool	Median	0.08	-0.02	0.13	-0.72	-0.00	-0.01	0.00	1.84	0.17
	25% Percentile	0.08	-0.02	0.13	-0.72	-0.00	-0.01	0.00	1.84	0.17
	75% Percentile	0.08	-0.02	0.13	-0.72	-0.00	-0.01	0.00	1.84	0.17
Deflated by MV_{it}										
Cross-sectional	Median	0.42	-0.02	-0.01	0.30	-0.03	0.00	0.04	1.34	0.52
	25% Percentile	0.41	-0.04	-0.01	0.30	-0.03	-0.02	0.04	1.34	0.51
	75% Percentile	0.42	-0.02	-0.01	0.30	-0.03	0.00	0.04	1.34	0.52
Pool	Median	0.41	-0.09	0.01	-0.29	0.03	-0.06	0.09	1.64	0.45
	25% Percentile	0.41	-0.09	0.01	-0.29	0.03	-0.06	0.09	1.64	0.45
	75% Percentile	0.41	-0.09	0.01	-0.29	0.03	-0.06	0.09	1.64	0.45

Table 5.25a,b,c - Medians and Percentiles of Estimated Coefficients and Adj. R^2 of current *RD, HR* and *DC* for RModel 8 (Full Prop-LID) (top), RL1 (middle) & RL2 for Sample where $BV \geq$ £5 Millions and r = 10%

	Statistics	ω_{L1} (RI_{it})	ω_{L2} (OA_{it})	ω_{L3} (CI_{it})	ω_{LR3} (RD_{it-3})	ω_{LH2} (HR_{it-2})	ω_{LD1} (DC_{it-1})	ω_{L7} (TD_{it})	ω_{L8} (DIV_{it})	A-R^2
Deflated by BV_{it}										
Cross-sectional	Median	0.25	0.01	0.07	-0.15	0.01	0.01	0.00	0.94	0.37
	25% Percentile	0.25	0.01	0.07	-0.15	0.01	0.01	0.00	0.94	0.37
	75% Percentile	0.25	0.01	0.07	-0.15	0.01	0.01	0.00	0.94	0.37
Pool	Median	0.09	-0.02	0.13	-0.62	-0.03	-0.00	0.01	1.87	0.17
	25% Percentile	0.09	-0.02	0.13	-0.62	-0.03	-0.00	0.01	1.87	0.17
	75% Percentile	0.09	-0.02	0.13	-0.62	-0.03	-0.00	0.01	1.87	0.17
Deflated by MV_{it}										
Cross-sectional	Median	0.42	-0.02	-0.01	0.36	-0.02	0.00	0.04	1.34	0.52
	25% Percentile	0.39	-0.03	-0.02	0.32	-0.04	-0.01	0.04	1.29	0.52
	75% Percentile	0.42	-0.02	-0.01	0.36	-0.02	0.00	0.04	1.34	0.52
Pool	Median	0.36	-0.04	-0.03	0.29	-0.05	-0.03	0.07	0.95	0.39
	25% Percentile	0.36	-0.04	-0.03	0.29	-0.05	-0.03	0.07	0.95	0.39
	75% Percentile	0.36	-0.04	-0.03	0.29	-0.05	-0.03	0.07	0.95	0.39

Annual cross-sectional sample (1995-1999) consists of 920 to 1,157 observations and pooled sample consisting of 5,341 observations. Regressions are run from:

$$RI_{it+1} = \omega_0 + \omega_{l1} RI_{it} + \omega_{l2} OA_{it} + \omega_{l3} CI_{it} + \omega_{l4} RD_{it} + \omega_{l5} HR_{it} + \omega_{l6} DC_{it} + \omega_{l7} TD_{it} + \omega_{l8} DIV_{it} + e_{it+1}$$

$$RI_{it+1} = \omega_0 + \omega_{l1} RI_{it} + \omega_{l2} OA_{it} + \omega_{l3} CI_{it} + \omega_{LR3} RD_{it-3} + \omega_{LH3} HR_{it-3} + \omega_{LD1} DC_{it-1} + \omega_{l7} TD_{it} + \omega_{l8} DIV_{it} + e_{it+1}$$

$$RI_{it+1} = \omega_0 + \omega_{l1} RI_{it} + \omega_{l2} OA_{it} + \omega_{l3} CI_{it} + \omega_{LR3} RD_{it-3} + \omega_{LH2} HR_{it-2} + \omega_{LD1} DC_{it-1} + \omega_{l7} TD_{it} + \omega_{l8} DIV_{it} + e_{it+1}$$

Table 5.26a - Coefficients and associated statistics of current *RD, HR* and *DC* for RModel 8 for Sample where *BV* ≥ £5 Millions and *r* = 10%

Year	No	Type	Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1995	2	Deflated by BV_{it}	Coeff	31,913.3	-0.072	0.380	0.010	0.092	-0.265	0.027	0.032	0.008	0.632	0.371	1,114
			t-Stat	(0.248)	***(-5.448)	***(13.801)	(1.104)	***(6.289)	***(-3.481)	***(3.314)	*(1.714)	(0.675)	***(9.056)		
			h-Stat	(0.196)	***(-3.641)	***(4.017)	(0.553)	***(4.053)	(-1.513)	***(2.625)	(1.313)	(0.395)	***(3.453)		
	3	Deflated by MV_{it}	Coeff	-579,316.4	-0.015	0.422	-0.016	-0.069	-0.724	-0.005	0.075	0.036	1.299	0.540	1,112
			t-Stat	***(-6.998)	**(-2.448)	***(13.123)	***(-2.892)	***(-4.203)	***(-4.544)	(-0.475)	***(3.412)	***(5.031)	***(9.450)		
			h-Stat	***(-3.344)	*(-1.839)	***(4.233)	(-1.549)	(-1.046)	**(-2.219)	(-0.235)	**(2.411)	***(2.978)	***(3.553)		
1996	2	Deflated by BV_{it}	Coeff	-494,197.5	-0.041	0.262	0.008	0.041	-0.221	0.045	-0.036	-0.013	0.903	0.261	1,157
			t-Stat	***(-2.912)	***(-2.651)	***(9.397)	(0.879)	***(2.757)	**(-2.327)	***(4.251)	(-1.462)	(-0.941)	***(10.568)		
			h-Stat	**(-2.251)	(-1.386)	***(3.155)	(0.388)	*(1.817)	*(-1.745)	(1.571)	(-0.895)	(-0.515)	***(3.549)		
	3	Deflated by MV_{it}	Coeff	-698,174.4	-0.047	0.214	0.002	0.007	0.470	0.080	-0.153	-0.009	1.607	0.642	1,155
			t-Stat	***(-6.954)	***(-7.117)	***(9.647)	(0.286)	(0.607)	**(2.240)	***(7.070)	***(-6.040)	(-0.900)	***(13.409)		
			h-Stat	***(-3.973)	***(-4.816)	**(2.347)	(0.111)	(0.391)	(1.113)	***(2.861)	***(-2.637)	(-0.362)	***(3.619)		
1997	2	Deflated by BV_{it}	Coeff	-252,361.7	-0.034	0.281	-0.084	0.064	0.368	0.008	0.181	0.121	0.622	0.316	1,124
			t-Stat	(-1.139)	*(-1.772)	***(8.493)	***(-7.595)	***(3.329)	***(4.507)	(0.598)	***(7.041)	***(9.612)	***(6.133)		
			h-Stat	(-1.225)	(-0.824)	***(3.194)	***(-2.727)	**(1.984)	(0.973)	(0.475)	*(1.671)	***(4.027)	***(2.628)		
	3	Deflated by MV_{it}	Coeff	-208,329.8	-0.057	0.085	-0.069	0.016	-0.146	-0.016	-0.071	0.123	2.444	0.520	1,122
			t-Stat	(-1.543)	***(-6.387)	***(3.970)	***(-7.030)	(0.890)	(-0.525)	(-1.147)	**(-2.196)	***(9.003)	***(14.279)		
			h-Stat	(-1.019)	***(-6.333)	(0.894)	*(-1.906)	(0.338)	(-0.587)	(-0.818)	(-1.398)	***(2.855)	***(4.115)		
1998	2	Deflated by BV_{it}	Coeff	-336,725.0	0.021	0.557	-0.061	-0.063	-0.066	0.071	0.044	0.025	0.666	0.510	1,025
			t-Stat	(-1.446)	(0.971)	***(18.467)	***(-6.535)	***(-5.551)	(-0.710)	***(5.839)	*(1.664)	**(2.494)	***(8.339)		
			h-Stat	(-1.358)	(0.501)	***(4.914)	**(-2.317)	(-1.311)	(-0.256)	***(3.000)	(1.370)	(0.895)	*(1.862)		
	3	Deflated by MV_{it}	Coeff	-85,107.7	0.038	0.495	-0.066	-0.064	-0.233	-0.108	0.008	0.045	1.438	0.443	1,024
			t-Stat	(-0.732)	***(3.871)	***(13.556)	***(-8.668)	***(-3.748)	(-1.325)	***(-7.243)	(0.292)	***(3.330)	***(8.212)		
			h-Stat	(-0.270)	***(3.245)	***(5.649)	***(-3.168)	(-1.206)	(-0.888)	***(-3.071)	(0.141)	(1.231)	***(3.045)		
1999	2	Deflated by BV_{it}	Coeff	-137,223.2	-0.425	-0.155	0.027	0.469	-1.408	-0.010	-0.475	0.020	4.972	0.491	921
			t-Stat	(-0.201)	***(-7.188)	**(-2.169)	(0.850)	***(13.472)	***(-5.030)	(-0.320)	***(-8.350)	(0.477)	***(19.522)		
			h-Stat	(-0.235)	(-1.532)	(-0.505)	(0.248)	*(1.859)	(-1.092)	(-0.176)	**(-2.262)	(0.311)	***(2.714)		
	3	Deflated by MV_{it}	Coeff	-725,778.0	-0.003	0.527	0.029	0.113	-0.561	-0.004	-0.148	-0.096	0.392	0.531	920
			t-Stat	***(-5.013)	(-0.298)	***(21.386)	***(3.039)	***(5.289)	***(-2.652)	(-0.248)	***(-6.256)	***(-5.523)	***(5.202)		
			h-Stat	***(-3.611)	(-0.273)	***(3.691)	*(1.675)	***(3.082)	**(-2.097)	(-0.156)	***(-2.767)	**(-2.213)	**(1.968)		
Pool	2	Deflated by BV_{it}	Coeff	-102,825	-0.085	0.108	-0.012	0.108	-0.204	-0.006	-0.108	0.010	1.867	0.181	5,341
			t-Stat	(-0.967)	***(-8.706)	***(7.668)	**(-2.343)	***(14.033)	***(-3.902)	(-1.001)	***(-8.798)	(1.515)	***(34.867)		
			h-Stat	(-0.737)	(-1.131)	(0.900)	(-0.633)	(0.956)	(-0.546)	(-0.156)	(-1.134)	(0.465)	***(2.896)		
	3	Deflated by MV_{it}	Coeff	176,124	-0.026	0.408	-0.091	0.009	-0.287	0.032	-0.062	0.093	1.639	0.447	5,333
			t-Stat	***(3.032)	***(-5.596)	***(56.358)	***(-23.293)	(1.163)	**(-2.445)	***(5.581)	***(-4.607)	***(16.945)	***(24.100)		
			h-Stat	(0.721)	***(-2.884)	***(8.489)	***(-2.715)	(0.203)	(-1.508)	(1.453)	**(-2.020)	***(3.203)	***(3.124)		

Table 5.26b - Coefficients and associated statistics of lagged *RD, HR(3)* and *DC* for RL1 for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	Intercept	ω_{L1} (RI_{it})	ω_{L2} (OA_{it})	ω_{L3} (CI_{it})	ω_{LR3} (RD_{it-3})	ω_{LH3} (HR_{it-3})	ω_{LD1} (DC_{it-1})	ω_{L7} (TD_{it})	ω_{L8} (DIV_{it})	A-R^2	Obs
1995	2	Deflated by BV_{it}	Coeff	90,594.691	-0.070	0.407	0.015	0.084	0.325	0.020	0.004	0.003	0.597	0.365	1,114
			t-Stat	(0.709)	***(-5.181)	***(15.000)	*(1.687)	***(5.779)	**(2.505)	*(1.877)	(0.209)	(0.216)	***(8.631)		
			h-Stat	(0.567)	***(-3.648)	***(4.146)	(0.898)	***(4.162)	**(2.567)	(1.256)	(0.224)	(0.135)	***(3.477)		
	3	Deflated by MV_{it}	Coeff	-469,040.242	-0.010	0.422	-0.017	-0.072	-0.600	-0.016	-0.015	0.039	1.339	0.53	1,112
			t-Stat	***(-5.417)	*(-1.739)	***(13.251)	***(-3.108)	***(-4.331)	**(-2.050)	(-1.563)	(-0.897)	***(5.395)	***(9.754)		
			h-Stat	**(-2.378)	(-1.146)	***(3.999)	(-1.611)	(-1.086)	(-0.993)	(-0.562)	(-0.541)	***(2.975)	***(3.595)		
1996	2	Deflated by BV_{it}	Coeff	-449,372.782	-0.035	0.257	0.006	0.044	-0.186	0.019	0.013	-0.008	0.935	0.248	1,157
			t-Stat	***(-2.651)	**(-2.223)	***(8.910)	(0.642)	***(2.930)	(-1.103)	(1.412)	(0.506)	(-0.557)	***(11.039)		
			h-Stat	**(-2.210)	(-1.234)	***(3.112)	(0.314)	*(1.820)	(-0.576)	(0.409)	(0.642)	(-0.310)	***(3.779)		
	3	Deflated by MV_{it}	Coeff	-779,298.877	-0.051	0.227	-0.006	0.039	1.063	0.079	0.000	0.012	1.487	0.639	1,155
			t-Stat	***(-7.640)	***(-7.869)	***(9.884)	(-0.939)	***(3.725)	***(3.166)	***(5.898)	(0.030)	(1.238)	***(11.599)		
			h-Stat	***(-4.402)	***(-5.806)	**(2.163)	(-0.434)	**(2.109)	(1.135)	**(2.061)	(0.018)	(0.584)	***(2.955)		
1997	2	Deflated by BV_{it}	Coeff	-159,250.051	-0.031	0.207	-0.086	0.069	1.619	-0.007	0.032	0.120	0.958	0.281	1,124
			t-Stat	(-0.707)	(-1.581)	***(6.455)	***(-7.591)	***(3.389)	***(7.155)	(-0.482)	(1.022)	***(9.313)	***(9.634)		
			h-Stat	(-0.809)	(-0.725)	*(1.697)	**(-2.523)	(1.445)	(1.406)	(-0.295)	(1.370)	***(3.673)	***(2.638)		
	3	Deflated by MV_{it}	Coeff	-163,631.941	-0.059	0.075	-0.057	-0.005	0.295	-0.056	-0.023	0.098	2.575	0.521	1,122
			t-Stat	(-1.213)	***(-6.825)	***(3.460)	***(-6.055)	(-0.290)	(0.563)	***(-3.234)	(-1.160)	***(9.003)	***(14.748)		
			h-Stat	(-0.862)	***(-6.316)	(0.858)	(-1.542)	(-0.132)	(0.673)	*(-1.692)	(-1.037)	**(2.323)	***(4.408)		
1998	2	Deflated by BV_{it}	Coeff	-155,741.195	0.045	0.574	-0.071	-0.057	-0.336	0.052	0.013	0.041	0.762	0.498	1,025
			t-Stat	(-0.666)	**(2.102)	***(19.012)	***(-7.651)	***(-4.943)	**(-2.241)	***(3.573)	(0.780)	***(4.138)	***(9.582)		
			h-Stat	(-0.655)	(0.974)	***(5.034)	***(-2.732)	(-1.185)	(-0.770)	*(1.902)	(1.284)	*(1.673)	*(1.946)		
	3	Deflated by MV_{it}	Coeff	-189,356.260	0.030	0.476	-0.062	-0.088	0.812	-0.115	0.030	0.035	1.240	0.454	1,024
			t-Stat	(-1.634)	***(3.124)	***(12.985)	***(-8.196)	***(-5.123)	***(2.778)	***(-8.563)	***(2.680)	***(2.629)	***(6.959)		
			h-Stat	(-0.648)	***(3.058)	***(5.268)	***(-2.820)	*(-1.822)	(1.402)	***(-2.889)	*(1.665)	(0.965)	***(2.984)		
1999	2	Deflated by BV_{it}	Coeff	-764,877.299	-0.480	-0.331	0.081	0.485	-1.688	0.047	-0.063	-0.172	5.135	0.43	921
			t-Stat	(-1.065)	***(-7.564)	***(-4.486)	**(2.473)	***(12.758)	***(-3.299)	(1.281)	(-0.880)	***(-4.045)	***(19.187)		
			h-Stat	(-1.301)	(-1.640)	(-0.925)	(0.688)	*(1.825)	*(-1.839)	(0.454)	(-1.075)	(-1.520)	**(2.440)		
	3	Deflated by MV_{it}	Coeff	-802,555.614	-0.018	0.551	0.033	0.116	-0.202	-0.030	0.014	-0.099	0.384	0.509	920
			t-Stat	***(-5.490)	**(-2.138)	***(21.363)	***(3.340)	***(5.288)	(-0.707)	**(-2.163)	(1.463)	***(-5.593)	***(4.968)		
			h-Stat	***(-3.616)	**(-2.113)	***(3.669)	*(1.728)	***(3.120)	(-0.462)	(-1.067)	(0.838)	**(-2.243)	*(1.741)		
Pool	2	Deflated by BV_{it}	Coeff	-366,185.906	-0.095	0.082	-0.015	0.128	-0.720	-0.003	-0.005	0.001	1.843	0.166	5,341
			t-Stat	**(-2.093)	***(-6.036)	***(3.575)	*(-1.911)	***(11.345)	***(-5.049)	(-0.258)	(-0.240)	(0.084)	***(25.753)		
			h-Stat	***(-2.652)	(-0.809)	(0.524)	(-0.454)	(0.854)	(-1.167)	(-0.028)	(-0.280)	(0.019)	***(2.641)		
	3	Deflated by MV_{it}	Coeff	-151,445.320	-0.011	0.357	-0.038	-0.027	0.295	-0.053	-0.028	0.074	0.945	0.389	5,333
			t-Stat	***(-2.664)	***(-2.976)	***(29.739)	***(-10.889)	***(-3.792)	*(1.788)	***(-7.884)	***(-5.613)	***(14.861)	***(16.863)		
			h-Stat	(-0.910)	(-1.195)	***(2.961)	**(-2.286)	(-0.993)	(0.747)	*(-1.858)	(-1.187)	***(3.375)	***(2.627)		

Table 5.26c - Coefficients and associated statistics of lagged *RD, HR(2)* and *DC* for RL2 for Sample where *BV* ≥ £5 Millions and *r* = 10%

Year	No	Type	Estim	1	Intercept	ω_{L1} (RI_{it})	ω_{L2} (OA_{it})	ω_{L3} (CI_{it})	ω_{LR3} (RD_{it-3})	ω_{LH2} (HR_{it-2})	ω_{LD1} (DC_{it-1})	ω_{L7} (TD_{it})	ω_{L8} (DIV_{it})	$A\text{-}R^2$	Obs
1995	2	Deflated by BV_{it}	Coeff	93,049.762	-0.070	0.407	0.015	0.083	0.340	0.017	0.004	0.003	0.595	0.365	1,114
			t-Stat	(0.727)	***(-5.129)	***(14.989)	*(1.675)	***(5.733)	***(2.646)	*(1.691)	(0.211)	(0.242)	***(8.597)		
			h-Stat	(0.577)	***(-3.633)	***(4.142)	(0.889)	***(4.105)	***(2.838)	(1.247)	(0.226)	(0.149)	***(3.464)		
	3	Deflated by MV_{it}	Coeff	-473,439.776	-0.011	0.423	-0.017	-0.072	-0.614	-0.015	-0.014	0.039	1.342	0.53	1,112
			t-Stat	***(-5.476)	*(-1.757)	***(13.255)	***(-3.096)	***(-4.331)	**(-2.086)	(-1.416)	(-0.882)	***(5.391)	***(9.690)		
			h-Stat	**(-2.421)	(-1.157)	***(3.983)	(-1.605)	(-1.087)	(-1.027)	(-0.522)	(-0.535)	***(2.961)	***(3.554)		
1996	2	Deflated by BV_{it}	Coeff	-445,538.195	-0.034	0.251	0.007	0.044	-0.148	0.010	0.013	-0.008	0.939	0.247	1,157
			t-Stat	***(-2.621)	**(-2.116)	***(8.787)	(0.752)	***(2.927)	(-0.892)	(0.729)	(0.520)	(-0.577)	***(11.003)		
			h-Stat	**(-2.145)	(-1.149)	***(2.883)	(0.347)	*(1.838)	(-0.448)	(0.230)	(0.659)	(-0.317)	***(3.689)		
	3	Deflated by MV_{it}	Coeff	-792,608.909	-0.053	0.223	-0.007	0.040	1.127	0.080	0.001	0.013	1.476	0.638	1,155
			t-Stat	***(-7.709)	***(-8.193)	***(9.762)	(-0.954)	***(3.729)	***(3.379)	***(5.742)	(0.066)	(1.346)	***(11.452)		
			h-Stat	***(-4.455)	***(-5.842)	**(2.128)	(-0.444)	**(2.063)	(1.225)	**(2.177)	(0.039)	(0.644)	***(2.900)		
1997	2	Deflated by BV_{it}	Coeff	-166,436.054	-0.032	0.207	-0.087	0.071	1.611	-0.002	0.032	0.120	0.945	0.281	1,124
			t-Stat	(-0.739)	(-1.610)	***(6.460)	***(-7.642)	***(3.509)	***(7.117)	(-0.160)	(1.030)	***(9.348)	***(9.494)		
			h-Stat	(-0.848)	(-0.747)	*(1.700)	**(-2.548)	(1.498)	(1.400)	(-0.099)	(1.381)	***(3.700)	***(2.606)		
	3	Deflated by MV_{it}	Coeff	-131,175.482	-0.057	0.070	-0.058	-0.006	0.355	-0.062	-0.022	0.098	2.600	0.523	1,122
			t-Stat	(-0.968)	***(-6.567)	***(3.232)	***(-6.096)	(-0.370)	(0.680)	***(-3.843)	(-1.148)	***(9.057)	***(14.920)		
			h-Stat	(-0.711)	***(-6.110)	(0.790)	(-1.552)	(-0.168)	(0.776)	**(-1.981)	(-0.991)	**(2.337)	***(4.451)		
1998	2	Deflated by BV_{it}	Coeff	-192,917.997	0.035	0.569	-0.065	-0.057	-0.348	0.065	0.013	0.031	0.732	0.502	1,025
			t-Stat	(-0.827)	*(1.655)	***(18.910)	***(-7.010)	***(-4.953)	**(-2.374)	***(4.651)	(0.795)	***(3.084)	***(9.177)		
			h-Stat	(-0.807)	(0.802)	***(5.054)	***(-2.589)	(-1.195)	(-0.796)	**(2.369)	(1.292)	(1.306)	*(1.907)		
	3	Deflated by MV_{it}	Coeff	-182,607.246	0.033	0.473	-0.062	-0.085	0.822	-0.116	0.030	0.037	1.245	0.455	1,024
			t-Stat	(-1.575)	***(3.399)	***(12.886)	***(-8.256)	***(-4.988)	***(2.813)	***(-8.664)	***(2.636)	***(2.751)	***(6.990)		
			h-Stat	(-0.621)	***(3.314)	***(5.208)	***(-2.833)	*(-1.752)	(1.436)	***(-2.972)	(1.634)	(1.019)	***(2.978)		
1999	2	Deflated by BV_{it}	Coeff	-694,762.094	-0.467	-0.342	0.070	0.473	-1.321	-0.027	-0.056	-0.124	5.132	0.429	921
			t-Stat	(-0.965)	***(-7.358)	***(-4.657)	**(2.142)	***(12.543)	***(-2.594)	(-0.842)	(-0.780)	***(-2.846)	***(19.132)		
			h-Stat	(-1.150)	(-1.608)	(-0.932)	(0.615)	*(1.785)	(-1.424)	(-0.295)	(-0.990)	(-1.322)	**(2.441)		
	3	Deflated by MV_{it}	Coeff	-814,594.835	-0.019	0.560	0.033	0.118	-0.254	-0.020	0.013	-0.099	0.368	0.507	920
			t-Stat	***(-5.521)	**(-2.218)	***(22.064)	***(3.297)	***(5.421)	(-0.889)	(-1.402)	(1.333)	***(-5.590)	***(4.776)		
			h-Stat	***(-3.562)	**(-2.279)	***(3.567)	*(1.722)	***(3.152)	(-0.563)	(-0.782)	(0.779)	**(-2.214)	*(1.651)		
Pool	2	Deflated by BV_{it}	Coeff	-324,320.467	-0.089	0.089	-0.017	0.125	-0.620	-0.025	-0.003	0.007	1.871	0.167	5,341
			t-Stat	*(-1.853)	***(-5.657)	***(3.872)	**(-2.114)	***(11.178)	***(-4.391)	***(-2.758)	(-0.171)	(0.722)	***(26.213)		
			h-Stat	**(-2.138)	(-0.752)	(0.574)	(-0.482)	(0.849)	(-1.074)	(-0.287)	(-0.221)	(0.169)	***(2.650)		
	3	Deflated by MV_{it}	Coeff	-144,416.654	-0.011	0.356	-0.037	-0.027	0.292	-0.054	-0.029	0.073	0.951	0.389	5,333
			t-Stat	**(-2.533)	***(-2.722)	***(29.608)	***(-10.684)	***(-3.784)	*(1.773)	***(-7.980)	***(-5.706)	***(14.760)	***(16.934)		
			h-Stat	(-0.885)	(-1.125)	***(2.924)	**(-2.247)	(-0.980)	(0.713)	**(-2.151)	(-1.217)	***(3.374)	***(2.597)		

Table 5.27 - Number of Significant Coefficients (t-Stat) of varying *RD, HR* and *DC* for (1) RModel 8 (top), (2) RL1 (middle) and (3) RL2 (bottom) for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	ω_{11} (RI_{it})		ω_{12} (OA_{it})		ω_{13} (CI_{it})		ω_{14} (RD_{it})		ω_{15} (HR_{it})		ω_{16} (DC_{it})		ω_{17} (TD_{it})		ω_{18} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	4	0	5	0	0	4	4	0	3	0	0	0	1	0	22	4
	3	Deflated by MV_{it}	5	0	3	1	0	5	0	5	1	0	3	0	2	0	1	0	15	11
1996	2	Deflated by BV_{it}	5	0	4	0	5	0	0	1	4	0	0	0	0	0	1	0	19	1
	3	Deflated by MV_{it}	5	0	4	0	0	2	5	0	4	0	0	3	0	1	1	0	19	6
1997	2	Deflated by BV_{it}	5	0	3	2	5	0	5	0	3	0	3	0	2	0	1	0	27	2
	3	Deflated by MV_{it}	5	0	4	1	4	0	0	0	1	0	0	3	2	0	1	0	17	4
1998	2	Deflated by BV_{it}	5	0	0	5	0	5	1	0	4	0	3	0	2	0	1	0	16	10
	3	Deflated by MV_{it}	5	0	0	5	0	5	0	0	0	4	0	0	2	0	1	0	8	14
1999	2	Deflated by BV_{it}	2	1	4	0	5	0	0	5	0	1	0	3	1	0	1	0	13	10
	3	Deflated by MV_{it}	5	0	2	0	5	0	0	5	0	0	0	3	0	2	1	0	13	10
Total	2	Deflated by BV_{it}	22	1	15	7	20	5	6	10	15	1	9	3	5	0	5	0	97	27
	3	Deflated by MV_{it}	25	0	13	7	9	12	5	10	6	4	3	9	6	3	5	0	72	45
Pool	2	Deflated by BV_{it}	5	0	4	1	5	0	0	1	2	0	0	3	0	0	1	0	17	5
	3	Deflated by MV_{it}	5	0	3	2	0	4	0	5	4	0	0	3	2	0	1	0	15	14

Year	No	Type	ω_{L1} (RI_{it})		ω_{L2} (OA_{it})		ω_{L3} (CI_{it})		w_{LR3} (RD_{it-3})		w_{LH3} (HR_{it-3})		w_{LD1} (DC_{it-1})		ω_{L7} (TD_{it})		ω_{L8} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	5	0	4	0	0	0	0	0	1	0	25	0
	3	Deflated by MV_{it}	5	0	3	1	0	5	0	5	0	0	0	0	2	0	1	0	11	11
1996	2	Deflated by BV_{it}	5	0	4	0	5	0	0	0	3	0	0	0	0	0	1	0	18	0
	3	Deflated by MV_{it}	5	0	4	0	4	0	5	0	4	0	2	0	0	0	1	0	25	0
1997	2	Deflated by BV_{it}	5	0	3	2	5	0	5	0	3	0	0	0	2	0	1	0	24	2
	3	Deflated by MV_{it}	5	0	4	1	3	0	0	0	0	1	0	0	2	0	1	0	15	2
1998	2	Deflated by BV_{it}	5	0	0	5	0	5	0	2	4	0	0	0	2	0	1	0	12	12
	3	Deflated by MV_{it}	5	0	0	5	0	5	5	0	0	4	3	0	2	0	1	0	16	14
1999	2	Deflated by BV_{it}	0	1	5	0	5	0	0	5	1	0	0	0	0	2	1	0	12	8
	3	Deflated by MV_{it}	5	0	2	0	5	0	0	0	0	1	1	0	0	2	1	0	14	3
Total	2	Deflated by BV_{it}	20	1	17	7	20	5	10	7	15	0	0	0	4	2	5	0	91	22
	3	Deflated by MV_{it}	25	0	13	7	12	10	10	5	4	6	6	0	6	2	5	0	81	30
Pool	2	Deflated by BV_{it}	5	0	3	1	5	0	0	4	3	0	0	0	0	0	1	0	17	5
	3	Deflated by MV_{it}	5	0	3	2	0	3	4	0	0	4	0	3	2	0	1	0	15	12

Table 5.27 - Number of Significant Coefficients (t-Stat) of varying *RD, HR* and *DC* for (1) RModel 8 (top), (2) RL1 (middle) and (3) RL2 (bottom) for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	ω_{L1} (RI_{it})		ω_{L2} (OA_{it})		ω_{L3} (CI_{it})		w_{LR3} (RD_{it-3})		w_{LH2} (HR_{it-2})		w_{LD1} (DC_{it-1})		ω_{L7} (TD_{it})		ω_{L8} (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	5	0	4	0	0	0	0	0	1	0	25	0
	3	Deflated by MV_{it}	5	0	3	1	0	5	0	5	0	0	0	0	2	0	1	0	11	11
1996	2	Deflated by BV_{it}	5	0	4	0	5	0	0	0	3	0	0	0	0	0	1	0	18	0
	3	Deflated by MV_{it}	5	0	4	0	4	0	5	0	4	0	2	0	0	0	1	0	25	0
1997	2	Deflated by BV_{it}	5	0	3	2	5	0	5	0	3	0	0	0	2	0	1	0	24	2
	3	Deflated by MV_{it}	5	0	4	1	3	0	0	0	0	1	0	0	2	0	1	0	15	2
1998	2	Deflated by BV_{it}	5	0	0	5	0	5	0	2	4	0	0	0	2	0	1	0	12	12
	3	Deflated by MV_{it}	5	0	0	5	0	5	5	0	0	4	3	0	2	0	1	0	16	14
1999	2	Deflated by BV_{it}	0	1	5	0	5	0	0	2	0	3	0	0	0	1	1	0	11	7
	3	Deflated by MV_{it}	5	0	2	0	5	0	0	0	0	0	1	0	0	2	1	0	14	2
Total	2	Deflated by BV_{it}	20	1	17	7	20	5	10	4	14	3	0	0	4	1	5	0	90	21
	3	Deflated by MV_{it}	25	0	13	7	12	10	10	5	4	5	6	0	6	2	5	0	81	29
Pool	2	Deflated by BV_{it}	5	0	3	1	5	0	0	1	0	1	0	0	0	0	1	0	14	3
	3	Deflated by MV_{it}	5	0	3	2	0	3	4	0	0	4	0	3	2	0	1	0	15	12

Annual cross-sectional and pool sample consists of 920 to 1,157 and 5,333 to 5,341 observations respectively. Regressions are run from three different specifications of Prop-LID: (top) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ (middle) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{LR3} RD_{it-3} + \omega_{LH3} HR_{it-3} + \omega_{LD1} DC_{it-1} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ (bottom) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{LR3} RD_{it-3} + \omega_{LH2} HR_{it-2} + \omega_{LD1} DC_{it-1} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in terms of (1) deflated by BV_{it} (2) deflated by MV_{it}. Hence RI_{it}, OA_{it}, RD_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation. equation. Numbers are in t-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs. Information of Top specifications (Full Prop-LID or RModel 8) is from **Table 5.12**.

In Table 5.25a-c, for EDBV, the cross-sectional and pool median $\overline{R}^2$ for all three models (RModel 8, RL1 and RL2) are the same (ie 0.37 and 0.17 respectively). For EDMV, the cross-sectional and pool median $\overline{R}^2$ for RModel 8 and RL1 are the same (ie 0.52 and 0.45 respectively), while the cross-sectional and pool median $\overline{R}^2$ for RL2 deteriorates with 0.52 and 0.39 respectively.

Since Tables 5.26a-c indicate that White's consistent covariance matrix (*h*-stat) understate the test statistics, consistent with previous sections and findings in US and UK studies, analysis of the number of statistically significant coefficients will be based on *t*-statistic.

From Table 5.27, using RModel 8 as control, the first comparison in terms of the number of statistically significant coefficients with the correct (incorrect) signs (*t*-stat) is between this equation and Model RL1 (middle). Cross-sectionally, Model RL1 has more number of significant coefficients with the correct (incorrect) signs than RModel 8 for *RD* [EDBV: 10 (7) vs. 6 (10), EDMV: 10 (5) vs. 5 (10)] but there is little difference between these two models for *RI, OA, CI, TD, DIV*, and mixed results for *HR* and *DC*.

Comparison between RModel 8 and RL2 reveals that RL2 has more number of significant coefficients with the correct (incorrect) signs than RModel 8 for *CI* cross-sectionally [EDMV: 12 (10) vs. 9 (12)] and *RD* [EDBV (c/s): 10 (4) vs. 6 (10), EDMV (c/s): 10 (5) vs. 5 (10)]. Consequently, the coefficient of *HR* deteriorates in Model RL2 as compared with RModel 8 in all years. There is little difference between these two models for *RI, OA, TD* and *DIV*, and mixed results for *DC*.

Hence, analysis in terms of the number of statistically significant coefficients with the correct (incorrect) sign suggests that RL1 and RL2 has more positively significant coefficients than RModel 8 in *CI*, but RModel 8 outperforms RL1 and RL2 for *HR*, while there is hardly any difference for other variables among these three equations. However, the pooled results for RL1 and RL2 are counter-theoretical (more negative signs) for *RD* [0 (4) (RL1-EDBV), 0 (1) (RL2-EDBV)], *HR* [0 (4) (RL1-EDMV), 0 (1), 0 (4) (RL2-both)] and *DC* [0 (3) (RL1-EDBV&EDMV)]. However, with the low magnitudes of most of the coefficients, and little difference in $\overline{R}^2$ among the three models, there is little to suggest

that using lagged *RD*, *HR* and *DC* in place of current values of these variables would improve the statistical coefficients or explanatory powers of the model.

In summary, once again, results of estimated coefficients using White's heteroscedasticity test reduced the magnitudes of the test statistics (*h*-stat), and hence, analysis in this section using *t*-stat and $\overline{R}^2$ suggests that there is little difference between RModel 8, RL1 and RL2, and therefore, it seems that there is no benefit in using lagged values of *RD*, *HR* or *DC* in place of the date *t* values.

5.7. Summary and Conclusions

The main aim of this chapter is to conduct tests to determine (1) the validity of the specification of the proposed information dynamics RI model; (2) estimate a prediction model, identifying which of these non-earnings accounting variables (comprehensive set of variables, CSV) are significant in the prediction model.

Previous studies testing the LID are conducted using US data that used various methodology, without much regard of a integrated framework of the OFF to estimate the LID and there is also a lack of a thorough evaluation of the appropriate kinds of variables to be used to proxy for other information or in predicting future *RI*. As a result, the contribution to existing literature by these studies is limited. Apart from the *RI* parameter, the performance of the conservative, capital investment and other information (v) parameters of the LID of these studies are disappointing. The evidence of conservatism and *CI* from these studies are inconsistent to the OFF, order backlog is of no use when used as a proxy for v and analysts' earnings forecasts as a proxy for v in predicting future *RI* show only modest improvements in explanatory power over past empirical researches using analysts' forecasts using the DDM. Empirically, some researchers employ unscaled equations (Hand and Landsman, 1999) or per share basis (eg Stober 1996) in their cross-section or pool estimation, and hence, these results should be viewed with caution since scale or/and heteroscedasticity is/are unaccounted for.

Therefore, in avoiding the issues identified in past studies, using UK data, this study formulate models based on a integrated OFF to estimate an information dynamic prediction model for *RI*, identifying which of these non-earnings accounting variables

(CSV) are significant in the prediction model; and the results are encouraging and contribute substantially to existing literature.

The results suggest that current *RI* is moderately persistent, *OA* can be used to proxy conservatism and expenditures on *CI* generates positive future *RI*, suggesting that all these variables conform to expectation and the OFF. Most of the coefficients of current *RD, HR* and *DC* are positively significant, suggesting that these variables can predict future *RI,* consistent with expectation and the OFF. *RD* and *HR* are long-lived while *DC* is probably short-lived, consistent with findings of short-lived *AD* in the US, however, the low magnitudes of their coefficients suggest that *RD, HR* and *DC* have weak potential to be intangibles. The results show that lagged *RD, HR* and *DC* have little impact when used with other current variables on one-year ahead *RI. TD* and in particular, *DIV* have high ability in predicting future *RI*, which conform to expectation.

The evidence indicates that *OA, CI, RD, HR, DC, TD* and *DIV* have incremental information content beyond *RI*, that all the eight variables selected are useful in predicting future *RI*, and with the support from a wide range of statistical tests on the validity for the inclusion of these variables in the RI model affirm the hypothesis that all the eight independent variables selected ought to be included in the Prop-LID. In addition, the explanatory power for Prop-LID are reasonably high and are much higher than models based on non-integrated framework of the OFF and using a single variable to proxy for other information (eg Dechow et al., 1999). The results are unlikely to be affected by incorrect inferences as a wide range of statistical tests are used to (1) test for the validity of the individual variables and model specifications; (2) mitigate scale and heteroscedasticity; and (3) detect multicollinearity. This implies that the carefully selected CSV that are theoretically and empirically based on the OFF, GAAP and previous studies to measure (1) value creation (*RI*); (2) conservatism (*OA*); (3) current +NPV projects (*CI*); (4) intangibles (*RD, HR, DC*); and (5) expectations of future profitability (*TD, DIV*) are able to predict future *RI,* and that the integrated model consisting of the CSV have higher explanatory power than non-integrated models that use single variable to proxy for other information.

This study uses deflation, residual analysis and White's consistent standard errors to mitigate heteroscedasticity. Deflating the level models by either *BV* or *MV* has greatly reduced the values of the intercepts and residuals, suggesting that deflation has mitigated the scale effect and heteroscedasticity problems, but the fit for the deflated equations

deteriorate, and that deflating by *BV* and *MV* produce different results. However, this study finds that the White's test can severely reduce the estimated coefficients for deflated equations, consistent with Barth and Kallapur (1996); Green et al. (1996) and Stober (1996) and hence, more research in the use of the White's test or a better technique in mitigating heteroscedasticity should be an interesting avenue for future research in CMRA.

The secondary aim of this chapter reveals the following. The evidence from this study indicates that the omission of outliers not only does not contribute to an improvement in statistical performance; it has a negative impact on individual independent variables as well as explanatory powers, suggesting that deletion of outliers in a sample may be more complex than one would expect. Analysis of the various samples in terms of the total number of significant coefficients and $\overline{R}^2$ reveal that for both cross-sectional and pooled data, sample where $BV \geq$ £5 millions and $r = 10\%$ outperform all other samples. This study also reveals that scaled equations that include an intercept generate better statistically results than equations that exclude an intercept, suggesting that the RI model specification may contain a constant, a view advocated by Myers (1999). Finally, the evidence for both cross-sectional and pool results based on $\overline{R}^2$ contrasts that from *t*-statistics, suggesting that the use of a wide range of statistical tests (eg $\overline{R}^2$, $\overline{RSS}$, *F*-test, AIC, *t*- and *h*-statistics) in this study provides better statistical inferences than analysis that rely on single measure.

RESULTS AND ANALYSES: VALUATION MODELS 6

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CHAPTER 6
RESULTS AND ANALYSES: VALUATION MODELS

6.1. Introduction and Background

In Chapter 5, I empirically tested the *RI* information dynamic models, and the findings largely supports my hypotheses that the comprehensive set of variables selected (CSV) are able to predict future residual income. This is consistent to the OFF in which variables that are able to predict future residual income are also relevant in determining a firm's market value. This chapter is a follow-up on Chapter 5 where the main aim here is to test for the value-relevant range of variables (CSV) in the Prop-VM and to determine the appropriate specification of the proposed valuation model. As in the previous chapter, the equations are estimated by pooling and cross-sectionally, and hence, scale effect and heteroscedasticity will be thoroughly investigated. The secondary aim of this chapter is to conduct various statistical and econometric tests to establish an appropriate sample and model for cross-sectional and pool estimations, whether differential cost of capital and the inclusion of an intercept in regressions affect statistical results. The **contribution of this chapter** is to provide UK evidence on the usefulness of a range of non-earnings accounting variables (CSV) in valuing the value of firms. The contribution of evidence on the usefulness of the CSV as predictors of future residual income was covered in Chapter 5.

The OFF attracts considerable interest in CMRA. The OFF is based on a set of linear information dynamics that lead to a closed-form valuation model. Thus, the coefficients of the valuation model are functions of the underlying parameters of the LID. In theory, the parameters in the LID vary across firms, and therefore, the coefficients in the valuation model should reflect this variation. Dechow et al. (1999) criticize researchers of the OFF that ignore the information dynamics because their models is purely a transformation of the DDM with no reference to book value or residual income. However, only five papers test for the relationship between empirically estimated linear information models and estimated equity valuation models and all of these studies are carried out in the US. Out of these five studies that have implemented the LID, only three of these (Dechow et al., 1999; Hand and Landsman, 1999; and Myers, 1999) have validly related the properties of the LID with that of the properties of the valuation model. Stober (1996) and Ahmed et al. (2000) merely incorporate the parameters estimated from the LID into an

enlarged valuation-based model to test for the incremental effects of persistence and conservatism on the valuation model parameters. Both Stober and Ahmed et al. also test for the cross-sectional coefficients of book values, operating assets and residual income of their respective valuation models and find that in most years, all these coefficients are positively significant, and the $\overline{R}^2$ of the former's valuation model is exceptionally high, many of which are above 70%.

The result of Dechow et al. suggests that when ω and γ were fed into the parameters of the valuation model, the forecasting accuracy of the model improves slightly over other competing models. In Myers (1999), the value of the firm is close to the market value under FO (1996) only. The valuation coefficients of bv_t, RI_t and $capx_t$ fed by the time-series LID of FO (1995, 1996) do not provide the best estimates of firm price, suggesting that the parameters estimated from the LID are not useful in valuing market value of equity. Moreover, the parameters estimated from the LID are not consistent to theory and are noisy as evidenced by the low R^2 for both FO (1995, 1996). The estimated coefficients of the LID and the valuation model of Hand and Landsman (1999) suggest that they are largely positives and statistically significant, with reported $\overline{R}^2 = 95\%$ for the VM.

In addition to these five papers that have tested for the relationship between empirically estimated LID and estimated VMs, eleven other researchers have used only the valuation model of the OFF, a framework commonly referred to as the Edward-Bell-Ohlson model (EBO) but five of these are not directly relevant for this Chapter because (1) Bernard (1995); Francis et al. (1997); and Penman and Sougiannis (1998) are only interested in investigating how well the EBO explains (forecasts) security prices as compared with the DDM; (2) Collins et al. (1997); and Lev and Zarowin (1999) use the EBO merely to investigate the combined value-relevance of earnings and book values across time, and hence, they are excluded from the discussion of the OFF. Therefore, the discussion will centre on the following six studies.

Using UK data, Rees (1997) examines retained earnings (*RE*) (instead of *RI*), the signalling effect of capital investments, dividend payout, and debt levels (all proxies for other information) using the EBO approach[1]. He finds capital investment (*CI*) and dividends (*DIV*) are value relevant but the sign of the coefficients for *TD* is negative, and

[1] His model is not strictly OFF as he uses *RE* instead of *RI* and a combined coefficient for *BV* and *TD*. However, I will discuss his work here as it has some implications to this research.

that the inclusion of *DIV* in the model improves the explanatory power of the model from 54% to 60%.

Frankel and Lee (1998) use the EBO to examine the usefulness of an analyst-based valuation model by estimating cross-sectionally firms' fundamental values (*V*). They find that *V* explains more than 80% and 70% of the cross-sectional variation in security prices using analysts' forecasts and historical data respectively. Book value of equity alone accounts for 60% of the correlation. By replicating most of Frankel and Lee (1998), Lee et al. (1999) use the 30 stocks in the Dow Jones Industrial Index (DJII) to measure the intrinsic values based on the following ratios: (1) most recent DJ earnings per share (*E/P*); (2) most recent DJ dividend per share (*D/P*); (3) most recent DJ book value per share (B/P); and (4) variations of the DJ value-to-price ratio (*V/P*). They find that accounting ratios (*P/B, P/D, P/E*) fail to capture certain key aspects of fundamental valuation but *V/P* consistently able to explain MVE and predict future DJII and S&P. From this, they conclude that *V/P* to estimate for *V* is superior to *P/B, P/D and P/E* and that the failure of these ratios to capture market value may be attributed to lower interest rates, decreased dividend payouts or growth expectations, or that the market is inefficient (p. 1736). Adopting in part similar to Rees and in part similar to Frankel and Lee and using Spanish data, Giner and Reverte (2001) analyse the informative value of the firm capital structure, and find that debt provides positive signal for firms facing good earnings prospects.

Ittner and Larcker (1998) examine the extent of aggregated nonfinancial measure, in the form of customer satisfaction scores (*ACSI*) in association with market value of equity using a cross-sectional EBO model. They find that *ACSI* measures are positively related to MVE. Using the EBO, Black et al. (1999) examine the value-relevance of firm reputation using the annual Fortune Rankings as proxy for nonfinancial information. They report that there is value-relevant information provided by the Fortune's most admired companies that cannot be explained by financial information.

Out of these six papers that only use the valuation model, only three (Rees, 1997; Ittner and Larcker, 1998; and Black et al. 1999) empirically test for the value-relevance of other information in the valuation model. Ittner and Larcker; and Black et al. find customer satisfaction and firm reputation respectively value-relevant, while Rees finds capital expenditures and dividends value-relevant. Accordingly, the three studies that have empirically tested for the usefulness of other information in the LID, only Dechow (1999);

and Hand and Landsman (1999) find value-relevance for analysts forecast of earnings and dividends respectively (see Chapter 5). Except for Rees, researchers use a single ad hoc proxy for v_t for the valuation model and while the results for the nonfinancial measures used in the valuation model are encouraging, the variables used by Ittner and Larcker; and Black et al. are not preciously clear since there is no appropriate measure of customer reputation and firm reputation respectively. Hence, the use of a single measure to proxy for v_t for the valuation model have also met with limited success, just like the LID, and the use of a comprehensive set of variables may be more appropriate in identifying performance measures that can explain market value of equity.

The six studies that did not implement the LID + the two studies that have implemented the LID but excluded v_t cannot be considered to have validly operationalised the OFF. Ohlson (1998, 2001); Myers (1999); and Lo and Lys (2000a) comment that researchers investigating the OFF by excluding v_t would not only make the OFF restrictive, but also violates the internal consistency of the overall OFF because v_t is an integral part of the information dynamics that is expected to influence future *RI* and the *MV*. Thus, the results of Stober; Frankel and Lee; Lee et al.; Ahmed et al.; and Giner and Reverte must be viewed with caution. Even the three studies (Dechow et al., 1999; Hand and Landsman, 1999; Myers 1999) that have validly implemented the LID and VM made no attempt to integrate O (1995); FO (1995, 1996) as a single framework in investigating the LID and the VM. Moreover, there is a general lack of an established methodology used in formulating and estimating a model under the OFF. Stober, and Ahmed et al. use per share basis for the LID and VM, Dechow et al. use MV_{it} as the scalar for the LID and per share basis for the VM, Myers use MV_{it} and BV_{it} as the scalar in his VM, Hand and Landsman use undeflated equations for both the LID and VM, and Giner and Reverte, Frankel and Lee, and Lee et al. use accounting ratios as independent variables.

Discussion and summary, out of the eleven studies that investigate the OFF, either in part or on its entirely, six of these use only the valuation models (EBO), three of these test for other information (Rees, 1997; Ittner and Larcker, 1998; and Black et al. 1999). While five studies test for the relationship between empirically estimated LID and the estimated valuation models, only three of these studies (Dechow, 1999; Hand and Landsman, 1999 and Myers, 1999) empirically test for the usefulness of other information in the LID and in the valuation model. Except for Rees, researchers use a single ad hoc

proxy for$v$ for the model and since there is no appropriate measure for some of these nonfinancial variables, eg customer reputation and firm reputation, at best, these results offer only qualified support for recent and growing moves to add value-relevance to accounting information by the inclusion of nonfinancial indicators (Lambert, 1998, p. 45). Hence, the use of a single measure to proxy for v for the valuation model have also met with limited success, just like the LID, and the use of a comprehensive set of variables may be more appropriate in identifying performance measures that can explain market value of equity. Since all these studies have implemented the valuation model, the explanatory power of the valuation model of Stober (1996) and Hand and Landsman (1999) are exceptionally high and that *V/P* explains about 80% of the cross-sectional variation in market value in Frankel and Lee (1998) and Lee et al (1999) while the *V/P* in Myers (1999) and forecast errors in Dechow et al. (1999) were less than satisfactory. Stober (1996); Rees (1997); and Giner and Reverte (2001) use per share basis in their estimating equations. Brown et al. (1999) show that using per share basis, where the dependent variable is price, result in higher R^2 because scale has not been controlled for. When Lo and Lys (2000a) replicated Hand and Landsman, and Frankel and Lee's studies, the explanatory power declined by half and one-third respectively. Lo and Lys suspect that the high correlations obtained by Lee et al. may be due to the scale effect.

Therefore, the **main purpose and contribution of this chapter is to investigate and hopefully to address the issues identified in the studies reviewed by using UK data and valuation models based on a integrated OFF to test for the value-relevance of the comprehensive set of accounting variables (CSV).**

The remainder of this chapter is organized as follows. **Section 2** highlights the summary statistics and the correlation matrix for the samples used for the empirical tests. **Section 3** examines the results from regressing the equations of the proposed residual income valuation models (Prop-VM). **Section 4** extends from the previous section in examining the impact of current and lagged *RD, HR* and *DC* on the Prop-VM. **Section 5** examines the impact of one-period lagged *OA* as against current *OA* on the Prop-VM. **Section 6** evaluates the forecasting and valuation abilities of varying models within OFF. **Section 7** concludes the chapter.

6.2. Summary Statistics

The empirical investigation of the proposed valuation model based on the OFF (ie Prop-VM) is conducted using samples where (1) $BV > 0$; (2) $BV > 0$ after outliers; (3) $BV \geq$ £5 millions; and (4) $BV \geq$ £5 millions after outliers over the period 1990-2001 drawn from DataStream. These samples are essentially the same samples used for the investigation of the *RI* dynamics (ie Prop-LID) covered in Chapter 5 and in order not to duplicate the analysis, only the salient findings of the samples are presented here.

For samples for the undeflated variables, the median and mean, maximum and minimum for all variables are extremely far apart, and standard deviations are far from 0. When the variables are deflated by *BV* and *MV*, as expected, the median and mean are very close, the maximum and minimum for all the deflated variables are not far apart while the standard deviations are not widely distributed. This clearly shows that the unscaled data will have a size (scale) problem, thus, the control for scale effect is a necessity when estimating the equations for the proposed valuation models.

While it is obvious that the descriptive statistics for the deflated variables have less deviations, skewness and the distribution is more symmetric, *RI(10%), RI(15%)* and *RI(20%)* are now negatively correlated with other independent deflated variables, and the low correlation among many deflated variables, particularly for the samples where $BV \geq$ £5 millions, however, the correlation of *OA* and *TD* becomes highly correlated.

Analysis of both the undeflated and deflated variables indicate that samples after omitting outliers have a higher inclination to non-normality, and higher scale problem, and more variables fall in the moderately correlated category while *OA* and *BV, OA* and *TD, BV* and *TD* become highly-correlated suggesting that the correlation between variables for these samples are not as good as that for the samples without omitting outliers. The correlation of *RI(10%), RI(15%)* and *RI(20%)* with another variable is not consistent in terms of magnitude of the correlation and signs, suggesting that the use of different cost of capital may affect the regression equations. Overall, the correlation matrix for all samples shows that multicollinearity in the regression may not be a serious concern.

6.3. Analysis of the Results from Estimating the Main Regression Equations

In the preceding Chapter, scaled equations that include an intercept generate better statistical results, however for this section, estimations using an intercept is not possible for equations with an inverse of size term and scaled by BV_{it} as BV_{it} is one of the independent variables (see Chapter 4, section 4.2.4.2). While an intercept can be included in equations scaled by MV_{it-1}, equations are also run without an intercept for equations scaled by MV_{it-1} in direct conformity with equations scaled by BV_{it}. Thus, MModel 1 to 8 are run on (1) undeflated equations with an intercept; (2) equations deflated by closing book values with an **inverse of size term and no intercept (EDBV)**; (3) equations deflated by opening market value of equity with an **inverse of size term and no intercept (EDMV-N)**; and (4) equations deflated by opening market value of equity with an **inverse of size term and an intercept (EDMV-I)**. Each regression is run on three different costs of capital rates of 10%, 15% and 20% so as to provide a more robust test for these equations.

Since BV_{it} is used as deflator, it is essential that BV_{it} should not be negative as the signs of the estimated coefficients will be influenced by the sign of the deflator. Even though the evidence in the previous Chapter strongly indicates that sample after deleting outliers do not contribute to an improvement in statistical results, for robustness reason, this Chapter uses sample without the omission of outliers as well as sample that omit at most 0.5% of the top and bottom observations. The estimations are first carried out by regressing cross-sectionally for each of the sample years, ie 1991 to 1999 (9 annual cross-sections). The data is then pooled over the entire sample periods to be estimated on a panel series. All regressions including the generation of output and statistical analysis are done automatically by specially self-written computer programs. The estimation basis and the numbers of regression runs are summarized as follows:

#	Basis	Estimation Type	Type *X* Equations *X* Years	Total
1	$BV > 0$	Annual cross-section (r = 10%)	4 X 8 X 9	288
		Annual cross-section (r = 15%)	4 X 8 X 9	288
		Annual cross-section (r = 20%)	4 X 8 X 9	288
		Pooled entire sample (r = 10%)	4 X 8	32
		Pooled entire sample (r = 15%)	4 X 8	32
		Pooled entire sample (r = 20%)	4 X 8	32
2	$BV > 0$ & Omit Outliers	Annual cross-section (r = 10%)	4 X 8 X 9	288
		Annual cross-section (r = 15%)	4 X 8 X 9	288
		Annual cross-section (r = 20%)	4 X 8 X 9	288

		Pooled entire sample (r = 10%)	4 X 8	32
		Pooled entire sample (r = 15%)	4 X 8	32
		Pooled entire sample (r = 20%)	4 X 8	32
3	$BV \geq$ £5 millions	Annual cross-section (r = 10%)	4 X 8 X 9	288
		Annual cross-section (r = 15%)	4 X 8 X 9	288
		Annual cross-section (r = 20%)	4 X 8 X 9	288
		Pooled entire sample (r = 10%)	4 X 8	32
		Pooled entire sample (r = 15%)	4 X 8	32
		Pooled entire sample ($\underline{r}$ = 20%)	4 X 8	32
4	$BV \geq$ £5 millions & Omit outliers	Annual cross-section (r = 10%)	4 X 8 X 9	288
		Annual cross-section (r = 15%)	4 X 8 X 9	288
		Annual cross-section (r = 20%)	4 X 8 X 9	288
		Pooled entire sample (r = 10%)	4 X 8	32
		Pooled entire sample (r = 15%)	4 X 8	32
		Pooled entire sample (r = 20%)	4 X 8	32
Total				3,840

Table 6.1 – Estimation Basis and Type, and the Number of Regression Runs

Table 6.2 indicates the range of $\bar{R}^2$ for all equations for both the cross-sectional and pool samples. Cross-sectional and pooled results of analysis of the number of statistically significant coefficients (t-stat) of the Prop-VM using differential samples and cost of capital are tabulated in Table 6.3a-c while the results in terms of h-stat are in Table 6.9, and the medians and percentiles of estimated coefficients are contained in Table 6.8. Tables 6.4 and 6.5 provide the intercept and inverse of scale and their associated statistics from cross-sectional and pool estimations for the sample where $BV \geq$ £5 millions and r = 10%. Table 6.6 gives the mean residual sum of squares from both the cross-sectional and pooled estimations for sample where $BV \geq$ £5 millions and r = 10%. The test of the validity for the addition of additional variables is tabulated in Table 6.7 while the Chow's Prediction test on parameter stability is contained in Table 6.10.

As the amount of information generated from the four samples are voluminous, only the information generated from the sample where $BV \geq$ £5 millions is reported since it has the best results among the four samples. However, references to other samples will be made from time to time if necessary, eg for comparison purposes.

Table 6.2 - Adjusted R^2 from Cross-sectional and Pool Estimations for all samples and r = 10%

Year	#	Type	*BV > 0*	*BV > 0 after outliers*	*BV ≥ £5 millions*	*BV ≥£5 m after outliers*
1991	1	No deflation	0.606 to 0.806	0.688 to 0.781	0.601 to 0.804	0.643 to 0.679
	2	Defl. by BV_{it}	0.144 to 0.167	0.144 to 0.167	-0.002 to -0.007	-0.002 to -0.007
	3	Defl. by MV_{it-1}	-0.978 to -0.49	-0.97 to -0.484	-1.409 to 0.692	-1.397 to -0.692
	4	Defl. by MV_{it-1} *(I)*	0.168 to 0.229	0.168 to 0.233	0.142 to 0.214	0.142 to 0.213
1992	1	No deflation	0.37 to 0.884	0.632 to 0.716	0.365 to 0.882	0.656 to 0.731
	2	Defl. by BV_{it}	0.002 to 0.047	0.002 to 0.051	-0.002 to -0.006	-0.002 to -0.008
	3	Defl. by MV_{it-1}	-0.01 to 0.209	-0.004 to 0.215	0.034 to 0.338	0.04 to 0.354
	4	Defl. by MV_{it-1} *(I)*	0.182 to 0.404	0.182 to 0.405	0.218 to 0.532	0.223 to 0.55
1993	1	No deflation	0.664 to 0.841	0.83 to 0.842	0.669 to 0.851	0.858 to 0.871
	2	Defl. by BV_{it}	0.16 to 0.833	0.166 to 0.836	0.004 to 0.073	0.005 to 0.056
	3	Defl. by MV_{it-1}	0 to 0.041	0.001 to 0.046	0.121 to 0.233	0.126 to 0.237
	4	Defl. by MV_{it-1} *(I)*	0.089 to 0.116	0.089 to 0.119	0.319 to 0.468	0.32 to 0.469
1994	1	No deflation	0.817 to 0.886	0.733 to 0.769	0.82 to 0.89	0.752 to 0.793
	2	Defl. by BV_{it}	0.001 to 0.004	0.001 to 0.004	0.018 to 0.079	0.042 to 0.07
	3	Defl. by MV_{it-1}	-1.982 to -1.455	-1.945 to -1.424	-2.47 to -1.921	-2.414 to -1.893
	4	Defl. by MV_{it-1} *(I)*	0.05 to 0.175	0.05 to 0.175	0.092 to 0.16	0.09 to 0.158
1995	1	No deflation	0.684 to 0.827	0.768 to 0.81	0.683 to 0.826	0.769 to 0.814
	2	Defl. by BV_{it}	0.056 to 0.06	0.056 to 0.059	0.049 to 0.327	0.026 to 0.242
	3	Defl. by MV_{it-1}	-0.56 to -0.203	-0.551 to -0.187	-0.734 to -0.382	-0.709 to -0.359
	4	Defl. by MV_{it-1} *(I)*	0.0695 to 0.418	0.069 to 0.425	0.115 to 0.346	0.119 to 0.355
1996	1	No deflation	0.802 to 0.893	0.755 to 0.81	0.804 to 0.895	0.741 to 0.809
	2	Defl. by BV_{it}	0.07 to 0.716	0.07 to 0.725	0.055 to 0.4312	0.021 to 0.344
	3	Defl. by MV_{it-1}	-0.203 to -0.104	-0.187 to -0.09	-0.317 to -0.203	-0.293 to -0.182
	4	Defl. by MV_{it-1} *(I)*	0.178 to 0.237	0.18 to 0.24	0.237 to 0.277	0.24 to 0.282
1997	1	No deflation	0.624 to 0.893	0.677 to 0.758	0.621 to 0.892	0.715 to 0.796
	2	Defl. by BV_{it}	0.101 to 0.852	0.102 to 0.854	0.013 to 0.534	0 to 0.471
	3	Defl. by MV_{it-1}	-2.098 to -1.736	-2.057 to -1.665	-2.552 to -2.136	-2.519 to -2.067
	4	Defl. by MV_{it-1} *(I)*	0.034 to 0.075	0.034 to 0.08	0.019 to 0.0663	0.019 to 0.071
1998	1	No deflation	0.746 to 0.858	0.523 to 0.704	0.745 to 0.857	0.59 to 0.725
	2	Defl. by BV_{it}	0.228 to 0.443	0.235 to 0.441	-0.001 to 0.447	0.052 to 0.39
	3	Defl. by MV_{it-1}	1.765 to -1.364	-1.742 to -1.335	-1.935 to -1.562	-1.921 to -1.549
	4	Defl. by MV_{it-1} *(I)*	0.034 to 0.095	0.034 to 0.096	0.047 to 0.096	0.048 to 0.094
1999	1	No deflation	0.678 to 0.917	0.565 to 0.634	0.676 to 0.917	0.514 to 0.614
	2	Defl. by BV_{it}	0.595 to 0.726	0.598 to 0.728	0.019 to 0.295	0.037 to 0.227
	3	Defl. by MV_{it-1}	0.047 to 0.133	0.049 to 0.136	-0.457 to -0.314	-0.447 to -0.305
	4	Defl. by MV_{it-1} *(I)*	0.189 to 0.253	0.188 to 0.252	0.039 to 0.088	0.038 to 0.088
Pool	1	No deflation	0.65 to 0.777	0.622 to 0.687	0.648 to 0.776	0.624 to 0.684
	2	Defl. by BV_{it}	0.008 to 0.182	0.008 to 0.211	0.003 to 0.047	0.004 to 0.033
	3	Defl. by MV_{it-1}	-0.247 to -0.175	-0.24 to -0.168	-0.47 to -0.344	-0.454 to -0.328
	4	Defl. by MV_{it-1} *(I)*	0.061 to 0.096	0.061 to 0.097	0.106 to 0.172	0.106 to 0.174

Annual samples range from 884 to 1,157 observations and the pooled samples consist of 8,666 to 9,302 observations.
Regressions are run from Prop-VM

No deflation $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by BV_{it} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Adj. R^2 ranges from the simple regressional model (MModel 1) to multiple regressional model (MModel 8).

Table 6.3a - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	1	No deflation	8	0	8	0	7	0	1	1	5	0	0	4	2	1	1	1	1	0	33	7
	2	Defl. by BV_{it}	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	3	Defl. by MV_{it-1}	7	1	8	0	5	1	1	0	5	0	3	0	0	0	2	0	1	0	32	2
	4	Defl. by MV_{it-1} (I)	8	0	8	0	0	3	6	0	5	0	0	0	0	0	2	0	1	0	30	3
1992	1	No deflation	3	3	8	0	7	0	5	0	5	0	3	1	0	3	2	0	1	0	34	7
	2	Defl. by BV_{it}	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
	3	Defl. by MV_{it-1}	8	0	8	0	0	3	0	6	0	4	4	0	0	3	0	0	0	1	20	17
	4	Defl. by MV_{it-1} (I)	8	0	8	0	0	2	0	5	0	4	4	0	0	3	2	0	0	1	22	15
1993	1	No deflation	8	0	8	0	7	0	0	1	5	0	0	3	0	0	1	0	1	0	30	4
	2	Defl. by BV_{it}	7	0	6	0	6	0	0	0	3	0	3	0	2	0	0	0	1	0	28	0
	3	Defl. by MV_{it-1}	8	0	0	8	0	5	6	0	2	0	0	4	3	0	0	2	0	0	19	19
	4	Defl. by MV_{it-1} (I)	8	0	0	8	0	5	6	0	0	1	0	4	3	0	0	2	0	1	17	21
1994	1	No deflation	8	0	8	0	7	0	1	0	5	0	0	4	0	3	1	0	1	0	31	7
	2	Defl. by BV_{it}	8	0	7	0	4	0	1	0	5	0	0	0	2	0	0	0	1	0	28	0
	3	Defl. by MV_{it-1}	8	0	0	6	0	7	6	0	5	0	4	0	3	0	0	0	1	0	27	13
	4	Defl. by MV_{it-1} (I)	1	0	0	0	0	5	6	0	0	0	0	0	0	0	0	0	0	0	7	5
1995	1	No deflation	8	0	8	0	7	0	6	0	5	0	0	4	3	0	2	0	1	0	40	4
	2	Defl. by BV_{it}	8	0	8	0	4	0	6	0	5	0	1	0	2	0	0	0	1	0	35	0
	3	Defl. by MV_{it-1}	8	0	0	7	1	5	6	0	5	0	4	0	3	0	0	2	0	1	27	15
	4	Defl. by MV_{it-1} (I)	7	0	1	7	2	0	6	0	5	0	0	0	3	0	0	2	0	1	24	10
1996	1	No deflation	7	0	8	0	7	0	5	0	5	0	0	1	0	3	0	0	1	0	33	4
	2	Defl. by BV_{it}	8	0	8	0	6	0	6	0	5	0	4	0	2	0	0	0	1	0	40	0
	3	Defl. by MV_{it-1}	4	0	8	0	0	4	3	0	5	0	4	0	3	0	0	0	0	0	27	4
	4	Defl. by MV_{it-1} (I)	0	3	8	0	0	0	6	0	0	0	4	0	0	3	0	0	0	1	18	7
1997	1	No deflation	7	1	8	0	7	0	6	0	5	0	1	0	0	1	1	1	1	0	36	3
	2	Defl. by BV_{it}	4	0	8	0	7	0	6	0	5	0	4	0	2	0	0	2	1	0	37	2
	3	Defl. by MV_{it-1}	6	0	0	7	2	0	2	0	5	0	2	0	3	0	0	2	1	0	21	9
	4	Defl. by MV_{it-1} (I)	0	0	7	0	1	2	6	0	5	0	0	0	0	0	0	2	0	1	19	5
1998	1	No deflation	8	0	8	0	7	0	0	1	5	0	0	4	3	0	0	2	0	1	31	8
	2	Defl. by BV_{it}	8	0	7	0	5	0	6	0	5	0	4	0	0	3	2	0	1	0	38	3
	3	Defl. by MV_{it-1}	8	0	0	8	0	0	0	6	5	0	4	0	3	0	0	0	0	0	20	14
	4	Defl. by MV_{it-1} (I)	8	0	1	0	0	2	0	0	5	0	0	4	0	0	2	0	0	1	16	7

Table 6.3a - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1999	1	No deflation	8	0	8	0	5	1	0	6	5	0	0	4	2	1	0	1	1	0	29	13
	2	Defl. by BV_{it}	8	0	7	0	5	2	6	0	5	0	0	0	0	1	2	0	1	0	34	3
	3	Defl. by MV_{it-1}	0	0	8	0	0	2	6	0	5	0	4	0	3	0	0	2	0	0	26	4
	4	Defl. by MV_{it-1} (I)	0	5	8	0	0	0	6	0	5	0	0	0	0	3	0	0	0	0	19	8
Total	1	No deflation	65	4	72	0	61	1	24	9	45	0	4	25	10	12	8	5	8	1	297	57
	2	Defl. by BV_{it}	56	0	51	0	37	2	31	0	33	0	16	0	10	4	4	2	7	0	245	8
	3	Defl. by MV_{it-1}	57	1	32	36	8	27	30	12	37	4	29	4	21	3	2	8	3	2	219	97
	4	Defl. by MV_{it-1} (I)	40	8	41	15	3	19	42	5	25	5	8	8	6	9	6	6	1	6	172	81
Pool	1	No deflation	8	0	8	0	7	0	0	6	5	0	0	4	2	1	2	0	1	0	33	11
	2	Defl. by BV_{it}	8	0	8	0	5	0	6	0	5	0	3	0	0	0	2	0	1	0	38	0
	3	Defl. by MV_{it-1}	8	0	6	0	2	5	4	0	5	0	4	0	3	0	0	2	0	1	32	8
	4	Defl. by MV_{it-1} (I)	8	0	8	0	2	4	6	0	5	0	4	0	0	3	0	2	0	1	33	10

Table 6.3b - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 15%

1991	1	No deflation	8	0	8	0	6	0	2	1	5	0	0	4	2	1	1	1	1	0	33	7
	2	Defl. by BV_{it}	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	3	Defl. by MV_{it-1}	7	1	8	0	5	1	1	1	5	0	3	0	0	0	2	0	1	0	32	3
	4	Defl. by MV_{it-1} (I)	8	0	8	0	0	2	6	0	5	0	0	0	0	0	2	0	1	0	30	2
1992	1	No deflation	5	1	8	0	7	0	5	0	5	0	3	0	0	3	2	0	1	0	36	4
	2	Defl. by BV_{it}	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
	3	Defl. by MV_{it-1}	8	0	8	0	0	3	0	6	0	4	4	0	0	3	1	0	0	1	21	17
	4	Defl. by MV_{it-1} (I)	8	0	8	0	0	2	0	5	0	4	4	0	0	3	2	0	0	1	22	15
1993	1	No deflation	8	0	8	0	7	0	0	1	5	0	0	4	0	0	1	0	1	0	30	5
	2	Defl. by BV_{it}	7	0	4	0	6	0	0	0	3	0	3	0	2	0	0	0	1	0	26	0
	3	Defl. by MV_{it-1}	8	0	0	8	0	5	6	0	2	0	0	4	3	0	0	2	0	0	19	19
	4	Defl. by MV_{it-1} (I)	8	0	0	8	0	5	6	0	0	1	0	4	3	0	0	2	0	1	17	21
1994	1	No deflation	8	0	8	0	7	0	3	0	5	0	0	4	0	3	1	0	1	0	33	7
	2	Defl. by BV_{it}	8	0	7	0	4	0	1	0	5	0	0	0	2	0	0	0	1	0	28	0
	3	Defl. by MV_{it-1}	8	0	0	5	0	7	6	0	5	0	4	0	3	0	0	0	1	0	27	12
	4	Defl. by MV_{it-1} (I)	1	0	1	0	0	5	6	0	0	0	0	0	0	0	0	0	0	0	8	5

Table 6.3b - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 15%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	1	No deflation	8	0	8	0	7	0	6	0	5	0	0	4	3	0	2	0	1	0	40	4
	2	Defl. by BV_{it}	8	0	8	0	4	0	6	0	5	0	1	0	2	0	0	0	1	0	35	0
	3	Defl. by MV_{it-1}	8	0	0	7	2	5	6	0	5	0	4	0	3	0	0	2	0	1	28	15
	4	Defl. by MV_{it-1} (I)	5	0	1	3	2	0	6	0	5	0	1	0	3	0	0	2	0	1	23	6
1996	1	No deflation	8	0	8	0	7	0	5	0	5	0	0	4	0	3	0	0	1	0	34	7
	2	Defl. by BV_{it}	8	0	8	0	6	0	6	0	5	0	4	0	2	0	0	0	1	0	40	0
	3	Defl. by MV_{it-1}	6	0	8	0	0	5	2	0	5	0	4	0	3	0	0	0	0	0	28	5
	4	Defl. by MV_{it-1} (I)	0	2	8	0	0	0	6	0	0	0	4	0	0	3	0	0	0	1	18	6
1997	1	No deflation	7	1	8	0	7	0	6	0	5	0	1	0	0	1	1	1	1	0	36	3
	2	Defl. by BV_{it}	6	0	8	0	7	0	6	0	5	0	4	0	2	0	0	2	1	0	39	2
	3	Defl. by MV_{it-1}	6	0	0	5	2	0	2	0	5	0	2	0	3	0	0	2	1	0	21	7
	4	Defl. by MV_{it-1} (I)	0	0	7	0	1	2	6	0	5	0	0	0	0	0	0	2	0	1	19	5
1998	1	No deflation	8	0	8	0	7	0	0	1	5	0	0	2	3	0	0	2	0	0	31	5
	2	Defl. by BV_{it}	8	0	7	0	5	0	6	0	5	0	4	0	0	3	2	0	1	0	38	3
	3	Defl. by MV_{it-1}	8	0	0	8	0	0	0	6	5	0	4	0	3	0	0	0	0	0	20	14
	4	Defl. by MV_{it-1} (I)	8	0	1	0	0	5	0	0	5	0	0	4	0	0	2	0	0	1	16	10
1999	1	No deflation	8	0	7	0	5	1	0	6	5	0	0	4	2	1	0	1	1	0	28	13
	2	Defl. by BV_{it}	8	0	7	0	5	2	6	0	5	0	0	0	0	1	2	0	1	0	34	3
	3	Defl. by MV_{it-1}	0	0	8	0	0	2	6	0	5	0	4	0	3	0	0	2	0	0	26	4
	4	Defl. by MV_{it-1} (I)	0	5	8	0	0	0	6	0	5	0	0	0	0	3	0	0	0	0	19	8
Total	1	No deflation	68	2	71	0	60	1	27	9	45	0	4	26	10	12	8	5	8	0	301	55
	2	Defl. by BV_{it}	58	0	49	0	37	2	31	0	33	0	16	0	10	4	4	2	7	0	245	8
	3	Defl. by MV_{it-1}	59	1	32	33	9	28	29	13	37	4	29	4	21	3	3	8	3	2	222	96
	4	Defl. by MV_{it-1} (I)	38	7	42	11	3	21	42	5	25	5	9	8	6	9	6	6	1	6	172	78
Pool	1	No deflation	8	0	8	0	7	0	0	6	5	0	0	4	2	1	2	0	1	0	33	11
	2	Defl. by BV_{it}	8	0	8	0	5	0	6	0	5	0	3	0	0	0	2	0	1	0	38	0
	3	Defl. by MV_{it-1}	8	0	7	0	2	5	4	0	5	0	4	0	3	0	0	2	0	1	33	8
	4	Defl. by MV_{it-1} (I)	8	0	8	0	2	4	6	0	5	0	4	0	0	3	0	2	0	1	33	10

Table 6.3c - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 20%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	1	No deflation	8	0	8	0	6	0	2	0	5	0	0	4	2	1	1	1	1	0	33	6
	2	Defl. by BV_{it}	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	3	Defl. by MV_{it-1}	7	1	8	0	5	1	1	5	5	0	3	0	0	0	2	0	1	0	32	7
	4	Defl. by MV_{it-1} (I)	8	0	8	0	0	2	6	0	5	0	0	2	0	0	2	0	0	0	29	4
1992	1	No deflation	5	1	7	0	7	0	5	0	5	0	3	0	0	3	2	0	1	0	35	4
	2	Defl. by BV_{it}	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
	3	Defl. by MV_{it-1}	8	0	8	0	0	3	0	6	0	4	4	0	0	3	1	0	0	1	21	17
	4	Defl. by MV_{it-1} (I)	8	0	8	0	0	2	0	5	0	4	4	0	0	3	2	0	0	1	22	15
1993	1	No deflation	8	0	8	0	7	0	1	1	5	0	0	4	0	0	1	0	1	0	31	5
	2	Defl. by BV_{it}	7	0	3	0	6	0	0	0	3	0	3	0	2	0	0	1	1	0	25	1
	3	Defl. by MV_{it-1}	8	0	0	8	0	5	6	0	2	0	0	4	3	0	0	2	0	0	19	19
	4	Defl. by MV_{it-1} (I)	8	0	0	7	0	5	6	0	0	1	0	4	3	0	0	2	0	1	17	20
1994	1	No deflation	8	0	8	0	7	0	4	0	5	0	0	4	0	3	1	0	1	0	34	7
	2	Defl. by BV_{it}	8	0	6	0	4	0	1	0	5	0	0	0	2	0	0	0	1	0	27	0
	3	Defl. by MV_{it-1}	8	0	0	3	0	7	6	0	5	0	4	0	3	0	0	0	1	0	27	10
	4	Defl. by MV_{it-1} (I)	1	0	2	0	0	5	6	0	0	0	0	0	0	0	0	0	0	0	9	5
1995	1	No deflation	8	0	8	0	7	0	5	0	5	0	0	4	3	0	2	0	1	0	39	4
	2	Defl. by BV_{it}	8	0	8	0	4	0	6	0	5	0	1	0	2	0	0	1	1	0	35	1
	3	Defl. by MV_{it-1}	8	0	1	4	2	5	6	0	5	0	4	0	3	0	0	2	0	1	29	12
	4	Defl. by MV_{it-1} (I)	4	0	2	0	2	0	6	0	5	0	1	0	3	0	0	2	0	1	23	3
1996	1	No deflation	8	0	8	0	7	0	6	0	5	0	0	4	0	0	0	0	1	0	35	4
	2	Defl. by BV_{it}	8	0	8	0	6	0	6	0	5	0	4	0	2	0	0	0	1	0	40	0
	3	Defl. by MV_{it-1}	8	0	8	0	0	5	2	0	5	0	4	0	3	0	0	0	0	0	30	5
	4	Defl. by MV_{it-1} (I)	0	0	8	0	0	0	5	0	0	0	4	0	0	3	0	0	0	1	17	4
1997	1	No deflation	7	1	8	0	7	0	5	0	5	0	1	0	0	1	1	1	1	0	35	3
	2	Defl. by BV_{it}	6	0	7	0	7	0	6	0	5	0	4	0	2	0	0	2	1	0	38	2
	3	Defl. by MV_{it-1}	6	0	0	5	2	0	0	0	5	0	2	0	3	0	0	2	1	0	19	7
	4	Defl. by MV_{it-1} (I)	0	0	8	0	1	2	6	0	5	0	0	0	0	0	0	2	0	1	20	5
1998	1	No deflation	8	0	8	0	7	0	0	0	5	0	0	2	3	0	0	2	0	0	31	4
	2	Defl. by BV_{it}	8	0	7	0	5	0	6	0	5	0	4	0	0	3	2	0	1	0	38	3
	3	Defl. by MV_{it-1}	8	0	0	7	0	0	0	6	5	0	4	0	3	0	0	0	0	0	20	13
	4	Defl. by MV_{it-1} (I)	8	0	3	0	0	5	0	0	5	0	0	4	0	0	2	0	0	1	18	10

Table 6.3c - Number of Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 20%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1999	1	No deflation	8	0	5	0	5	1	0	6	5	0	0	4	2	1	0	1	1	0	26	13
	2	Defl. by BV_{it}	8	0	7	0	5	2	6	0	5	0	0	0	0	1	2	0	1	0	34	3
	3	Defl. by MV_{it-1}	1	0	8	0	0	2	6	0	5	0	4	0	3	0	0	2	0	0	27	4
	4	Defl. by MV_{it-1} (I)	0	1	8	0	0	0	6	0	5	0	0	0	0	3	0	0	0	0	19	4
Total	1	No deflation	68	2	68	0	60	1	28	7	45	0	4	26	10	9	8	5	8	0	299	50
	2	Defl. by BV_{it}	58	0	46	0	37	2	31	0	33	0	16	0	10	4	4	4	7	0	242	10
	3	Defl. by MV_{it-1}	62	1	33	27	9	28	27	17	37	4	29	4	21	3	3	8	3	2	224	94
	4	Defl. by MV_{it-1} (I)	37	1	47	7	3	21	41	5	25	5	9	10	6	9	6	6	0	6	174	70
Pool	1	No deflation	8	0	8	0	7	0	0	6	5	0	0	4	2	0	2	0	1	0	33	10
	2	Defl. by BV_{it}	8	0	8	0	5	0	6	0	5	0	3	0	0	0	2	0	1	0	38	0
	3	Defl. by MV_{it-1}	8	0	8	0	2	5	4	0	5	0	4	0	3	0	0	2	0	1	34	8
	4	Defl. by MV_{it-1} (I)	8	0	8	0	1	3	6	0	5	0	4	0	0	3	0	2	0	1	32	9

Annual cross-sectional and pool samples consist of 884 to 1,157 and 8,666 to 9,302 observations respectively. Regressions are run from MModel 1 to 8:

No deflation $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by BV_{it} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Hence BV_{it}, RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation. Numbers are in t-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 6.4 - Intercepts and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	MModel 1	MModel 2	MModel 3	MModel 4	MModel 5	MModel 6	MModel 7	MModel 8	NS *	S *
1991	1	No deflation	962	0.601	Coeff	70,808,198	62,715,969	59,949,355	71,151,708	92,942,684	103,409,774	103,768,558	115,802,974		
					Std. Err	37,657,625	36,199,492	36,161,812	35,567,320	35,496,094	34,914,642	33,886,799	26,720,557		
					t-Stat	*(1.880)	*(1.733)	*(1.658)	**(2.000)	***(2.618)	***(2.962)	***(3.062)	***(4.334)	0	8
	4	Defl. by MV_{it-1} (I)	922	0.142	Coeff	1.016	1.020	1.046	1.022	1.024	1.024	1.029	0.995		
					Std. Err	0.025	0.026	0.026	0.027	0.027	0.027	0.026	0.031		
					t-Stat	***(40.789)	***(39.286)	***(40.305)	***(38.405)	***(38.170)	***(38.174)	***(39.055)	***(32.429)	0	8
1992	1	No deflation	940	0.365	Coeff	289,650,777	121,926,485	104,750,329	110,432,566	74,242,878	63,857,657	62,192,586	80,991,201		
					Std. Err	54,449,625	42,640,632	40,869,591	37,357,947	37,681,737	36,966,343	36,499,285	24,263,749		
					t-Stat	***(5.320)	***(2.859)	**(2.563)	***(2.956)	**(1.970)	*(1.727)	*(1.704)	***(3.338)	0	8
	4	Defl. by MV_{it-1} (I)	902	0.218	Coeff	0.993	0.987	0.961	0.966	0.794	0.880	0.931	1.147		
					Std. Err	0.068	0.068	0.068	0.068	0.061	0.060	0.060	0.059		
					t-Stat	***(14.574)	***(14.431)	***(14.205)	***(14.119)	***(13.000)	***(14.783)	***(15.534)	***(19.285)	0	8
1993	1	No deflation	998	0.669	Coeff	88,283,158	56,970,636	56,114,889	58,383,310	67,820,429	65,810,396	67,866,778	101,984,895		
					Std. Err	38,013,839	34,142,746	34,184,115	31,964,364	32,117,298	32,114,943	31,452,151	25,851,081		
					t-Stat	**(2.322)	*(1.669)	(1.642)	*(1.827)	**(2.112)	**(2.049)	**(2.158)	***(3.945)	1	7
	4	Defl. by MV_{it-1} (I)	920	0.319	Coeff	0.899	0.865	0.931	0.967	1.077	1.043	1.037	1.083		
					Std. Err	0.055	0.055	0.053	0.054	0.054	0.054	0.053	0.054		
					t-Stat	***(16.389)	***(15.810)	***(17.438)	***(17.770)	***(19.948)	***(19.206)	***(19.389)	***(20.100)	0	8
1994	1	No deflation	1,061	0.82	Coeff	61,551,055	48,816,917	44,782,758	46,217,000	66,003,930	61,627,581	61,533,054	68,293,082		
					Std. Err	28,334,822	27,158,464	26,974,932	26,107,359	25,826,375	25,490,117	25,435,304	22,426,505		
					t-Stat	**(2.172)	*(1.797)	*(1.660)	*(1.770)	**(2.556)	**(2.418)	**(2.419)	***(3.045)	0	8
	4	Defl. by MV_{it-1} (I)	966	0.092	Coeff	1.077	1.064	1.069	1.064	1.066	1.067	1.067	1.069		
					Std. Err	0.021	0.021	0.020	0.021	0.021	0.022	0.022	0.022		
					t-Stat	***(52.140)	***(50.749)	***(52.803)	***(51.098)	***(50.437)	***(49.417)	***(49.360)	***(48.678)	0	8
1995	1	No deflation	1,114	0.683	Coeff	127,232,628	76,931,898	72,624,535	72,639,883	94,540,684	102,406,147	104,843,861	102,835,508		
					Std. Err	40,539,551	33,781,983	32,599,742	31,585,420	31,588,163	31,269,392	30,903,333	30,428,528		
					t-Stat	***(3.138)	**(2.277)	**(2.228)	**(2.300)	***(2.993)	***(3.275)	***(3.393)	***(3.380)	0	8
	4	Defl. by MV_{it-1} (I)	1,025	0.115	Coeff	1.113	1.112	1.072	1.048	1.042	1.022	1.017	1.172		
					Std. Err	0.036	0.036	0.035	0.034	0.035	0.036	0.036	0.035		
					t-Stat	***(31.335)	***(31.095)	***(30.920)	***(30.556)	***(29.481)	***(28.248)	***(28.282)	***(33.596)	0	8
1996	1	No deflation	1,157	0.804	Coeff	149,043,541	97,520,025	96,608,724	85,185,140	102,505,923	95,420,214	95,728,284	115,252,192		
					Std. Err	40,088,800	35,875,636	35,898,505	30,991,402	30,957,495	30,806,698	30,828,188	29,829,917		
					t-Stat	***(3.718)	***(2.718)	***(2.691)	***(2.749)	***(3.311)	***(3.097)	***(3.105)	***(3.864)	0	8
	4	Defl. by MV_{it-1} (I)	1,049	0.237	Coeff	1.054	1.056	1.089	1.088	1.051	1.074	1.075	1.097		
					Std. Err	0.038	0.039	0.039	0.040	0.040	0.042	0.042	0.042		
					t-Stat	***(27.557)	***(27.304)	***(27.876)	***(27.256)	***(25.966)	***(25.701)	***(25.731)	***(26.264)	0	8

Table 6.4 - Intercepts and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	MModel 1	MModel 2	MModel 3	MModel 4	MModel 5	MModel 6	MModel 7	MModel 8	NS *	S *
1997	1	No deflation	1,124	0.621	Coeff	56,467,603	-25,137,283	-24,853,643	-40,985,812	-29,584,501	-30,000,942	-32,429,791	-31,493,097		
					Std. Err	75,179,440	66,215,969	66,040,071	54,362,481	54,872,719	54,865,908	54,723,948	40,642,792		
					t-Stat	(0.751)	(-0.380)	(-0.376)	(-0.754)	(-0.539)	(-0.547)	(-0.593)	(-0.775)	8	0
	4	Defl. by MV_{it-1} *(I)*	1,040	0.019	Coeff	1.132	1.132	1.141	1.131	1.132	1.135	1.120	1.137		
					Std. Err	0.022	0.022	0.022	0.022	0.022	0.022	0.023	0.023		
					t-Stat	***(52.130)	***(52.102)	***(53.000)	***(51.583)	***(51.624)	***(51.532)	***(49.242)	***(49.273)	0	8
1998	1	No deflation	1,025	0.745	Coeff	-27,029,274	-138,680,948	-127,368,596	-213,672,312	-108,940,817	-93,778,872	-86,975,574	-96,019,830		
					Std. Err	86,786,963	82,400,412	82,445,129	70,981,444	72,142,395	70,414,286	67,842,165	68,004,272		
					t-Stat	(-0.311)	*(-1.683)	(-1.545)	***(-3.010)	(-1.510)	(-1.332)	(-1.282)	(-1.412)	6	2
	4	Defl. by MV_{it-1} *(I)*	958	0.047	Coeff	1.052	1.055	1.058	1.043	1.084	1.082	1.084	1.095		
					Std. Err	0.024	0.024	0.024	0.025	0.026	0.026	0.026	0.026		
					t-Stat	***(44.575)	***(44.618)	***(43.371)	***(41.973)	***(41.433)	***(40.915)	***(41.029)	***(41.706)	0	8
1999	1	No deflation	921	0.676	Coeff	145,738,830	25,056,749	-30,810,582	-130,524,866	32,593,774	42,004,096	42,317,805	87,433,448		
					Std. Err	120,240,205	109,338,313	105,351,590	81,480,637	82,019,256	81,641,330	81,716,111	63,720,194		
					t-Stat	(1.212)	(0.229)	(-0.292)	(-1.602)	(0.397)	(0.514)	(0.518)	(1.372)	8	0
	4	Defl. by MV_{it-1} *(I)*	884	0.039	Coeff	1.319	1.319	1.339	1.284	1.291	1.319	1.321	1.323		
					Std. Err	0.062	0.062	0.061	0.062	0.065	0.067	0.067	0.067		
					t-Stat	***(21.342)	***(21.328)	***(22.006)	***(20.726)	***(19.781)	***(19.761)	***(19.630)	***(19.661)	0	8
Pool	1	No deflation	9,302	0.648	Coeff	70,320,672	77,239,967	31,581,779	1,322,351	49,708,150	52,747,283	46,442,139	61,340,675		
					Std. Err	22,185,298	21,792,604	21,172,773	19,153,411	19,472,126	19,482,823	19,349,917	18,230,891		
					t-Stat	***(3.170)	***(3.544)	(1.492)	(0.069)	**(2.553)	***(2.707)	**(2.400)	***(3.365)	2	6
	4	Defl. by MV_{it-1} *(I)*	8,666	0.106	Coeff	1.070	1.068	1.081	1.063	1.038	1.051	1.041	1.113		
					Std. Err	0.014	0.014	0.014	0.015	0.015	0.015	0.015	0.015		
					t-Stat	***(74.671)	***(74.346)	***(75.141)	***(72.423)	***(69.662)	***(69.911)	***(68.827)	***(73.441)	0	8

Annual samples range from 884 to 1,157 observations and the pooled samples consist of 8,666 to 9,302 observations. Regressions are run from Prop-VM:

Note equations deflated by MV_{it-1} *(I)* has both an intercept an inverse of scale term.

MModel 1 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+e_{it+1}$

MModel 2 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\omega_2 OA_{it}+e_{it+1}$

MModel 3 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+e_{it+1}$

MModel 4 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+e_{it+1}$

MModel 5 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+e_{it+1}$

MModel 6 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+\alpha_6 DC_{it}+e_{it+1}$

MModel 7 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+\alpha_6 DC_{it}+\alpha_7 TD_{it}+e_{it+1}$

MModel 8 $MV_{it}=\alpha_A+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+\alpha_6 DC_{it}+\alpha_7 TD_{it}+\alpha_8 DIV_{it}+e_{it+1}$

* NS, S = Number of intercepts that are not-significant/significant at the 10% level.

Table 6.5 - Inverse of Scale Terms and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	MModel 1	MModel 2	MModel 3	MModel 4	MModel 5	MModel 6	MModel 7	MModel 8	NS*	S*
1991	1	Defl. by BV_{it}	962	-0.001	Coeff	16,496,309.3	16,414,160.5	16,373,557.1	16,584,330.8	18,857,336.4	18,796,329.5	19,058,283.4	18,771,823.9		
					Std. Err	18,071,642.2	18,082,750.9	18,090,357.3	18,099,359.0	18,407,742.4	18,481,532.3	18,518,682.1	18,740,892.3		
					t-Stat	(0.913)	(0.908)	(0.905)	(0.916)	(1.024)	(1.017)	(1.029)	(1.002)	8	0
	2	Defl. by MV_{it-1}	922	-1.409	Coeff	2,210,049.5	1,855,420.7	1,886,219.1	1,869,651.2	1,527,134.4	1,528,358.4	1,781,927.4	3,124,138.0		
					Std. Err	352,000.1	348,024.9	349,712.4	337,032.3	360,877.7	362,293.7	370,464.0	343,828.2		
					t-Stat	***(6.279)	***(5.331)	***(5.394)	***(5.547)	***(4.232)	***(4.219)	***(4.810)	***(9.086)	0	8
	3	Defl. by MV_{it-1} *(I)*	922	0.142	Coeff	871,326.5	884,670.5	743,409.7	765,483.6	816,257.1	799,998.7	1,107,502.2	1,280,833.1		
					Std. Err	212,560.3	214,014.0	212,010.6	210,624.0	224,960.5	225,784.7	227,394.5	241,174.4		
					t-Stat	***(4.099)	***(4.134)	***(3.506)	***(3.634)	***(3.628)	***(3.543)	***(4.870)	***(5.311)	0	8
1992	1	Defl. by BV_{it}	940	-0.001	Coeff	4,807,619.6	4,635,055.6	4,585,721.7	5,367,562.5	4,871,984.5	4,385,688.6	4,060,353.6	5,131,629.7		
					Std. Err	11,385,293.1	11,391,888.4	11,393,908.3	11,419,063.0	11,684,068.5	11,702,613.4	11,731,799.8	11,920,318.1		
					t-Stat	(0.422)	(0.407)	(0.402)	(0.470)	(0.417)	(0.375)	(0.346)	(0.430)	8	0
	2	Defl. by MV_{it-1}	902	0.034	Coeff	392,345.7	444,936.6	29,865.4	97,832.9	1,877,358.4	1,828,815.5	2,022,268.3	930,814.9		
					Std. Err	485,776.5	485,574.1	483,186.7	485,232.2	433,298.9	426,069.3	444,935.4	510,243.6		
					t-Stat	(0.808)	(0.916)	(0.062)	(0.202)	***(4.333)	***(4.292)	***(4.545)	*(1.824)	4	4
	3	Defl. by MV_{it-1} *(I)*	902	0.218	Coeff	238,365.4	263,119.9	-75,438.8	-97,216.6	1,500,032.1	1,391,553.8	1,898,317.2	-667,626.0		
					Std. Err	437,221.4	437,865.1	436,831.9	439,278.3	398,644.7	383,252.1	395,034.8	436,754.5		
					t-Stat	(0.545)	(0.601)	(-0.173)	(-0.221)	***(3.763)	***(3.631)	***(4.805)	(-1.529)	5	3
1993	1	Defl. by BV_{it}	998	0.005	Coeff	10,386,277.2	10,477,019.5	10,429,115.9	11,007,877.5	9,240,561.4	8,853,793.4	8,465,721.5	15,589,079.5		
					Std. Err	4,923,602.5	4,904,095.5	4,904,195.4	4,893,532.1	4,922,542.7	4,917,952.4	4,923,025.3	4,913,290.8		
					t-Stat	**(2.109)	**(2.136)	**(2.127)	**(2.249)	*(1.877)	*(1.800)	*(1.720)	***(3.173)	0	8
	2	Defl. by MV_{it-1}	920	0.121	Coeff	-462,848.5	-1,893,887.0	-1,920,601.9	-1,857,947.2	-1,502,535.2	-1,407,168.3	-920,358.9	-1,068,011.6		
					Std. Err	612,677.0	644,883.6	636,493.8	643,182.5	649,576.7	637,794.3	637,612.3	676,927.2		
					t-Stat	(-0.755)	***(-2.937)	***(-3.017)	***(-2.889)	**(-2.313)	**(-2.206)	(-1.443)	(-1.578)	3	5
	3	Defl. by MV_{it-1} *(I)*	920	0.319	Coeff	-585,145.3	-1,575,337.1	-1,589,879.5	-1,825,559.5	-1,008,901.6	-971,754.1	-520,597.6	-1,374,932.2		
					Std. Err	539,106.7	572,193.6	551,981.8	554,718.1	542,870.3	538,867.0	537,066.4	563,755.9		
					t-Stat	(-1.085)	***(-2.753)	***(-2.880)	***(-3.291)	*(-1.858)	*(-1.803)	(-0.969)	**(-2.439)	2	6
1994	1	Defl. by BV_{it}	1,061	0.019	Coeff	9,727,605.2	9,405,610.6	8,945,885.3	9,242,875.3	8,348,759.3	8,004,738.1	8,308,788.3	12,047,817.4		
					Std. Err	4,613,118.0	4,590,407.4	4,590,574.2	4,556,103.0	4,604,338.9	4,603,867.7	4,615,436.4	4,579,763.6		
					t-Stat	**(2.109)	**(2.049)	*(1.949)	**(2.029)	*(1.813)	*(1.739)	*(1.800)	***(2.631)	0	8
	2	Defl. by MV_{it-1}	966	-2.47	Coeff	4,309,376.85	3,251,157.14	3,351,820.84	3,354,990.20	3,055,784.44	2,377,936.59	2,322,481.58	2,819,659.99		
					Std. Err	589,055.88	594,667.04	591,501.12	577,647.84	576,983.66	583,224.91	585,571.64	591,429.57		
					t-Stat	***(7.316)	***(5.467)	***(5.667)	***(5.808)	***(5.296)	***(4.077)	***(3.966)	***(4.768)	0	8
	3	Defl. by MV_{it-1} *(I)*	966	0.092	Coeff	2,129,963.9	1,899,992.5	2,013,296.1	2,018,825.8	2,036,091.8	2,054,559.0	2,040,730.8	2,006,795.3		
					Std. Err	304,192.7	311,292.5	300,579.0	300,687.3	302,615.4	309,698.9	311,067.6	317,591.0		
					t-Stat	***(7.002)	***(6.104)	***(6.698)	***(6.714)	***(6.728)	***(6.634)	***(6.560)	***(6.319)	0	8

Table 6.5 - Inverse of Scale Terms and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	MModel 1	MModel 2	MModel 3	MModel 4	MModel 5	MModel 6	MModel 7	MModel 8	NS*	S*
1995	1	Defl. by BV_{it}	1,114	0.05	Coeff	7,674,793.8	7,732,667.5	7,262,968.0	5,808,234.7	5,204,919.4	4,806,600.1	4,830,214.8	5,769,477.6		
					Std. Err	2,046,006.9	2,044,653.3	2,001,506.6	1,833,299.0	1,867,953.4	1,867,065.8	1,865,717.1	1,767,520.3		
					t-Stat	***(3.751)	***(3.782)	***(3.629)	***(3.168)	***(2.786)	**(2.574)	***(2.589)	***(3.264)	0	8
	2	Defl. by MV_{it-1}	1,025	-0.734	Coeff	3,223,708.5	2,565,719.7	2,722,823.6	2,542,215.8	1,884,624.4	539,479.7	504,851.5	266,615.4		
					Std. Err	767,786.8	803,573.0	770,731.7	753,758.5	749,863.5	760,728.0	756,018.8	762,562.3		
					t-Stat	***(4.199)	***(3.193)	***(3.533)	***(3.373)	**(2.513)	(0.709)	(0.668)	(0.350)	3	5
	3	Defl. by MV_{it-1} *(I)*	1,025	0.115	Coeff	57,904.9	37,200.8	239,300.2	180,230.9	134,402.7	-199,487.2	-223,012.5	-1,431,554.2		
					Std. Err	557,676.9	581,750.4	559,668.5	550,105.3	554,084.5	570,207.6	566,244.5	527,274.2		
					t-Stat	(0.104)	(0.064)	(0.428)	(0.328)	(0.243)	(-0.350)	(-0.394)	***(-2.715)	7	1
1996	1	Defl. by BV_{it}	1,157	0.055	Coeff	3,554,027.7	4,266,155.8	4,542,567.0	3,204,714.9	1,737,153.3	1,601,028.9	1,623,748.1	4,987,232.4		
					Std. Err	2,300,353.8	2,236,680.9	2,201,709.3	2,091,126.2	2,073,420.2	2,064,158.9	2,064,389.3	1,812,833.4		
					t-Stat	(1.545)	*(1.907)	**(2.063)	(1.533)	(0.838)	(0.776)	(0.787)	***(2.751)	5	3
	2	Defl. by MV_{it-1}	1,049	-0.317	Coeff	6,196,647.4	5,893,510.9	5,907,097.2	6,077,481.5	5,062,211.7	4,641,801.5	4,533,803.4	4,191,304.4		
					Std. Err	654,128.3	660,996.2	661,388.3	656,719.4	651,536.6	658,526.1	667,243.4	813,164.5		
					t-Stat	***(9.473)	***(8.916)	***(8.931)	***(9.254)	***(7.770)	***(7.049)	***(6.795)	***(5.154)	0	8
	3	Defl. by MV_{it-1} *(I)*	1,049	0.237	Coeff	5,015,907.4	5,041,099.2	4,952,343.5	4,956,065.9	4,540,806.7	4,736,648.2	4,608,054.5	3,075,179.2		
					Std. Err	499,879.9	506,080.8	502,082.5	503,698.8	508,221.7	515,245.0	521,726.1	632,010.0		
					t-Stat	***(10.034)	***(9.961)	***(9.864)	***(9.839)	***(8.935)	***(9.193)	***(8.832)	***(4.866)	0	8
1997	1	Defl. by BV_{it}	1,124	0.012	Coeff	-3,387,587.3	320,011.9	504,463.5	702,692.0	-3,384,076.5	-3,112,889.3	-3,353,253.5	-879,648.1		
					Std. Err	3,382,816.6	3,120,873.3	2,975,811.1	2,638,506.4	2,530,393.3	2,508,018.3	2,503,924.6	2,369,713.2		
					t-Stat	(-1.001)	(0.103)	(0.170)	(0.266)	(-1.337)	(-1.241)	(-1.339)	(-0.371)	8	0
	2	Defl. by MV_{it-1}	1,040	-2.552	Coeff	5,221,248.7	5,101,940.2	5,137,606.2	4,551,466.3	4,553,182.0	4,520,494.7	2,432,979.7	2,700,452.1		
					Std. Err	573,617.4	581,151.3	588,333.1	582,390.7	592,331.3	591,653.0	619,641.3	621,281.2		
					t-Stat	***(9.102)	***(8.779)	***(8.732)	***(7.815)	***(7.687)	***(7.640)	***(3.926)	***(4.347)	0	8
	3	Defl. by MV_{it-1} *(I)*	1,040	0.019	Coeff	1,093,885.6	1,035,037.0	1,245,173.3	1,173,845.2	1,093,227.1	1,095,627.7	779,682.9	595,871.1		
					Std. Err	311,726.9	315,292.0	314,028.8	315,014.0	320,194.3	320,017.4	340,160.2	341,809.8		
					t-Stat	***(3.509)	***(3.283)	***(3.965)	***(3.726)	***(3.414)	***(3.424)	**(2.292)	*(1.743)	0	8
1998	1	Defl. by BV_{it}	1,025	0	Coeff	-3,290,757.1	4,266,750.2	1,728,077.8	827,914.2	-3,675,282.8	-3,772,543.1	-3,760,622.4	-2,854,292.6		
					Std. Err	3,881,617.4	3,511,389.0	3,302,123.8	3,127,774.4	3,018,261.2	3,014,565.1	2,977,951.5	2,960,610.0		
					t-Stat	(-0.848)	(1.215)	(0.523)	(0.265)	(-1.218)	(-1.251)	(-1.263)	(-0.964)	8	0
	2	Defl. by MV_{it-1}	958	-1.935	Coeff	2,710,409.3	2,813,479.7	1,959,963.8	1,799,359.7	1,071,106.3	597,370.5	606,757.7	556,401.3		
					Std. Err	564,421.9	577,201.1	584,098.8	570,088.5	572,539.0	581,238.3	587,150.8	599,112.9		
					t-Stat	***(4.802)	***(4.874)	***(3.356)	***(3.156)	*(1.871)	(1.028)	(1.033)	(0.929)	3	5
	3	Defl. by MV_{it-1} *(I)*	958	0.047	Coeff	789,325.1	672,417.4	711,110.5	688,941.9	994,724.8	952,706.6	1,051,272.8	733,580.6		
					Std. Err	324,511.2	332,073.3	339,992.4	338,757.5	341,911.8	349,902.8	352,772.5	355,925.2		
					t-Stat	**(2.432)	**(2.025)	**(2.092)	**(2.034)	***(2.909)	***(2.723)	***(2.980)	**(2.061)	0	8

Table 6.5 - Inverse of Scale Terms and associated statistics from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	$A\text{-}R^2$	Estim	MModel 1	MModel 2	MModel 3	MModel 4	MModel 5	MModel 6	MModel 7	MModel 8	NS*	S*
1999	1	Defl. by BV_{it}	921	0.02	Coeff	15,398,696.8	15,759,579.8	16,420,298.0	14,442,124.3	13,269,338.4	13,379,331.5	14,096,829.7	15,895,065.6		
					Std. Err	6,337,802.7	6,227,289.6	6,096,203.6	5,635,361.1	5,705,364.5	5,706,834.3	5,614,921.7	5,450,367.4		
					t-Stat	**(2.430)	**(2.531)	***(2.694)	**(2.563)	**(2.326)	**(2.344)	**(2.511)	***(2.916)	0	8
	2	Defl. by MV_{it-1}	884	-0.457	Coeff	9,208,332.7	9,084,329.7	9,312,320.5	9,139,751.4	8,337,671.2	8,083,899.0	7,765,306.5	7,622,838.4		
					Std. Err	1,027,053.3	1,146,606.3	1,140,334.7	1,108,412.0	1,103,922.0	1,109,631.8	1,121,817.0	1,150,357.4		
					t-Stat	***(8.966)	***(7.923)	***(8.166)	***(8.246)	***(7.553)	***(7.285)	***(6.922)	***(6.626)	0	8
	3	Defl. by MV_{it-1} *(I)*	884	0.039	Coeff	4,971,809.7	4,981,554.3	5,210,160.2	5,300,435.4	5,328,427.8	5,474,500.0	5,508,855.7	5,250,796.3		
					Std. Err	857,475.2	950,975.1	934,781.6	927,316.5	930,854.6	932,608.2	942,127.8	965,819.2		
					t-Stat	***(5.798)	***(5.238)	***(5.574)	***(5.716)	***(5.724)	***(5.870)	***(5.847)	***(5.437)	0	8
Pool	1	Defl. by BV_{it}	9,302	0.003	Coeff	6,412,417.0	7,222,260.6	6,912,855.0	6,727,287.9	5,328,926.3	5,292,808.1	5,514,611.4	7,995,136.0		
					Std. Err	2,573,266.3	2,560,436.1	2,551,625.4	2,534,826.8	2,558,864.1	2,559,044.5	2,561,673.6	2,557,847.8		
					t-Stat	**(2.492)	***(2.821)	***(2.709)	***(2.654)	**(2.083)	**(2.068)	**(2.153)	***(3.126)	0	8
	2	Defl. by MV_{it-1}	8,666	-0.47	Coeff	3,529,738.3	3,359,359.3	3,362,405.2	3,328,355.0	3,155,338.8	3,106,056.3	2,713,000.8	2,488,238.6		
					Std. Err	183,384.4	185,572.2	185,756.0	182,792.8	179,688.7	180,164.7	182,350.0	193,389.9		
					t-Stat	***(19.248)	***(18.103)	***(18.101)	***(18.208)	***(17.560)	***(17.240)	***(14.878)	***(12.866)	0	8
	3	Defl. by MV_{it-1} *(I)*	8,666	0.106	Coeff	2,074,346.4	2,040,990.2	2,078,552.0	2,090,297.0	2,052,006.5	2,107,082.9	1,968,213.3	826,174.2		
					Std. Err	144,367.8	146,076.4	145,538.7	145,269.6	144,720.5	144,751.7	147,003.6	153,479.1		
					t-Stat	***(14.368)	***(13.972)	***(14.282)	***(14.389)	***(14.179)	***(14.557)	***(13.389)	***(5.383)	0	8

Annual samples range from 884 to 1,157 observations and the pooled samples consist of 8,666 to 9,302 observations. Regressions are run from Prop-VM:

Note equations deflated by MV_{it-1} *(I)* has both an intercept an inverse of scale term.

MModel 1 $MV_{it} = \alpha_0 + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it+1}$

MModel 2 $MV_{it} = \alpha_0 + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \omega_2 OA_{it} + e_{it+1}$

MModel 3 $MV_{it} = \alpha_0 + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + e_{it+1}$

MModel 4 $MV_{it} = \alpha_0 + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + e_{it+1}$

MModel 5 $MV_{it} = \alpha_0 + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + e_{it+1}$

MModel 6 $MV_{it} = \alpha_0 + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + e_{it+1}$

MModel 7 $MV_{it} = \alpha_0 + \alpha_0 RI_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + e_{it+1}$

MModel 8 $MV_{it} = \alpha_0 + \alpha_0 RI_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it+1}$

* NS, S = Number of inverse of scale term that are not-significant/significant at the 10% level.

Table 6.6 - Mean Residual Sum of Squares from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	Type	Obs	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Mean	
1991	No deflation	962	1,225	1,130	1,125	1,084	1,060	1,022	962	597	1,026	X 10^{15}
	Defl. by BV_{it}	962	850.308	850.24	850.047	849.705	849.29	849.289	849.23	849.221	849.666	
	Defl. by MV_{it-1}	922	1.05	1.001	1	0.928	0.921	0.921	0.912	0.732	0.933	
	Defl. by MV_{it-1} *(I)*	922	0.373	0.373	0.361	0.355	0.355	0.355	0.341	0.34	0.35663	
1992	No deflation	940	2,630	1,572	1,439	1,201	1,172	1,125	1,095	483	1,340	X 10^{15}
	Defl. by BV_{it}	940	342.171	342.017	341.763	341.379	341.364	341.135	341.066	340.97	341.483	
	Defl. by MV_{it-1}	902	4.208	4.188	4.046	4.037	3.032	2.927	2.92	2.862	3.528	
	Defl. by MV_{it-1} *(I)*	902	3.403	3.399	3.302	3.301	2.55	2.352	2.298	2.019	2.828	
1993	No deflation	998	1,300	1,044	1,044	912	906	904	866	582	945	X 10^{15}
	Defl. by BV_{it}	998	63.77	63.199	63.133	62.674	62.222	61.954	61.828	58.894	62.2093	
	Defl. by MV_{it-1}	920	2.691	2.585	2.516	2.514	2.487	2.393	2.331	2.33	2.481	
	Defl. by MV_{it-1} *(I)*	920	2.081	2.031	1.888	1.868	1.731	1.703	1.65	1.613	1.821	
1994	No deflation	1,061	768	703	692	648	624	607	603	468	639	X 10^{15}
	Defl. by BV_{it}	1,061	57.191	56.552	56.352	55.443	55.351	55.188	55.141	53.264	55.5603	
	Defl. by MV_{it-1}	966	1.106	1.053	1.038	0.989	0.971	0.943	0.942	0.924	0.996	
	Defl. by MV_{it-1} *(I)*	966	0.289	0.286	0.266	0.266	0.266	0.266	0.266	0.265	0.271	
1995	No deflation	1,114	1,655	1,143	1,063	997	976	954	930	901	1,078	X 10^{15}
	Defl. by BV_{it}	1,114	11.385	11.357	10.861	9.077	9.055	8.988	8.967	8.023	9.71413	
	Defl. by MV_{it-1}	1,025	1.772	1.76	1.617	1.543	1.492	1.428	1.409	1.402	1.553	
	Defl. by MV_{it-1} *(I)*	1,025	0.903	0.903	0.834	0.805	0.804	0.8	0.788	0.664	0.813	
1996	No deflation	1,157	1,682	1,337	1,336	994	977	963	963	896	1,144	X 10^{15}
	Defl. by BV_{it}	1,157	14.598	13.769	13.325	11.972	11.6	11.482	11.473	8.754	12.1216	
	Defl. by MV_{it-1}	1,049	2.02	2.005	2.004	1.967	1.858	1.835	1.833	1.832	1.919	
	Defl. by MV_{it-1} *(I)*	1,049	1.17	1.17	1.148	1.148	1.127	1.122	1.12	1.101	1.138	
1997	No deflation	1,124	5,657	4,364	4,337	2,936	2,930	2,927	2,908	1,603	3,257	X 10^{15}
	Defl. by BV_{it}	1,124	29.637	25.03	22.736	17.858	16.066	15.76	15.672	13.916	19.5844	
	Defl. by MV_{it-1}	1,040	1.33	1.328	1.328	1.272	1.272	1.266	1.18	1.166	1.268	
	Defl. by MV_{it-1} *(I)*	1,040	0.367	0.367	0.357	0.356	0.355	0.354	0.352	0.347	0.357	
1998	No deflation	1,025	7,298	6,479	6,452	4,758	4,605	4,379	4,060	4,049	4,754	X 10^{16}
	Defl. by BV_{it}	1,025	38.628	30.998	27.27	24.426	22.222	22.14	21.584	21.203	26.0589	
	Defl. by MV_{it-1}	958	1.304	1.303	1.255	1.192	1.148	1.13	1.13	1.13	1.199	
	Defl. by MV_{it-1} *(I)*	958	0.423	0.422	0.422	0.418	0.409	0.409	0.407	0.398	0.414	
1999	No deflation	921	12,790	10,500	9,702	5,783	5,445	5,382	5,382	3,266	6,873	X 10^{16}
	Defl. by BV_{it}	921	88.412	85.254	81.59	69.59	69.462	69.393	67.068	63.008	74.2221	
	Defl. by MV_{it-1}	884	3.946	3.945	3.886	3.666	3.559	3.543	3.53	3.529	3.701	
	Defl. by MV_{it-1} *(I)*	884	2.6	2.6	2.505	2.461	2.46	2.45	2.45	2.446	2.497	
Pool	No deflation	9,302	4,310	4,157	3,894	3,183	3,137	3,134	3,088	2,740	3,113	X 10^{16}
	Defl. by BV_{it}	9,302	156.168	154.449	153.338	151.303	151.062	151.042	150.989	149.23	152.198	
	Defl. by MV_{it-1}	8,666	2.287	2.279	2.279	2.206	2.126	2.123	2.093	2.09	2.185	
	Defl. by MV_{it-1} *(I)*	8,666	1.391	1.391	1.379	1.374	1.362	1.357	1.353	1.288	1.362	

Regressions are run from Prop-VM $MV_{it} = (\alpha_A) + (\alpha_B) + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$
in terms of (1) no deflation (2) deflated by BV_{it} (no intercept) (3) deflated by MV_{it-1} (no intercept) (4) deflated by MV_{it-1}.
The RSS are calculated from MModel 1 to 8 which is equivalent to measuring the errors from the addition of the variable BV_{it}, RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it}.

Table 6.7 - Schwarz Criterion, AIC and *F*-tests from Cross-sectional and Pooled Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	Stat	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})
1991	2	Defl. by BV_{it}	962	Schwarz	9.598	9.605	9.612	9.619	9.626	9.632	9.639	9.646	9.654
				AIC	9.588	9.590	9.592	9.594	9.595	9.597	9.599	9.601	9.603
				F-Test	0.681	0.374	0.077	0.217	0.386	0.467	0.002	0.066	0.010
	3	Defl. by MV_{it-1}	922	Schwarz	3.042	*2.909	*2.869	2.875	*2.808	2.808	2.815	*2.813	*2.600
				AIC	3.031	*2.893	*2.848	2.849	*2.776	*2.771	2.773	*2.766	*2.547
				F-Test	NA	***138.425	***44.549	0.823	***71.410	***6.768	0.002	***9.030	***225.203
	4	Defl. by MV_{it-1} *(I)*	922	Schwarz	2.007	*1.882	1.889	*1.863	*1.855	1.862	1.869	*1.837	1.840
				AIC	1.991	*1.861	1.863	*1.831	*1.818	1.820	1.822	*1.785	*1.782
				F-Test	11.400	***130.020	0.304	***31.758	***13.868	0.416	0.742	***36.199	***4.524
1992	2	Defl. by BV_{it}	940	Schwarz	8.689	8.695	8.702	8.708	8.715	8.722	8.728	8.735	8.742
				AIC	8.678	8.680	8.681	8.683	8.684	8.686	8.687	8.689	8.691
				F-Test	0.109	0.923	0.423	0.694	1.053	0.041	0.625	0.188	0.264
	3	Defl. by MV_{it-1}	902	Schwarz	4.334	*4.298	4.300	*4.273	4.279	*4.000	*3.972	3.977	*3.965
				AIC	4.323	*4.282	*4.279	*4.247	*4.247	*3.963	*3.930	*3.929	*3.912
				F-Test	NA	***40.143	***4.244	***31.624	2.052	***296.774	***32.042	**2.246	***18.047
	4	Defl. by MV_{it-1} *(I)*	902	Schwarz	4.127	*4.093	4.099	*4.078	4.085	*3.834	*3.761	*3.745	*3.624
				AIC	4.111	*4.071	4.072	*4.046	4.048	*3.792	*3.713	*3.692	*3.565
				F-Test	103.909	***38.132	1.064	***26.366	0.240	***263.900	***75.453	***20.834	***123.366
1993	2	Defl. by BV_{it}	998	Schwarz	7.010	7.014	*7.012	7.018	*7.017	*7.017	7.020	7.025	*6.983
				AIC	7.000	*6.999	*6.992	6.993	*6.988	*6.983	*6.980	*6.980	*6.934
				F-Test	3.984	2.558	***8.970	1.051	***7.265	***7.211	***4.290	**2.018	***49.269
	3	Defl. by MV_{it-1}	920	Schwarz	3.870	*3.850	*3.817	*3.798	3.804	*3.801	*3.770	*3.751	3.758
				AIC	3.860	*3.834	*3.796	*3.771	3.773	*3.764	*3.728	*3.704	3.706
				F-Test	99.727	***25.823	***37.358	***25.400	0.472	***10.208	***35.678	***24.146	0.424
	4	Defl. by MV_{it-1} *(I)*	920	Schwarz	3.618	*3.600	*3.583	*3.518	*3.515	*3.446	*3.437	*3.413	*3.398
				AIC	3.602	*3.579	*3.557	*3.486	*3.478	*3.404	*3.390	*3.360	*3.340
				F-Test	200.849	***22.969	***22.588	***69.397	***9.533	***72.311	***14.929	***29.618	***20.630
1994	2	Defl. by BV_{it}	1,061	Schwarz	6.914	*6.904	*6.899	6.902	*6.893	6.898	6.901	6.907	*6.879
				AIC	6.905	*6.890	*6.881	*6.879	*6.865	6.865	*6.864	6.865	*6.832
				F-Test	4.330	***17.752	***11.935	**3.758	***17.319	1.752	***3.114	0.887	***37.070
	3	Defl. by MV_{it-1}	966	Schwarz	2.960	*2.960	*2.918	*2.911	*2.870	*2.858	*2.836	2.842	*2.830
				AIC	2.950	*2.945	*2.898	*2.886	*2.839	*2.823	*2.796	2.797	*2.780
				F-Test	NA	***7.128	***48.670	***13.441	***47.697	***17.912	***28.087	1.107	***18.812
	4	Defl. by MV_{it-1} *(I)*	966	Schwarz	1.619	1.625	*1.622	*1.556	1.562	1.569	1.576	1.583	1.590
				AIC	1.604	1.605	*1.597	*1.526	1.527	1.529	1.531	1.533	1.534
				F-Test	50.196	0.505	***10.110	***72.895	0.746	0.273	0.080	0.248	0.286

Table 6.7 - Schwarz Criterion, AIC and *F*-tests from Cross-sectional and Pooled Estimations for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	Obs	Stat	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})
1995	2	Defl. by BV_{it}	1,114	Schwarz	5.327	*5.289	5.293	*5.255	*5.081	5.085	*5.084	5.088	*4.983
				AIC	5.318	*5.276	*5.275	*5.232	*5.054	*5.054	*5.048	*5.048	*4.938
				F-Test	9.676	***50.584	**2.791	***50.679	***217.871	**2.729	***8.229	***2.669	***129.990
	3	Defl. by MV_{it-1}	1,025	Schwarz	3.472	*3.430	*3.430	*3.352	*3.312	*3.285	*3.248	*3.242	3.244
				AIC	3.463	*3.416	*3.411	*3.328	*3.283	*3.251	*3.210	*3.198	*3.196
				F-Test	NA	***51.141	***7.239	***90.464	***48.760	***34.882	***45.404	***13.879	***4.726
	4	Defl. by MV_{it-1} (I)	1,025	Schwarz	2.783	*2.763	2.770	*2.697	*2.668	2.674	2.675	*2.667	*2.502
				AIC	2.769	*2.744	2.746	*2.668	*2.634	2.636	*2.632	*2.619	*2.449
				F-Test	52.990	***27.521	0.016	***84.941	***37.138	0.496	***5.716	***15.417	***190.262
1996	2	Defl. by BV_{it}	1,157	Schwarz	5.589	*5.537	*5.485	*5.458	*5.357	*5.332	*5.327	5.333	*5.068
				AIC	5.580	*5.524	*5.467	*5.436	*5.331	*5.301	*5.292	5.293	*5.025
				F-Test	0.988	***68.634	***69.423	***38.441	***130.206	***36.901	***11.782	0.899	***356.544
	3	Defl. by MV_{it-1}	1,049	Schwarz	3.558	3.561	*3.560	3.566	*3.554	*3.504	*3.498	3.504	3.510
				AIC	3.549	*3.547	*3.541	3.542	*3.526	*3.470	*3.460	3.461	3.463
				F-Test	NA	**4.542	***7.792	0.556	***19.574	***61.397	***12.744	1.010	0.544
	4	Defl. by MV_{it-1} (I)	1,049	Schwarz	3.059	*3.021	3.028	*3.016	3.023	*3.011	3.013	3.017	*3.007
				AIC	3.044	*3.002	3.004	*2.988	2.989	*2.973	*2.970	*2.970	*2.955
				F-Test	134.411	***47.093	0.105	***19.442	0.010	***19.307	***4.738	**2.346	***17.891
1997	2	Defl. by BV_{it}	1,124	Schwarz	6.252	*6.246	*6.083	*5.993	*5.758	*5.658	*5.645	5.646	*5.533
				AIC	6.243	*6.232	*6.065	*5.971	*5.731	*5.627	*5.610	*5.606	*5.489
				F-Test	1.678	***14.232	***206.153	***112.998	***305.691	***124.685	***21.653	***6.300	***140.724
	3	Defl. by MV_{it-1}	1,040	Schwarz	3.142	3.143	3.148	3.155	*3.118	3.125	3.128	*3.063	*3.059
				AIC	3.132	*3.129	3.129	3.131	*3.090	3.092	*3.089	*3.021	*3.011
				F-Test	NA	***5.174	1.601	0.157	***46.052	0.000	***4.139	***75.807	***11.866
	4	Defl. by MV_{it-1} (I)	1,040	Schwarz	1.863	*1.863	1.868	*1.849	1.851	1.855	1.860	*1.860	*1.853
				AIC	1.849	*1.844	1.844	*1.820	*1.817	1.817	*1.817	*1.812	*1.801
				F-Test	7.445	***7.681	1.518	***27.015	***5.070	1.927	**2.172	***7.191	***13.494
1998	2	Defl. by BV_{it}	1,025	Schwarz	6.506	6.512	*6.299	*6.177	*6.074	*5.986	5.989	*5.971	*5.960
				AIC	6.497	6.498	*6.280	*6.153	*6.045	*5.953	*5.951	*5.927	*5.912
				F-Test	0.966	0.838	***251.325	***139.560	***118.794	***101.058	***3.783	***26.188	***18.263
	3	Defl. by MV_{it-1}	958	Schwarz	3.127	*3.125	3.131	*3.101	*3.057	*3.026	*3.018	3.025	3.032
				AIC	3.117	*3.110	3.111	*3.075	*3.026	*2.991	*2.977	2.979	2.981
				F-Test	NA	***9.023	0.733	***36.533	***50.060	***36.604	***15.144	0.013	0.183
	4	Defl. by MV_{it-1} (I)	958	Schwarz	2.000	2.006	2.011	2.017	*2.016	*2.001	2.008	2.011	*1.996
				AIC	1.985	1.986	*1.985	1.987	*1.980	*1.961	1.962	*1.960	*1.940
				F-Test	24.442	1.301	**2.658	0.286	***8.458	***20.867	0.325	***4.045	***21.046

Table 6.7 - Schwarz Criterion, AIC and *F*-tests from Cross-sectional and Pooled Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Obs	Stat	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})
1999	2	Defl. by BV_{it}	921	Schwarz	7.352	*7.342	*7.313	*7.277	*7.125	7.131	7.137	*7.110	*7.055
				AIC	7.341	*7.326	*7.292	*7.250	*7.094	7.094	7.095	*7.063	*7.003
				F-Test	4.653	***15.744	***33.966	***41.179	***157.951	1.684	0.906	***31.657	***58.763
	3	Defl. by MV_{it-1}	884	Schwarz	4.233	4.234	4.241	*4.234	*4.183	*4.161	4.164	4.168	4.176
				AIC	4.222	*4.217	4.219	*4.207	*4.151	*4.123	*4.121	*4.120	4.121
				F-Test	NA	***6.592	0.059	***13.389	***52.848	***26.323	***3.879	***3.336	0.318
	4	Defl. by MV_{it-1} *(I)*	884	Schwarz	3.828	*3.824	3.832	*3.802	*3.792	3.800	3.803	3.811	3.817
				AIC	3.812	*3.802	3.805	*3.770	*3.754	3.756	*3.754	3.757	3.757
				F-Test	13.778	***10.576	0.001	***33.428	***15.767	0.137	***3.645	0.070	1.462
Pool	2	Defl. by BV_{it}	9,302	Schwarz	7.894	*7.892	*7.882	*7.875	*7.863	*7.862	7.863	7.864	*7.853
				AIC	7.892	*7.889	*7.879	*7.872	*7.858	*7.857	7.857	*7.857	*7.846
				F-Test	4.333	***27.070	***103.513	***67.373	***125.050	***14.818	1.215	***3.267	***109.550
	3	Defl. by MV_{it-1}	8,666	Schwarz	3.669	*3.668	*3.666	3.667	*3.635	*3.599	*3.599	*3.586	*3.585
				AIC	3.667	*3.666	*3.662	3.663	*3.631	*3.594	*3.592	*3.578	*3.577
				F-Test	NA	***15.001	***31.390	0.143	***285.190	***328.216	***11.538	***123.945	***12.057
	4	Defl. by MV_{it-1} *(I)*	8,666	Schwarz	3.176	*3.172	3.173	*3.166	*3.163	*3.155	*3.152	*3.150	*3.102
				AIC	3.174	*3.169	*3.169	*3.161	*3.157	*3.149	*3.145	*3.142	*3.093
				F-Test	489.484	***42.096	2.229	***73.095	***34.755	***74.996	***34.142	***26.817	***437.376

Annual cross-sectional and pool samples consist of 884 to 1,157 and 8,666 to 9,302 observations respectively. Regressions are run from MModel 1 to 8:

No deflation $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by BV_{it} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Table 6.8 - Medians and Percentiles of Estimated Coefficients, Adj. R^2 and RSS from Cross-sectional and Pool Estimations of Equations deflated by BV_{it} and MV_{it-1} for Sample where $BV \geq$ £5 Millions and $r = 10\%$

	Statistics	$\alpha_0 (BV_{it})$	$\alpha_1 (RI_{it})$	$\alpha_2 (OA_{it})$	$\alpha_3 (CI_{it})$	$\alpha_4 (RD_{it})$	$\alpha_5 (HR_{it})$	$\alpha_6 (DC_{it})$	$\alpha_7 (TD_{it})$	$\alpha_8 (DIV_{it})$	$A\text{-}R^2$	$\overline{RSS}$
Deflated by BV_{it}												
Cross-sectional	Median	1.61	2.10	0.28	0.98	11.88	0.26	0.45	0.07	12.86	0.05	55.40
	25% Percentile	1.20	1.68	0.14	0.52	9.77	0.01	0.13	-0.29	6.51	0.01	16.96
	75% Percentile	2.17	2.83	0.47	1.87	13.71	0.78	1.18	0.52	17.23	0.25	69.53
Pool	Median	1.41	1.97	0.41	1.35	12.57	0.40	0.30	0.31	13.48	0.03	151.18
	25% Percentile	1.25	1.77	0.30	1.35	12.44	0.31	0.15	0.30	13.48	0.02	151.18
	75% Percentile	1.84	2.04	0.48	1.46	13.42	0.43	0.31	0.96	15.03	0.04	151.18
Deflated by MV_{it-1}												
Cross-sectional	Median	0.29	-0.22	-0.04	0.10	6.32	0.33	0.55	0.02	-0.53	-0.49	1.52
	25% Percentile	0.17	-0.48	-0.10	-0.04	4.65	0.11	0.35	-0.21	-0.78	-1.85	1.17
	75% Percentile	0.50	0.30	-0.00	0.27	8.28	0.52	0.71	0.01	2.60	-0.20	2.50
Pool	Median	0.25	0.09	-0.04	0.07	6.50	0.41	0.13	-0.20	-1.01	-0.39	2.17
	25% Percentile	0.19	0.07	-0.05	0.03	6.44	0.39	0.13	-0.20	-1.01	-0.47	2.17
	75% Percentile	0.37	0.09	0.02	0.09	6.51	0.43	0.15	-0.20	-1.01	-0.36	2.17
Deflated by MV_{it-1} (I)												
Cross-sectional	Median	0.09	0.18	-0.02	0.25	1.36	-0.01	-0.03	0.01	-2.19	0.17	0.80
	25% Percentile	-0.02	-0.05	-0.05	0.11	-0.96	-0.04	-0.35	-0.12	-4.35	0.08	0.36
	75% Percentile	0.21	0.44	-0.01	0.37	2.55	0.05	0.06	0.10	-0.95	0.25	1.80
Pool	Median	0.11	0.12	-0.01	0.14	1.78	0.20	-0.25	-0.07	-4.91	0.12	1.37
	25% Percentile	0.06	0.11	-0.02	0.13	1.70	0.18	-0.25	-0.07	-4.91	0.11	1.37
	75% Percentile	0.12	0.13	-0.00	0.15	2.21	0.21	-0.24	-0.01	-1.94	0.13	1.37

Annual samples (1991-1999) range from 884 to 1,157 observations and the pooled samples consist of 8,666 to 9,302 observations. Regressions are run from Prop-VM:

Deflated by BV_{it} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Table 6.9 - Number of *h* -Statistically Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	1	No deflation	4	0	2	0	0	0	0	0	1	0	0	3	0	0	1	0	1	0	9	3
	2	Defl. by BV_{it}	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	3	Defl. by MV_{it-1}	1	0	7	0	5	0	0	0	5	0	0	0	0	0	1	0	1	0	20	0
	4	Defl. by MV_{it-1} *(I)*	1	0	8	0	0	2	0	0	5	0	0	0	0	0	2	0	0	0	16	2
1992	1	No deflation	1	1	7	0	5	0	0	0	4	0	0	0	0	1	0	0	1	0	18	2
	2	Defl. by BV_{it}	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
	3	Defl. by MV_{it-1}	6	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	10	1
	4	Defl. by MV_{it-1} *(I)*	3	0	1	0	0	0	0	0	0	0	3	0	0	3	0	0	0	1	7	4
1993	1	No deflation	8	0	8	0	6	0	0	0	4	0	0	1	0	0	0	0	1	0	27	1
	2	Defl. by BV_{it}	7	0	6	0	6	0	0	0	3	0	3	0	2	0	0	0	1	0	28	0
	3	Defl. by MV_{it-1}	8	0	0	7	0	0	2	0	2	0	0	0	3	0	0	0	0	0	15	7
	4	Defl. by MV_{it-1} *(I)*	6	0	0	6	0	0	6	0	0	0	0	4	0	0	0	0	0	0	12	10
1994	1	No deflation	8	0	8	0	6	0	0	0	5	0	0	1	0	0	0	0	1	0	28	1
	2	Defl. by BV_{it}	8	0	7	0	4	0	1	0	5	0	0	0	2	0	0	0	1	0	28	0
	3	Defl. by MV_{it-1}	7	0	0	0	0	4	2	0	5	0	3	0	3	0	0	0	1	0	21	4
	4	Defl. by MV_{it-1} *(I)*	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	6	0
1995	1	No deflation	4	0	8	0	7	0	1	0	5	0	0	3	0	0	0	0	0	0	25	3
	2	Defl. by BV_{it}	8	0	8	0	4	0	6	0	5	0	1	0	2	0	0	0	1	0	35	0
	3	Defl. by MV_{it-1}	5	0	0	0	0	0	6	0	5	0	3	0	3	0	0	0	0	0	22	0
	4	Defl. by MV_{it-1} *(I)*	1	0	1	0	1	0	6	0	0	0	0	0	0	0	0	1	0	1	9	2
1996	1	No deflation	1	0	8	0	7	0	0	0	5	0	0	0	0	0	0	0	1	0	22	0
	2	Defl. by BV_{it}	8	0	8	0	6	0	6	0	5	0	4	0	2	0	0	0	1	0	40	0
	3	Defl. by MV_{it-1}	2	0	0	0	0	1	0	0	2	0	4	0	0	0	0	0	0	0	8	1
	4	Defl. by MV_{it-1} *(I)*	0	3	8	0	0	0	5	0	0	0	4	0	0	0	0	0	0	1	17	4
1997	1	No deflation	1	0	7	0	7	0	0	0	5	0	0	0	0	0	0	0	1	0	21	0
	2	Defl. by BV_{it}	4	0	8	0	7	0	6	0	5	0	4	0	2	0	0	2	1	0	37	2
	3	Defl. by MV_{it-1}	0	0	0	1	2	0	0	0	5	0	2	0	0	0	0	2	0	0	9	3
	4	Defl. by MV_{it-1} *(I)*	0	0	1	0	1	0	6	0	0	0	0	0	0	0	0	1	0	1	8	2
1998	1	No deflation	3	0	8	0	7	0	0	0	5	0	0	2	0	0	0	2	0	0	23	4
	2	Defl. by BV_{it}	8	0	7	0	5	0	6	0	5	0	4	0	0	3	2	0	1	0	38	3
	3	Defl. by MV_{it-1}	7	0	0	2	0	0	0	6	5	0	4	0	3	0	0	0	0	0	19	8
	4	Defl. by MV_{it-1} *(I)*	1	0	0	0	0	0	0	0	1	0	0	4	0	0	1	0	0	1	3	5

Table 6.9 - Number of *h* -Statistically Significant Coefficients from Cross-sectional and Pool Estimations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1999	1	No deflation	8	0	2	0	0	1	0	5	5	0	0	4	0	0	0	0	1	0	16	10
	2	Defl. by BV_{it}	8	0	7	0	5	2	6	0	5	0	0	0	0	1	2	0	1	0	34	3
	3	Defl. by MV_{it-1}	0	0	2	0	0	0	5	0	5	0	4	0	3	0	0	0	0	0	19	0
	4	Defl. by MV_{it-1} *(I)*	0	1	0	0	0	0	6	0	5	0	0	0	0	3	0	0	0	0	11	4
Total	1	No deflation	38	1	58	0	45	1	1	5	39	0	0	14	0	1	1	2	7	0	189	24
	2	Defl. by BV_{it}	56	0	51	0	37	2	31	0	33	0	16	0	10	4	4	2	7	0	245	8
	3	Defl. by MV_{it-1}	36	0	9	10	7	5	15	6	34	0	24	0	15	1	1	2	2	0	143	24
	4	Defl. by MV_{it-1} *(I)*	12	4	19	6	2	2	35	0	11	0	7	8	0	6	3	2	0	5	89	33
Pool	1	No deflation	8	0	8	0	6	0	0	6	5	0	0	1	0	0	1	0	1	0	29	7
	2	Defl. by BV_{it}	8	0	8	0	5	0	6	0	5	0	3	0	0	0	2	0	1	0	38	0
	3	Defl. by MV_{it-1}	6	0	0	0	0	0	0	0	5	0	4	0	0	0	0	2	0	0	15	2
	4	Defl. by MV_{it-1} *(I)*	2	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	5	1

Annual cross-sectional and pool samples consist of 884 to 1,157 and 8,666 to 9,302 observations respectively. Regressions are run from MModel 1 to 8:

No deflation $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by BV_{it} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_A + \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Hence BV_{it}, RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation. Numbers are in t -statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 6.10 - Chow's Prediction Test on Stability from the Full and Half Samples where $BV \geq$ £5 millions and r = 10%

Year	No	Type	Obs (Full/Half)		Mod 1 (BV_{it} +RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})
1991	2	Defl. by BV_{it}	962	481	***379.794	***407.002	***409.283	***535.656	***534.259	***561.359	***569.661	***643.718
	3	Defl. by MV_{it-1}	922	469	**1.331	**1.362	**1.357	**1.31	1.291	1.289	1.265	1.246
	4	Defl. by MV_{it-1} (I)	922	469	***2.483	***2.514	***2.763	***2.701	***2.7	***2.692	***2.606	***2.603
1992	2	Defl. by BV_{it}	940	470	***144.169	***168.387	***171.99	***224.811	***224.681	***231.22	***234.674	***358.058
	3	Defl. by MV_{it-1}	902	458	0.420	0.420	0.428	0.434	**1.322	**1.344	**1.341	**1.346
	4	Defl. by MV_{it-1} (I)	902	458	0.293	0.305	0.303	0.303	**1.453	**1.456	**1.398	**1.327
1993	2	Defl. by BV_{it}	998	499	***15.795	***16.468	***16.498	***17.782	***18.142	***20.012	***20.606	***23.369
	3	Defl. by MV_{it-1}	920	470	***1.77	***1.715	***1.662	***1.667	***1.65	***1.608	***1.537	***1.681
	4	Defl. by MV_{it-1} (I)	920	470	1.220	1.210	**1.76	**1.87	1.106	1.131	1.062	1.047
1994	2	Defl. by BV_{it}	1,061	530	***23.029	***26.226	***26.099	***34.06	***34.856	***40.021	***40.213	***52.059
	3	Defl. by MV_{it-1}	966	500	***1.686	***2.264	***2.291	***2.375	***2.311	***2.381	***2.384	***2.393
	4	Defl. by MV_{it-1} (I)	966	500	***3.729	1.190	1.250	**1.35	***4.021	***4.014	1.230	***4.165
1995	2	Defl. by BV_{it}	1,114	557	***4.142	***4.412	***4.495	***4.697	***4.771	***4.982	***5.102	***4.971
	3	Defl. by MV_{it-1}	1,025	533	***1.809	***1.946	***1.9	***1.839	***1.803	***1.752	***1.978	***2.092
	4	Defl. by MV_{it-1} (I)	1,025	533	***1.896	***1.899	***1.947	***1.841	***1.838	1.160	1.070	***2.87
1996	2	Defl. by BV_{it}	1,157	578	***1.514	***2.254	***2.264	***2.921	***3.323	***3.503	***3.542	***3.428
	3	Defl. by MV_{it-1}	1,049	547	***3.266	***3.557	***3.737	***3.833	***3.651	***3.791	***3.871	***3.861
	4	Defl. by MV_{it-1} (I)	1,049	547	***11.205	***11.355	***12.055	***12.108	***11.976	***11.963	***11.915	***11.959
1997	2	Defl. by BV_{it}	1,124	562	1.045	***1.693	***1.549	1.241	1.156	1.172	1.177	1.020
	3	Defl. by MV_{it-1}	1,040	538	0.873	0.942	0.979	1.032	1.033	1.033	1.051	1.095
	4	Defl. by MV_{it-1} (I)	1,040	538	1.280	1.037	1.130	1.246	1.233	1.210	1.249	1.182
1998	2	Defl. by BV_{it}	1,025	512	0.563	1.098	***1.546	**1.456	**1.34	**1.365	**1.309	**1.309
	3	Defl. by MV_{it-1}	958	486	1.173	1.171	1.237	**1.346	**1.44	**1.46	**1.462	**1.467
	4	Defl. by MV_{it-1} (I)	958	486	1.199	1.231	1.217	1.192	**1.392	**1.393	**1.424	**1.4
1999	2	Defl. by BV_{it}	921	460	***1.631	***1.98	***2.113	***2.059	***2.173	***2.185	***2.091	***1.99
	3	Defl. by MV_{it-1}	884	445	***3.458	***3.639	***3.562	***3.612	***3.602	***3.768	***3.802	***3.85
	4	Defl. by MV_{it-1} (I)	884	445	***8.008	**1.47	***7.847	***7.776	***7.839	1.214	***7.815	***7.812
Pool	2	Defl. by BV_{it}	9,302	4,651	0.145	0.134	0.126	0.114	0.112	0.112	0.112	0.102
	3	Defl. by MV_{it-1}	8,666	4,368	0.961	0.972	0.982	0.945	1.001	0.998	0.999	1.013
	4	Defl. by MV_{it-1} (I)	8,666	4,368	0.794	0.799	0.816	0.808	0.844	0.849	0.856	0.960

The F-statistic is

$$F = \frac{\frac{RSS_{BV \geq 5m} - RSS_{BV \geq 5m/2}}{n_{BV \geq 5m} - n_{BV \geq 5m/2}}}{\frac{RSS_{BV \geq 5m/2}}{n_{BV \geq 5m/2} - k - 1}}$$

where:

* $RSS_{BV \geq £5m}$ = Residual Sum of Squares from regression based on full sample
* $RSS_{BV \geq £5m/2}$ = Residual Sum of Squares from regression based on half of the full sample

, * = Rejection of parameter stability at 5% and 1% significant level respectively.

6.3.1 Analysis of likely Statistical, Econometric and Economic Issues

This analysis is necessary to address any statistical and econometric issues that may have an impact on the results obtained. Three analyses are conducted to determine whether (1) samples with and without outliers; (2) differential cost of capital; and (3) scaled and scaled equations affect statistical results.

The first analysis of the results obtained in this subsection is to determine whether or not, samples with and without outliers affect statistical results. Firstly, the analysis is based on $\bar{R}^2$ (Table 6.2). The comparison is between $BV > 0$ with $BV > 0$ after outliers, and $BV \geq$ £5 millions with $BV \geq$ £5 millions after outliers. To be consistent with the Prop-LID, the analysis is made using r = 10%. In general, $\bar{R}^2$ for the undeflated equations before omitting outliers are higher than those after outliers, but there is not much difference in $\bar{R}^2$ among the deflated equations.

Though not all samples with/without outliers are reported, the total numbers of statistically significant coefficients with the correct (incorrect) signs for EDBV, EDMV-N and EDMV-I for r = 10% are 245 (8), 219 (97) and 172 (81) respectively (Table 6.3a) vs. the corresponding figures in the same sample after outliers of 224 (6), 216 (91), and 171 (87). Thus, it appears that samples without omitting outliers have more significant coefficients with the correct signs cross-sectionally, particularly for $BV \geq$ £5 millions. This evidence is consistent with the findings for Prop-LID in Chapter 5.

The second analysis of the results obtained in this subsection is to determine whether or not, differential cost of capital, ie r = 10%, 15% or 20% influence regression results. As the amount of information generated by both annual cross-section and pool estimations are voluminous, it is more appropriate to use the number of coefficients that is at least 10% significant with either the expected and unexpected signs[2] for this analysis. From Table 6.3a-c, the total numbers of statistically significant for r = 10%, 15% and 20% estimated cross-sectionally are almost the same, eg 245 (8) for r = 10% and 15%, 242 (10) for r = 20% for EDBV. The results for the pool estimations for all three *r's* are almost

[2] The justifications for the expected signs for each independent variable are covered in **Chapter 4 – Empirical Design**. The expected signs for BV_{it}, RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} and DIV_{it} are all positives. 1% level *t*-stat significant coefficients comprises 85% (cross-section), and 88%–94% (pool) of all significant coefficients for Prop-VM. Correspondingly, these are comparable to the 84%–94% (cross-section), and 96% (pool) for all significant coefficients for the Prop-LID for EDBV and EDMV respectively.

identical, eg 38 (0) for EDBV. Thus, this evidence suggests that there is little difference in statistical results using different cost of capital, unlike (but not inconsistent) with Prop-LID where r = 10% provides the best results in terms of statistical coefficients, and to be consistent between Prop-LID&VM, r = 10% is used for all subsequent analysis.

The third analysis of the results obtained in this subsection is to determine whether or not, unscaled and scaled equations affect statistical results. I begin by critically examining the intercept terms for all Prop-VM models (ie MModel 1 to 8) for the undeflated equation and the equations deflated by MV with intercept EDMV-I since there are the two equations with intercepts (Table 6.4). The values of the intercept (α_A) for the undeflated equations are exceptionally large (eg −130,524,866 for MModel 4 in 1999, and 289,650,777 for MModel 1 in 1992), and most of the intercepts are statistically significant. The standard errors for the undeflated equations are also exceptionally large (eg 120,240,205 for MModel 1 in 1999). On the other hand, the values of α_A and the standard errors for EDMV-I for both the cross-sectional and pool data are exceptionally small, most of them hardly exceeding 0.05 and 0.01 respectively but most of its t-stats are significant. The presence of large coefficient of the intercept in undeflated equations suggest the likelihood of (1) the omission of correlated variable(s) (Barth and Kallipur, 1996) or (2) scale effect (Easton and Sommers, 2002).

Examination of the inverse of size variables $\frac{1}{BV}$ and $\frac{1}{MV}$ cross-sectionally and the pool reveals that the coefficients are either positives or negatives, and are exceptionally large, though not as large as the coefficients of the intercept for the undeflated equations (Table 6.5). In general, $\frac{1}{MV}$ of EDMV-I have lowest values. About half and all of $\frac{1}{BV}$ are significant in the cross-sectional and pool samples respectively, and almost ¾ of $\frac{1}{MV}$ are significant cross-sectionally and in the pool. Thus, evidence of $\frac{1}{BV}$ and $\frac{1}{MV}$ for the Prop-VM indicates the likelihood of the omission of a relevant unscaled variable/measurement errors in one/more independent variables in the deflated equations. A solution to the large coefficients of the intercept and the inverse of scale terms is to include a constant term in the model, a common suggestion advocated by researchers in CMRA (eg Myers, 1999; Akbar, 2000) or in econometric texts (eg Maddala, 1992).

The final part of the third analysis centres on the residual sum of squares (*RSS*) for each type of equation from MModel 1 to 8. In Table 6.6, the $\overline{RSS}$ from all undeflated equations are exceptionally large (eg 10,500 X 10^{15} for MModel 2 in 1999). The $\overline{RSS}$ for EDBV averages 850 in 1991, drops to an average of 340 in 1992 and thereafter, but increases from 1995 onwards, with an average of 70 in 1999. The $\overline{RSS}$ for the EDMV-N range from 0.732 (MModel 8, 1991) to 4.208 (MModel 1, 1992), and for EDMV-I, from 0.265 (MModel 8, 1994) to 3.403 (MModel 1, 1992). Overall, EDMV-I has the best fit, followed by EDMV-N and EDBVs while the undeflated equations have exceptionally large $\overline{RSS}$ suggesting that these equations are poorly specified or/and affected by scale, heteroscedasticity or likelihood of the omission of correlated variable(s) (Barth and Kallipur, 1996; Easton and Sommers, 2002). In general, the $\overline{RSS}$ for all equations of Prop-VM are larger than those of Prop-LID.

6.3.2 Analysis of the Value-relevance for the Variables chosen

Out of the eleven studies that used the OFF, either in part or on its entirely, six of these use only the valuation models (EBO), three of these test for other information (Rees, 1997; Ittner and Larcker, 1998; and Black et al. 1999). While five studies test for the relationship between empirically estimated LID and estimated equity valuation models, only three of these studies (Dechow, 1999; Hand and Landsman, 1999 and Myers, 1999) empirically test for the usefulness of other information in the LID and in the VM. This means that five of these studies did not even operationalise v_t, which suggests that the models specified violate the internal consistency of the OFF. Except for Rees, researchers use a single ad hoc proxy for$v$ for the valuation model. While the parameters estimated cross-sectional (pool) for *BV, OA, RI* and *CI* of the respective VMs are largely significantly positives, ie consistent to the OFF, the findings of v_t is mixed. Hence, the use of a single measure to proxy for v_t for the valuation model have also met with limited success, just like the LID, and the use of a comprehensive set of variables may be more appropriate in identifying performance measures that can explain market value of equity.

While the fit for the VMs of Dechow et al. and Myers are not satisfactory, Stober, Hand and Landsman, Frankel and Lee, and Lee et al. report satisfactory fit for their respective VMs. Lo and Lys (2000a) suspect that the high explanatory power obtained by Hand and Landsman, and the high correlations for Frankel and Lee, and Lee et al. may be

due to the scale effect, and when Lo and Lys replicated Hand and Landsman, and Frankel and Lee's work, the explanatory power declined by half and one-third respectively. An explanation for such undesirable outcome of the specifications of these models may be due to the use of non-integrated OFF, and hence, an integrated framework in investigating the LID and the VM may be desirable, and moreover, different methodologies and estimating techniques were used in these studies. So far, only one study used UK data, another one used Spanish data while the rest used US data. However, cross-sectional and pooling of time-series and cross-sectional data are increasingly being used to investigate the OFF.

Therefore, the analysis of this subsection is to investigate and address the issues identified in past studies that used the OFF by using **UK data and valuation models based on an integrated OFF to test for the value-relevance of the CSV.** Models based on an integrated OFF to estimate an information dynamic prediction model for *RI* were carried out in the previous chapter. This analysis serves as the **main issues/hypotheses of this chapter**, which is to determine whether (1) the proposed Prop-VM model is econometrically (statistically) valid; (2) the comprehensive set of non-earnings variables (CSV) are value-relevant; and (3) scale-effect and heteroscedasticity are issues in the regressions. Analysis will be made in reference to only the deflated equations as the undeflated equations cannot be validly accepted in cross-sectional and pool estimations in view of their large residuals, biased standard errors due to scale or/and heteroscedasticity and likely omission of relevant variables.

The first analysis of the results obtained in this subsection is to determine whether the specification of Prop-VM is econometrically (statistically) valid. This analysis is conducted by observing the validity of adding new variable at each stage of the estimation process, ie from the simple regression (MModel 1) to the nine-variable multiple regression (MModel 8). This is equivalent to testing whether a relevant variable has been omitted from an equation. These tests are done to ensure that the carefully chosen variables based from prior literature will provide a more comprehensive framework for the valuation model. As demonstrated in the previous Chapter as well as by other researchers (eg Brown et al., 1999) that the measurement of the validity of adding new variables using R^2 ($\overline{R}^2$) is inadequate because any increase in $\overline{R}^2$ does NOT mean that the specification of an equation has improved, and that $\overline{R}^2$ becomes erratic (even negatives) when an intercept is not included in a scaled equation. Hence, I avoid $\overline{R}^2$ test, and instead use (1) Schwarz Criterion

(SC); (2) Akaike Information Criterion (AIC); and (3) *F*-test to test for the validity of adding new variables. This is probably the first study that employs a whole range of statistical measures to determine the validity for adding additional variables in a model. The Schwarz Criterion is an alternative to the AIC that imposes a larger penalty for additional coefficients:

$$SC = In\left(\frac{\sum e_i^2}{n}\right) + \frac{klog\ n}{n} \qquad (6.1)$$

The cross-sectional and pooled results of SC, AIC and *F*-tests from estimating MModel 1 to 8 are depicted in Table 6.7. As in Chapter 5, as long as any two of the three criteria is satisfied, the inclusion of additional variable in the regression is considered justifiable[3]. A weak criterion is when only one of the three criterions is satisfied.

For the EDBV, except for the early years (1991 and 1992), the inclusion of *RI, OA, CI, RD* and *DIV* is justifiable in every case, *HR* (justifications for 1993, 1995-1998, pool), *DC* (justifications in 1993-1998), and *TD* (justifications in 1993, 1995, 1997-1999, pool). No variable has weak/no justification for all years/pool, suggesting that the few cases of weak/no justification for some variables are exceptional. Results of most of the *F*-tests show that they are 1% significant, but the medians $\bar{R}^2$ = 0.05 (cross-section) and 0.03 (pool) for the EDBV are low (Table 6.8). The evidence using the whole range of statistical measures strongly indicates that the inclusion of all nine independent variables (*BV, RI, OA, CI, RD, HR, DC, TD* and *DIV*) in the EDBV from 1993 onwards is valid.

For the EDMV-N, the inclusion of *RI* is justifiable in every year, *RD, HR, DC* are justifiable in 9 out of 10 years, *OA* (justifications in 1991-1996, pool), *TD* (justifications in 1991-1993, 1995, 1997, 1999, pool), and *CI* and *DIV* are justifiable in 7 out of 10 years. For EDMV-I, *CI* is justifiable in 9 out of 10 years (exception in 1998), *RI, TD* and *DIV* are justifiable in 8 out of 10 years, *RD* (justifications in 1991, 1993, 1995, 1997-1999, pool), *TD* (justifications in 1991-1993, 1995-1998, pool), and *HR* and *OA* are justifiable in 5 and 6 out of 10 years respectively. No variable has weak/no justification for all years/pool, suggesting that the few years of weak/no justification for some variables do not occur on a regular basis (exceptional). Thus, the evidence strongly indicates that the inclusions of all the nine variables are justifiable for EDMV-I&N. This validity test also shows that the

[3] The sign of the bias depends on the parameter of the omitted variable and the covariance between the omitted variable with the other independent variables (see Dougherty, 1992, p. 169-70).

inclusion of all variables in the Prop-VM is stronger for EDMV-N since it has more justification years than EDMV-I.

Tests using *F*-tests, AIC and SC for EDBV and EDMV on the cross-sectional and pool properties of alternative specifications were also carried out (see Chapter 4, section 4.2.4.2.). Though not reported, the results are not as impressive as those reported for the order contained in Table 6.7. For instance, when *DIV* is added to *BV, RI, OA, CI, HR, RD* and *DC* for EDBV, there is no justification for 1991-1993 (unreported) vs. justification in every year for the reported order per Table 6.7.

Results from using the whole range of statistical measures show that the carefully selected variables that are theoretically and empirically based on the OFF, GAAP and previous studies to measure (1) value creation; (2) conservatism; (3) current +NPV projects; (4) intangibles; and (5) expectations of future profitability, are not only validly able to predict future *RI* (see Chapter 5), they are also validly able to value equity of firms.

The next analysis concerns the economic, accounting and financial rationale for the proposed VM. The cross-sectional and pool medians of α_0 = 1.61, 0.29, 0.09 and 1.41, 0.25, 0.11 for EDBV, EDMV-N and EDMV-I respectively (Table 6.8). Almost all of the coefficients are positives and are significant (Table 6.3a), suggesting that ***BV*** **provides value-relevant fundamental information**, consistent to expectation and the OFF.

The cross-sectional and pool medians of the coefficient of *RI* (α_1) = 2.1, –0.22, 0.09 and 1.97, 0.09, 0.12 for EDBV, EDMV-N, EDMV-I respectively (Table 6.8). Except for the cross-sectional result for EDMV-N [Table 6.3a, 32 (36)], most of α_1 are significantly positive for EDBV [51 (0), 8 (0)] and EDMV-I [41 (15), 8 90)]. The finding of more cross-sectional negative α_1 for EDMV-N is unexpected as EDBV has no significantly negative α_1 and that EDMV-I has nearly three times more significantly positive α_1. An explanation for this phenomenon suggests that an intercept may be necessary for equations scaled by *MV*. However, the impressive pool results for EDMV-N suggest that *RI* is positively value-relevant in explaining prices, ie **UK firms in general create values**, consistent to expectation and the OFF.

The medians of α_2 = 0.28 (cross-section) and 0.41 (pool) for EDBV while the corresponding figures for EDMV-N and EDMV-I are –0.04, –0.04 and –0.02, –0.01

respectively (Table 6.8). Results from this study suggest that the signs of α_2 are affected by the deflator, and whether they are estimated cross-sectionally or by pooling basis, a phenomenon consistent with Prop-LID. In the OFF, the coefficient of *OA* (ω_{12}) represents either unbiased ($\omega_{12} = 0$) or conservative ($\omega_{12} > 0$) accounting. Therefore, if $\omega_{12} = 0$, $\alpha_2 = 0$ suggesting that the firm practise unbiased accounting, and if $\omega_{12} > 0$, $\alpha_2 \neq 0$ (if firm practice conservatism, $\alpha_2 > 0$ and $\alpha_2 < 0$ implying that the LID violates the OFF). Thus, the results for *OA* of EDMV-N and EDMV-I are invalid, and the evidence of EDBV suggests that in general, **firms in UK adopt conservative accounting**.

The total numbers of statistically significant coefficients with the correct (incorrect) signs of α_3 for EDBV, EDMV-N, EDMV-I from cross-sectional and pool estimations are 31 (0), 30 (12), 42 (5) and 6 (0), 4 (0), 6 (0) respectively (Table 6.3a), and cross-sectional and pool medians of α_1 = 0.98, 0.1, 12.56 and 1.35, 0.07, 0.14 respectively (Table 6.8). According to Feltham and Ohlson (1996), $\omega_{13} < 0$ implies an expected decline in investments and $\alpha_3 < 0$ (negative net value investment), $\omega_{13} = 1$ implies no expected growth and $\alpha_1 = 0$ (zero net value investment) and $\omega_{13} > 1$ implies positive expected growth and $\alpha_3 > 0$ (positive net value investment). Thus, the positive α_3 for this study are consistent with expectation and the OFF suggesting that in general, **UK firms invest in positive NPV projects**.

This is probably the first study that uses *RD*, *HR* and *DC* as surrogates for intangibles in CMRA. If *RD*, *HR* and *DC* can proxy for long-lived intangibles, their coefficients should be 1 + *g* (growth rate of investing in these expenditures). For EDBV, the total numbers of statistically significant coefficients with the correct (incorrect) signs for *RD* (α_4), *HR* (α_5), and *DC* (α_6) are 33 (0), 16 (0), and 10 (4) respectively, estimated cross-sectionally (Table 6.3a), and for the pool, the corresponding figures are 5 (0), 3 (0), and 0 (0) respectively. The cross-sectional and pool medians of α_4, α_5 and α_6 are 11.88, 0.26, 0.45 and 12.57, 0.4 and 0.3 respectively (Table 6.8). For EDMV-N, the total numbers of statistically significant α_4, α_5 and α_6 with the correct (incorrect) signs for are 37 (4), 29 (4) and 21 (3) respectively (cross-section) and 5 (0) for the three coefficients in the pool (Table 6.3a). The cross-sectional and pool medians for α_4, α_5 and α_6 are 6.32, 0.33, 0.55 and 6.5, 0.41, 0.13 respectively (Table 6.8). For EDMV-I, the total numbers of significant α_4, α_5 and α_6 with the correct (incorrect) signs for are 25 (5), 8 (8) and 6 (9) respectively

(cross-section) and 5 (0), 4 (0) and 0 (3) respectively (pool) (Table 6.3a). The cross-sectional and pool medians for α_4, α_5 and α_6 are 1.36, –0.01 and –0.03 respectively (cross-section) and 1.78, 0.2 and –0.25 respectively (pool) (Table 6.8). Results of α_4, α_5 and α_6 suggest that the magnitudes and signs are affected by the deflator and exclusion/inclusion of intercept. $\alpha_4 > 1$ for all types of equations, while α_5 and α_6 are positives but are < 1 for EDBV and EDMV-N. This suggests that the **market capitalizes *RD* but not *HR* and *DC***, thus the evidence of α_4, α_5 and α_6 offer partial support of my hypotheses that *RD*, *HR* and *DC* proxy intangibles.

For EDBV, the total numbers of significant coefficients with the correct (incorrect) signs for *TD* are 4 (2) (cross-section) and 2 (0) (pool) and for *DIV* are 7 (0) (cross-section) and 1 (0) (pool). The corresponding figures of α_7 for EDMV-N and EDMV-I are 2 (8), 6 (6) and 0 (2) respectively, and of α_8 are 3 (2), 1 (6) and 0 (1) respectively. For EDBV, the cross-sectional and pool medians of α_7 are 0.07 and 0.31 respectively and of α_8 are 12.86 and 13.48 respectively (Table 6.8). The cross-sectional and pool medians of α_7 and α_8 for EDMV-N are 0.02, –0.2 and –0.53, –1.01 respectively, and the corresponding figures for EDMV-I are 0.01, –0.07 and –2.19, –4.91 respectively. The evidence of α_7 largely supports the hypothesis of this study that **debts signal 'good' news about a firm's value**. This evidence of α_8 is mixed with EDBV strongly supporting the **'good' news signalling hypothesis of dividends** while that of EDMV-N and EDMV-I **support the 'bad' news effect**. This phenomenon is unexpected considering that all of ω_{18} (*DIV*) are positively significant in the Prop-LID and there is no measurement error in *DIV*, hence, the most likely explanation is that *MVE* may not be a suitable deflator for the Prop-VM.

Overall, for EDBV, all variables conform to expectations, for EDMV-N, except for *OA, TD* and *DIV*, the rest of the variables performed to expectations. For EDMV-I, only half of the variables (ie *BV, RI, CI, RD*) performed to expectations. It appears that there is no clear pattern in which year the coefficient is significant, eg the estimated coefficient of *HR* for MModel 8 (EDMV-I) is negatively significant in 1998 but not in 1999, and that the choice of deflator and inclusion/exclusion of an intercept affects statistical results. The evidence shows that every coefficient is significant (or at least with the correct sign) in most years (pool), thus, **supporting my hypothesis that all the nine variables (*BV, RI, OA, CI, RD, HR, DC, TD, DIV*) selected that comprise the CSV are value-relevant**, and

hence, ought to be included in the Prop-VM. Also, ***RI, OA, CI, RD, HR, DC, TD, DIV*** **have incremental information content beyond *BV* in explaining market values**. The residuals for Prop-VM improve when *RD, HR, DC, TD* and *DIV* are included in the regressions, eg $\overline{RSS}$ declines from 81.59 to 63.008 (1999) for EDBV (Table 6.6), suggesting that the **CSV approach** instead of a single variable **improves the usefulness of other information, v** contained in the valuation model.

The third and final analysis for this subsection is to investigate the effect of **scale and heteroscedasticity** on regressions since many of the equations for this study are estimated cross-sectionally. Besides residual analysis and scaling, this study also uses White's heteroskedasticity consistent covariance test (*h*-stat) in mitigating heteroskedasticity. The most pronounced difference in the total number of statistically significant coefficients with the correct signs based on *t*- and *h*-stat relates to the undeflated equations (cross-section), in which the number declined from 297 (*t*-stat) to 189 (*h*-stat) or 240 vs. 165 after netting off the number of significant coefficients with incorrect signs (Table 6.3a, 6.9). The drop in the total number of statistically significant coefficients with correct (incorrect) signs based on *t*- and *h*-stat (cross-section) for the EDMV-I is also substantial, ie 172 (81) vs. 89 (33) respectively. Many of the 1% significant coefficient has either become 10% significant or insignificant when the White test is used, for example, a 1% significant coefficient (*t*-stat = 6.266) of *RD* using MModel 8 in 1995 declines to insignificant (*h*-stat = 1.439) (Table 6.9). Interestingly, for EDBV, the total number of *t*- and *h*-stat significant coefficients with correct (incorrect) signs for both cross-section and pool data are identical, ie 245 (8) and 38 (0) respectively. But closer examination reveals that the magnitudes of the *h*-stat drop substantially as compared with the *t*-stat, in which many of the 1% statistical significant coefficients become only 10% significant (similar to EDMV-I), eg the number of cross-sectional significant coefficients with 1% level drops from 208 (*t*-stat) to 165 (*h*-stat), a 25% drop!. Thus, the *h*-stat wipes out many significant coefficients that are based on *t*-stat for all equations, consistent with findings of Green et al. (1996); and Prop-LID.

6.3.3 Analysis of Other Issues

This analysis examines the (1) likelihood of multicollinearity in regressions; (2) parameters stability; and (3) choice of scalar that may have an impact on the results obtained. These are the **secondary objectives** of this chapter.

As the Prop-VM consists of nine independent variables, a likely problem that may encounter in such a large regression equation is multicollinearity, and considering that *OA/MV* and *TD/MV* are highly correlated (see earlier analysis on correlation matrix, Chapter 5). Since none of the proposed test method for multicollinearity is effective (Pindyck and Rubinfeld, 1998, p. 97) and in consistent with Chapter 5, the following detection methods are used (1) examine estimated models with high standard errors and low *t*-statistics; (2) examine estimated models with a relatively high R^2 with few significant *t*-statistics or that the *F*-statistic is highly significant while none or few of the individual variables are significant; and (3) test for stability of the estimated coefficients when some observations are deleted, and examine the predictions from the model.

As in Chapter 5, the standard errors for all independent variables for the scaled equations are small (hardly exceeding 0.06 for EDMV-I&N and 2 for EDBV) (not reported). Except for EDMV-I in 1993, the *t*-statistics show that there are far more number of coefficients that are statistically significant than insignificant (see Table 6.3a). On average, there are about 25, 2½ and 2 times more significant coefficients than insignificant ones for EDBV, EDMV-N and EDMV-I respectively. There are very few high $\overline{R}^2$ with few significant *t*-statistics, in fact, the $\overline{R}^2$ rarely exceeds 0.5 for all samples. Thus, analysis using (1) and (2) indicate that multicollinearity is not an issue for the Prop-VM.

Chow's Test for Predictive Stability is carried out for (3). The test for parameter stability is never conclusive and neither will it provide a clear indication of multicollinearity in a multiple regression because while rejection of the null hypothesis of parameter stability, imply that the parameters are unstable, but a failure to reject the null hypothesis does not indicates that the parameters are stable. This test is conducted by splitting the full sample (ie $BV \geq$ £5 millions) into two equal samples (n_1 and n_2), for example, for 1991, the full sample of 962 observations is split equally where n_1 = 1st to 481st observations, and n_2 = 482nd to 962nd observations. The *F*-statistic becomes:

$$F = \frac{\dfrac{RSS_{BV\geq 5m} - RSS_{BV\geq 5m/2}}{n_{BV\geq 5m} - n_{BV\geq 5m/2}}}{\dfrac{RSS_{BV\geq 5m/2}}{n_{BV\geq 5m/2} - k - 1}} \qquad (6.1)$$

where:

- $RSS_{BV\geq £5m}$ = Residual Sum of Squares from regression based on full sample
- $RSS_{BV\geq £5m/2}$ = Residual Sum of Squares from regression based on half of the full sample

The null hypothesis of parameter stability of the estimated coefficients of EDBV is rejected in all years except for 1997 and the pool. Parameter stability of the estimated coefficients of EDMV-N is rejected in 1991, 1993-1999 while those of EDMV-I is rejected in 1991, 1995-1996 and 1999 with mixed results in 1992 and 1998. The evidence suggests that the parameters of EDMV-N are less stable than EDMV-I in the sampled period. Since (1) and (2) are conclusive while (3) is inconclusive, there is little indication of multicollinearity in the Prop-VM. Nevertheless, multicollinearity does not imply any violation of the classical assumptions, even with a high degree of multicollinearity, the OLS estimators retain all their desired properties of efficiency, consistency, etc.

The third and final analysis of this subsection examines the effect of deflation on regressions. By deflating the level models by either *BV* or *MV*, the intercepts and residuals have greatly reduced, but the fit for the scaled equation deteriorates. In fact, most of $\overline{R}^2$ for EDMV-N are negatives. It appears that deflation has mitigated the scale effect and heteroscedasticity problems, consistent with the literature reviewed. The results show that the signs and magnitude of the estimated coefficients and the number of statistically significant coefficients scaled by *BV* and *MV* are different. For example, the pooled median coefficients of *RI* for EDBV is 2.1 but –0.04 for EDMV-N (Table 6.8), and in 1996, α_4 is significant when *RD* is deflated by *MV* but is insignificant when *RD* is deflated by *BV*. The evidence shows that EDBV has the most number of significant coefficients with the correct signs and its median coefficients for all variables are positives and sufficiently large, totally supports my hypothesis that all nine variables of the CSV are positively value-relevant (EDMV-N and EDMV-I has 6 and 5 respectively). Thus, results from this Chapter shows that statistical results and inferences are affected by deflators, unlike in the Prop-LID where inferences are not substantially affected by the deflators.

Discussion and summary for entire Section 6.3, I will first discuss the main issues/hypotheses of this chapter. Cross-sectional and pooled results in terms of *F*-tests, AIC and SC are impressive as they reveal that all the eight independent variables that made up the comprehensive set of non-earnings accounting variables for estimating a prediction model and a valuation model are still valid.

The cross-section (pool) medians of α_0 (*BV*) = 1.61 (1.41), 0.29 (0.25), 0.09 (0.11) for EDMV, EDMV-N and EDMV-I. Using Feltham and Ohlson's (1995) valuation model

specification, Stober (1996) obtains a mean of the coefficient of book value per share (*BVPS*) = 1.4 from cross-sectional estimations. Dechow et al. (1999) obtain a median coefficient of *BVPS* = 0.51 (no*v*) and 0.26 (with*v*, proxied by consensus forecast of earnings for *t*+1) for their Ohlson's (1995) VM specifications estimated cross-sectionally. Also using Ohlson's (1995) VM specification estimated cross-sectionally, Hand and Landsman (1999) obtain a mean of the coefficient of *BV* = 0.86 where the parameter of *RI* is substituted with 0.61 and 0.46 for dividend and non-dividend paying firms, and the *BV* = 0.58 where the parameter of *RI* is estimated. For his valuation models estimated cross-sectionally, Myers (1999) obtains a median of the coefficient of (1) *BV* = 0.464 for Ohlson (1995) (2) *BV* = 0.543 for Feltham and Ohlson (1995); and (3) *BV* = 0.3 for Feltham and Ohlson (1996). Using Ohlson's (1989) VM specification that includes *BV, RD, DIV,* earnings and components of accruals and cash flows, estimated cross-sectionally and by pooling, Akbar (2000) obtains an average of the coefficient of *BV* = 1.3 and 1.1 (EDBV) and *BV* = 0.6 and 0.7 (EDMV-I) respectively. Sougiannis (1994) obtains a mean of the coefficient of *BV* = –0.055 for his VM specification that include current and lagged *RD* deflated by *BV* estimated cross-sectionally. In his cross-sectional estimation of EBO-type of valuation model, Rees (1997) obtains an average coefficient of *BV* = 0.553. Using the VM with current and lagged *BV*, earnings and *RD* deflated by *BV*, Stark and Thomas (1998) obtain a pooled coefficient of *BV* = 1.72 and 2.37 when lagged *BV* is included. However, inferences from the various authors must be exercised with caution as the specifications and methodology used in their estimations differs (see Table below), nevertheless, the evidence of positive coefficients of *BV* for this study is consistent with other studies and the OFF show that *BV* provides value-relevant fundamental information.

Authors	Model Framework	Per share	BV_{it}	MV_{it-1}	Level
Dechow et al (1999)	Ohlson (1995)	√			
Hand and Landsman (1999)	Ohlson (1995)				√
Stober (1996)	Feltham & Ohlson (1995)	√			
Ahmed et al (2000)	Feltham & Ohlson (1996)	√			
Myers (1999)	Ohlson (1995), Feltham & Ohlson (1995, 1996)	√			
Sougiannis (1994)	Ohlson (1989)		√		
Green et al (1996)	Ohlson (1989)		√		
Stark and Thomas (1998)	Ohlson (1989)		√		
Akbar (2000)	Ohlson (1989)		√	√	
Rees (1997)	Edward-Bell-Ohlson	√			

Table 6.11 – Studies with varying Model Frameworks and Scaling Methods

Except for the cross-sectional median of α_1 (*RI*) of EDMV-N, the rest of the coefficients are positives and significant. Stober (1996) obtains a mean *RI* per share (*RIPS*) = 4.96 while Myers (1999) obtains a median coefficient of (1) *RI* = 1.358 for O (1995) (2) *RI* = 0.481 for FO (1995) and (3) *RI* = 0.438 for FO (1996). The mean *RIPS* = 4.047 estimated cross-sectionally in Ahmed et al. (2000). Thus, the median of α_1 for EDBV is higher than all of Myer's models but much lower than that of Stober and Ahmed et al. The positive α_1 from this study is consistent with other studies and the OFF indicates that *RI* is positively relevant in explaining prices and that UK and US firms in general create values.

In this study, α_2 (*OA*) are mostly significantly positives in EDBV only. The mean coefficient of *OAPS* in Stober and Ahmed et al. are 0.22 and 0.365 respectively and both are statistically significant. The mostly negative α_2 for EDMV-N&I are unexpected and according to the OFF, negative α_2 is invalid. An explanation for this inconsistency may be due to *MV* being an inappropriate scalar. Therefore, if we can exclude the results for equations scaled by *MV*, the evidence of α_2 suggests that in general, firms in UK and US adopt conservative accounting.

The coefficients of *CI* (α_3) for this study are predominantly positives and significant. The mean coefficient of *CI* in Ahmed et al., Myers, and Rees are 0.262, 0.007 and 0.958 respectively (all are significant, 1%). The finding of positive α_3 for this study and other empirical studies are consistent with the OFF suggesting that these expenditures represent positive NPV investments.

The evidence in this study indicates that α_4 (*RD*) > 1 for all types of equations, while α_5 (*HR*) = 0 ≤ 1 for all but EDMV-I (cross-section), and α_6 (*DC*) = 0 ≤ 1 for EDBV and EDMV-N but $\alpha_6 < 0$ for EDMV-I. To compare α_4 with the estimated coefficient of *RD* for competing studies, see table below:

Deflator	Estimations	Sougiannis (1994)	Green et al (1996)	Stark & Thomas (1998)	Akbar (2000)	This study Prop-VM
BV_{it}	Cross-section	0.286	4.15	7.38	9.97	11.85
	Pool		3.51	7.11	7.58	12.56
MV_{it-1}	Cross-section				6.12	1.36
	Pool				5.55	1.78

Table 6.12 – Estimated coefficient of *RD* for Prop-VM and competing VMs

The magnitudes of α_4 are highest for cross-sectional and pool estimations for EDBV but are much lower than those in Akbar for EDMV. The expected $\alpha_4 > 1$ is

consistent with UK and US findings (Table 6.12) therefore, it appears that *RD* is a capital component of market value. The largely positive α_5 is supported by HRM studies in which changes in an HR system can affect a firm's market value by $15,000-$45,000 per employee (Huselid and Becker, 1995; 1996); that the changes in HR policies can affect the probability of survival for a new firm by as much as 22% (Welbourne and Andrews, 1996). The finding of positive α_6 (EDBV and EDMV-N) may be construed to be consistent with the positive coefficients of *AD* in respect to market value in Hirschey (1982); Hirschey and Weygandt (1985); and Sougiannis (1994) suggests that equations scaled by *MV* should not include an intercept. Even though most of α_5 and α_6 are positives but their values are low ($0 \leq 1$) suggesting that they are value-relevant but may not be long-lived assets, which partially support my hypothesis that they can proxy intangibles. The mostly positive α_6 and the fairly high cross-section median = 0.45 (EDBV) and 0.55 (EDMV-N) is encouraging considering that *DC* is noisy as it includes costs such as transportation, warehousing, insurance, freight charges, distribution and other costs in addition to advertising costs.

The median of α_7 (*TD*) are all positives while the median α_8 (*DIV*) are highly positives (cross-section=12.86, pool=13.48) for EDBV but are negatives for EDMV-N&I. Rees (1997) obtains estimated cross-sectional coefficients of *TDPS* = –0.416, –0.391 and –0.272 (all significant, 1%) for his EBO specifications that includes *DIVPS, REPS* and *BVPS* respectively. Thus, in Rees, *TDPS* provides strong negative signal ('bad' news) to the market. Making use of the firm debt-to-equity ratio to determine the 'optimal' level of a firm's capital structure, Green et al. (1996) found that departures from this ratio in either direction will not be rewarded by the market. This finding is similar to the 'good' news signal effect of debt, which suggests that as a result of the tax benefit of debt, market prices increase with leverage. Consequently, Fama and French (1998) conclude that debt has no net benefit as high leverage is 'bad' news about a firm's value (p. 841). Thus, the evidence of α_7 largely supports the hypothesis of this study that debts signal 'good' news about a firm's value, consistent with Green et al., but is inconsistent with Rees, and Fama and French. However, Rees uses per share basis in his estimations. Fama and French use a wide range of past, current and future factors, such as earnings, investment, *RD* expenditures, dividends but ignoring equity book value in their valuation model. Evidence from empirical studies indicate that book value of equity has substantial incremental explanatory power beyond earnings in equity valuation (particularly for loss firms) (eg

Collins at al., 1999) and there is strong likelihood that the valuation model of Fama and French is misspecified due to the omission of book value (see Easton and Harris, 1991; Barth at al.,1993, 1996; Kothari and Zimmerman, 1995; Francis and Schipper, 1996; Green et al., 1996; Burgstahler and Dichev, 1997; and Lev and Zarowin, 1999).

Rees (1997) obtains estimated cross-sectional coefficients of *DIVPS* = 12.679, 12.639 and 15.675 (all significant, 1%) for his various signalling models that includes *BVPS, TDPS* and *CIPS*. Using O (1995), Hand and Landsman (1999) obtain estimated coefficients of *DIV* = 1.88 (with *expectation of earnings*$_{t+1}$) and 2.49 (with *analysts forecast of earnings*$_{t+1}$) (all significant, 1%) respectively. In Akbar (2000), the cross-sectional and pool medians *DIV* = –1.735 and –1.87 respectively (EDBV) and –1.39 and –1.14 respectively (EDMV-N). The evidence of α_8 is mixed with EDBV strongly supporting the 'good' news signalling effect of dividends, consistent with Rees, and Hand and Landsman, while that of EDMV-N and EDMV-I support the 'bad' news effect, consistent with Akbar. More interestingly, the evidence of α_8 for EDBV here contrasts that of Akbar, considering that both of these studies use the same dataset and there is no measurement error in dividends. A probable explanation for this inconsistency is the different model specification used. This finding partially supports the strong showing of *DIV*, regardless of the deflators used in the Prop-LID.

The evidence indicates that the use of the White's consistent standard errors reduced the number of statistically significant coefficients with the correct (incorrect) signs or caused many of the 1% statistical significant coefficients to become only 10% significant, implying that the White's test can severely understate the true coefficients for the deflated equations, as indicated in Barth and Kallapur (1996); Stober (1996); Green et al. (1996); and Prop-LID. Besides scaling, many authors use per share basis (eg Dechow et al., Stober, Ahmed et al., Myers, Rees; Giner and Reverte) in mitigating scale and heteroscedasticity but their results should be interpreted cautiously as scale has not been controlled for (eg Easton, 1998; Brown et al., 1999) or change in scale during or across the testing periods, eg if there are changes in transactions involving shares, such as stock-splits, new issues (see Easton, 1998; Brown et al., 1999; Lo and Lys, 2000a; Ohlson, 2000). Therefore, this research suggests that more research in the use of the White's test or a better technique in mitigating heteroscedasticity should be an interesting avenue for future research in CMRA.

Overall, *RI, OA, CI, RD, HR. DC, TD* and *DIV* have incremental information content beyond *BV*, and all these nine variables are value-relevant, implying that they are able to measure (1) value creation; (2) conservatism; (3) current +NPV projects; (4) intangibles; and (5) expectations of future profitability. The findings from a wide range of statistics, econometric, economic and accounting measures for Prop-VM are summarized in Table 6.13.

The discussion that follows forms the secondary issues/hypotheses of this Chapter. Note that the various measures used to detect multicollinearity reveal little indication of multicollinearity in the Prop-VM. The analysis shows that for both cross-sectional and pool data, EDBV have more significant *t*-and *h*-stat and higher medians for most coefficients (except for *HR* and *DC*) than EDMVs. On the other hand, EDMVs have more significant coefficients with the correct sign for *HR* and *DC*, higher median $\bar{R}^2$s, more stable parameters, and lower $\overline{RSS}$ than EDBVs. EDMV-N having more number of significant coefficients with the correct sign than EDMV-I while EDMV-I having higher median $\bar{R}^2$s, more stable parameters, and lower $\overline{RSS}$ than EDMV-N. Thus, statistical results were influenced by the intercept and deflator, inconsistent with Barth and Kallapur (1996). In general, the **conclusion of Prop-VM is largely consistent with Prop-LID.**

Consistent with Prop-LID, the omission of outliers has a negative impact on individual independent variables as well as explanatory powers. However, in some extent, this evidence is consistent with Green et al. (1996); Akbar (2000); and Easton and Sommers (2002) where they found that omission of extreme observations/outliers does not improve statistical results. Hence, the question on the deletion of outliers in a sample may be more complex than one would expect.

Based on the number of statistical significant coefficients with the correct sign in an equation suggest that varying cost of capital has little affect on the cross-sectional and pooled results, unlike Prop-LID where the use of 10% cost of capital outperforms that of 15% or 20% in both cross-sectional and pooled data.

Table 6.13 – Summary of various Measures for the proposed market valuation models (Prop-VM) for the deflated equations.

#	Statistics	EDBV					EDMV-N					EDMV-I				
		Cross-section		Pool		√	Cross-section		Pool		√	Cross-section		Pool		√
		NS	Median	NS	Median		NS	Median	NS	Median		NS	Median	NS	Median	
1	α_0 *(BV)* [1]	56 (0)	1.61	8 (0)	1.41	√	57 (1)	0.29	8 (0)	0.25	*	40 (8)	0.09	8 (0)	0.11	
2	α_1 *(RI)* [1]	51 (0)	2.10	8 (0)	1.97	√	32 (36)	-0.22	8 (0)	0.09		41 (15)	0.18	8 (0)	0.12	*
3	α_2 *(OA)* [1]	37 (2)	0.28	5 (0)	0.41	√	8 (27)	-0.04	2 (5)	-0.01		3 (19)	-0.02	2 (4)	-0.01	*
4	α_3 *(CI)* [1]	31 (0)	0.98	6 (0)	1.35		30 (12)	0.10	4 (0)	0.07		42 (5)	0.25	6 (0)	0.14	√
5	α_4 *(RD)* [1]	33 (0)	11.85	5 (0)	12.57	√	37 (4)	6.32	5 (0)	6.50	*	25 (5)	1.36	5 (0)	1.78	
6	α_5 *(HR)* [1]	16 (0)	0.26	3 (0)	0.40		29 (4)	0.33	4 (0)	0.41	√	8 (8)	-0.01	4 (0)	0.20	
7	α_6 *(DC)* [1]	10 (4)	0.45	0 (0)	0.30		21 (3)	0.55	3 (0)	0.13	√	6 (9)	-0.03	0 (3)	-0.25	
8	α_7 *(TD)* [1]	4 (2)	0.07	2 (0)	0.31	√	2 (8)	-0.07	0 (2)	-0.20		6 (6)	-0.01	0 (2)	-0.07	*
9	α_8 *(DIV)* [1]	7 (0)	12.86	1 (0)	13.48	√	3 (2)	-0.53	0 (1)	-1.01	*	1 (6)	-2.19	0 (1)	-4.91	
10	*t* -stat	245 (8)		38 (0)		√	219 (97)		32 (8)		*	172 (81)		33 (10)		
11	*h* -stat	245 (8)		38 (0)		√	143 (24)		15 (2)			89 (33)		5 (1)		
12	Median $\bar{R}^2$		0.05		0.03			-0.49	0.12	-0.39			0.17		0.12	√
13	Intercept α_A [2]					√						0 (72)		0 (8)		
14	Inverse of scale [2] $\frac{1}{BV}$ and $\frac{1}{MV}$	37 (35)		0 (8)		√	13 (59)		0 (8)			14 (58)		0 (8)		
15	SC, AIC, *F* -test [3]	49 (22)		7 (1)			57 (16)		7 (1)		√	48 (24)		8 (0)		
16	Chow's Prediction test of Stability	64.00		0.00			52.00		0.00			43.00		0.00		√
17	$\overline{RSS}$	55.40		151.18			1.52		2.17			0.80		1.37		√

√ indicates better performer provided the measure of one deflator > 10% than the other.

1 indicates number of statistical significant with correct (incorrect) signs, and median coefficient respectively.

2 indicates number of statistical significant (insignificant) coefficient.

3 indicates clear (weak) validity of adding an additional variable.

4 indicates number of statistical significant coefficients

* indicates better result between EDMV-N and EDMV-I

6.4. Analysis of the Results from Estimating the Regression Equations containing current and lagged *Research & Development expenditures (RD), Human Resource costs (HR) and Distribution Costs (DC)*

This section extends from the previous section in examining the impact of current and lagged *RD, HR* and *DC* expenditures on *MV* using cross-sectional and pool data, and to determine whether they can be validly used as proxies for intangibles in the VM. Since sample where $BV \geq$ £5 millions and $r = 10\%$ for the deflated equations without an intercept gives the best result as compared with other samples with/without outliers using $r = 15\%$ or 20% in the previous sections, all the tests in this section will be based on this sample estimated using deflated equations with an inverse of size term. Three models: (1) Model MRD for current and lagged *RD* from year 1 to 4; (2) Model MHR for current and lagged *HR* from year 1 to 4; and (3) Model MDC for current and lagged *DC* from year 1 to 4 are estimated based on different criteria using OLS. Models MRD, MRH and MRD are ran on (1) equation deflated by closing book values (EDBV); and (2) equation deflated by opening market value of equity (EDMV-N). The estimations are first carried out by regressing cross-sectionally for each of the sample years from 1995 to 1999 (5 annual cross-sections). Years 1991 to 1994 are not used because lag data for these years is not available. The data is then pooled over the entire sample periods to be estimated on a pooling basis. All regressions including the generation of output and statistical analysis are done automatically by specially self-written computer programs. The estimation basis and the numbers of regression runs are summarized as follows:

Basic	Type	Estimation Type	Type *X* Equations *X* Years	Total
$BV \geq$ £5 millions, $r = 10\%$	*RD*	Annual cross-section	2 X 5 X 5	50
	HR	Annual cross-section	2 X 5 X 5	50
	DC	Annual cross-section	2 X 5 X 5	50
	RD	Pooled entire sample	2 X 5	10
	HR	Pooled entire sample	2 X 5	10
	DC	Pooled entire sample	2 X 5	10
Total				180

Table 6.14 – Estimation Basis, Type, and the Number of Regression Runs

Results from medians and percentiles of estimated coefficients and $\overline{R}^2$s, and the number of significant coefficients of current of current and lagged *RD, HR* and *DC* are depicted in Table 6.15a-c and Table 6.16a-c respectively. The Polynomial distributed lags of *RD, HR* and *DC* are depicted in Table 6.17a-b.

Table 6.15a,b,c - Medians and Percentiles of Estimated Coefficients and Adj. R^2 of current and lagged *RD*, *HR*, *DC* of Deflated Equations for Sample where $BV \geq$ £5 Millions and $r = 10\%$

	Statistics	$\alpha_{RBV}(BV_{it})$	$\alpha_{RRI}(RI_{it})$	$\alpha_{R}(RD_{it})$	$\alpha_{R-1}(RD_{it-1})$	$\alpha_{R-2}(RD_{it-2})$	$\alpha_{R-3}(RD_{it-3})$	$\alpha_{R-4}(RD_{it-4})$	$A\text{-}R^2$
Defl. by BV_{it}									
C/s	Median	2.86	2.98	19.52	-1.05	3.05	1.52	17.57	0.15
	25% Percentile	2.40	1.88	14.97	-16.47	-12.03	-3.57	2.72	0.12
	75% Percentile	3.21	3.11	24.07	5.48	11.00	7.40	18.44	0.20
Pool	Median	2.77	2.36	16.84	-0.42	0.10	-4.02	10.67	0.12
	25% Percentile	2.76	2.36	16.71	-0.51	-0.15	-6.54	10.67	0.12
	75% Percentile	2.77	2.36	16.97	-0.03	0.24	-1.50	10.67	0.12
Defl. by MV_{it}									
C/s	Median	0.17	-0.29	8.48	-1.41	-6.67	1.57	4.76	-0.63
	25% Percentile	0.13	-0.35	6.44	-7.79	-10.06	-7.10	4.29	-1.78
	75% Percentile	0.20	0.20	9.95	5.06	3.93	10.58	6.35	-0.36
Pool	Median	0.13	0.15	8.48	-1.41	-6.67	1.57	4.76	-0.63
	25% Percentile	0.13	0.15	6.44	-7.79	-10.06	-7.10	4.29	-1.78
	75% Percentile	0.13	0.15	9.95	5.06	3.93	10.58	6.35	-0.36

	Statistics	$\alpha_{HBV}(BV_{it})$	$\alpha_{HRI}(RI_{it})$	$\alpha_{H}(HR_{it})$	$H\text{-}1(HR_{it-1})$	$H\text{-}2(HR_{it-2})$	$H\text{-}3(HR_{it-3})$	$H\text{-}4(HR_{it-4})$	$A\text{-}R^2$
Defl. by BV_{it}									
C/s	Median	2.18	1.24	2.46	-2.47	-0.29	-0.15	-1.19	0.13
	25% Percentile	2.09	0.76	1.23	-3.04	-0.87	-1.50	-1.31	0.07
	75% Percentile	2.40	2.59	4.68	-0.48	0.52	0.59	0.74	0.20
Pool	Median	2.37	1.18	3.11	-1.78	0.26	-0.48	0.09	0.09
	25% Percentile	2.36	1.16	3.11	-1.82	0.04	-0.50	0.09	0.09
	75% Percentile	2.38	1.19	3.13	-1.76	0.27	-0.46	0.09	0.09
Defl. by MV_{it}									
C/s	Median	0.09	-0.54	1.41	-1.28	-0.20	0.23	-0.32	-0.48
	25% Percentile	0.08	-0.66	1.07	-1.74	-0.96	-0.08	-0.84	-1.62
	75% Percentile	0.12	0.28	1.98	-0.96	-0.06	0.94	0.01	-0.41
Pool	Median	0.02	0.03	1.30	-1.53	0.70	0.22	-0.41	-0.66
	25% Percentile	0.02	-0.65	0.89	-1.58	-0.76	-0.07	-0.73	-1.61
	75% Percentile	0.12	0.24	1.97	-0.96	0.69	0.93	-0.07	-0.42

	Statistics	$\alpha_{DBV}(BV_{it})$	$\alpha_{DRI}(RI_{it})$	$\alpha_{D}(DC_{it})$	$D\text{-}1(DC_{it-1})$	$D\text{-}2(DC_{it-2})$	$D\text{-}3(DC_{it-3})$	$D\text{-}4(DC_{it-4})$	$A\text{-}R^2$
Defl. by BV_{it}									
C/s	Median	2.49	2.27	1.73	-0.08	-0.11	0.09	-0.23	0.07
	25% Percentile	2.40	1.56	1.45	-0.13	-0.12	-0.11	-0.34	0.04
	75% Percentile	3.49	2.65	2.09	0.01	0.10	0.27	0.10	0.09
Pool	Median	2.37	1.18	3.11	-1.78	0.26	-0.48	0.09	0.09
	25% Percentile	2.36	1.16	3.11	-1.82	0.04	-0.50	0.09	0.09
	75% Percentile	2.38	1.19	3.13	-1.76	0.27	-0.46	0.09	0.09
Defl. by MV_{it}									
C/s	Median	0.21	-0.10	0.91	0.12	-0.11	0.48	0.10	-0.54
	25% Percentile	0.13	-0.26	0.66	-0.04	-0.16	-0.15	-0.08	-1.75
	75% Percentile	0.30	0.26	1.06	0.30	0.17	0.73	0.44	-0.39
Pool	Median	0.02	0.03	1.30	-1.53	0.70	0.22	-0.41	-0.66
	25% Percentile	0.08	-0.14	0.66	-0.19	-0.14	-0.14	-0.30	-1.73
	75% Percentile	0.28	0.25	1.23	0.30	0.52	0.66	0.36	-0.42

Annual cross-sectional sample (1995-1999) consists of 884 to 1,157 observations and pooled sample consisting 4,956 to 5,341 observations. Regressions are run from:

Eq. 1 $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + e_{it+1}$

Eq. 2 $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + e_{it+1}$

Eq. 3 $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \alpha_{H-2} HR_{it-2} + e_{it+1}$

Eq. 4 $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \alpha_{H-2} HR_{it-2} + \alpha_{H-3} HR_{it-3} + e_{it+1}$

Eq. 5 $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \alpha_{H-2} HR_{it-2} + \alpha_{H-3} HR_{it-3} + \alpha_{H-4} HR_{it-4} + e_{it+1}$

Due to space constraint and since all specifications are similar, only *RD* models are shown.

Table 6.16a - Number of Significant Coefficients (t-Stat) (top) (h-Stat) of Current and Lagged RD costs for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	$\alpha_{RRI}(BV_{it})$		$\alpha_{RRI}(RI_{it})$		$\alpha_{R}(RD_{it})$		$\alpha_{R\text{-}1}(RD_{it\text{-}1})$		$\alpha_{R\text{-}2}(RD_{it\text{-}2})$		$\alpha_{R\text{-}3}(RD_{it\text{-}3})$		$\alpha_{R\text{-}4}(RD_{it\text{-}4})$		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	3	1	0	0	1	16	4
	3	Deflated by MV_{it-1}	5	0	0	5	3	0	4	0	0	3	0	1	1	0	13	9
1996	2	Deflated by BV_{it}	5	0	5	0	5	0	3	0	2	0	0	1	1	0	21	1
	3	Deflated by MV_{it-1}	5	0	5	0	5	0	0	0	2	0	0	2	0	0	17	2
1997	2	Deflated by BV_{it}	5	0	5	0	5	0	0	4	2	0	1	0	1	0	19	4
	3	Deflated by MV_{it-1}	5	0	0	5	4	0	0	2	1	0	2	0	0	0	12	7
1998	2	Deflated by BV_{it}	5	0	4	0	5	0	0	4	1	0	0	0	0	0	15	4
	3	Deflated by MV_{it-1}	5	0	0	5	5	0	0	0	0	3	2	0	1	0	13	8
1999	2	Deflated by BV_{it}	5	0	5	0	5	0	3	0	0	2	0	1	1	0	19	3
	3	Deflated by MV_{it-1}	0	0	5	0	5	0	0	1	0	0	0	0	0	0	10	1
Total	2	Deflated by BV_{it}	25	0	24	0	25	0	6	8	5	5	2	2	3	1	90	16
	3	Deflated by MV_{it-1}	20	0	10	15	22	0	4	3	3	6	4	3	2	0	65	27
Pool	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	1	1	0	16	1
	3	Deflated by MV_{it-1}	5	0	5	0	5	0	0	0	0	1	0	0	1	0	16	1
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	3	0	0	0	1	15	4
	3	Deflated by MV_{it-1}	5	0	0	0	1	0	4	0	0	2	0	0	1	0	11	2
1996	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	0	0	0	15	0
	3	Deflated by MV_{it-1}	0	0	0	0	1	0	0	0	1	0	0	1	0	0	2	1
1997	2	Deflated by BV_{it}	5	0	0	0	5	0	0	3	2	0	0	0	1	0	13	3
	3	Deflated by MV_{it-1}	0	0	0	0	3	0	0	0	1	0	2	0	0	0	6	0
1998	2	Deflated by BV_{it}	5	0	0	0	5	0	0	4	1	0	0	0	0	0	11	4
	3	Deflated by MV_{it-1}	5	0	0	0	4	0	0	0	0	2	2	0	1	0	12	2
1999	2	Deflated by BV_{it}	5	0	0	0	5	0	0	0	0	1	0	1	1	0	11	2
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	1	0	0	0	0	0	0	5	1
Total	2	Deflated by BV_{it}	25	0	10	0	25	0	0	7	3	4	0	1	2	1	65	13
	3	Deflated by MV_{it-1}	10	0	0	0	14	0	4	1	2	4	4	1	2	0	36	6
Pool	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	0	1	0	16	0
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	0	0	0	0	0	1	0	6	0

Regressions are run from $MV_{it} = \alpha_{RBV} BV_{it} + \alpha_{RRI} RI_{it} + \alpha_R RD_{it} + e_{it}$, $MV_{it} = \alpha_{RBV} BV_{it} + \alpha_{RRI} RI_{it} + \alpha_R RD_{it} + \alpha_{R\text{-}1} RD_{it-1} + \varepsilon_{it}$, $MV_{it} = \alpha_{RBV} BV_{it} + \alpha_{RRI} RI_{it} + \alpha_R RD_{it} + \alpha_{R\text{-}1} RD_{it-1} + \alpha_{R\text{-}2} RD_{it-2} + e_{it}$ $MV_{it} = \alpha_{RBV} BV_{it} + \alpha_{RRI} RI_{it} + \alpha_R RD_{it} + \alpha_{R\text{-}1} RD_{it-1} + \alpha_{R\text{-}2} RD_{it-2} + \alpha_{R\text{-}3} RD_{it-3} + e_{it}$, $MV_{it} = \alpha_{RBV} BV_{it} + \alpha_{RRI} RI_{it} + \alpha_R RD_{it} + \alpha_{R\text{-}1} RD_{it-1} + \alpha_{R\text{-}2} RD_{it-2} + \alpha_{R\text{-}3} RD_{it-3} + \alpha_{R\text{-}4} RD_{it-4} + e_{it}$ in terms of deflated by (1) BV_{it} (2) MV_{it-1}. Numbers are in t- and h-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 6.16b - Number of Significant Coefficients (t-Stat) (top) (h-Stat) of Current and Lagged HR costs for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	$\alpha_{HB\varsigma}$ (BV_{it})		α_{HRI} (RI_{it})		α_{H} (HR_{it})		α_{H-1} (HR_{it-1})		α_{H-2} (HR_{it-2})		α_{H-3} (HR_{it-3})		α_{H-4} (HR_{it-4})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	0	1	0	1	0	0	0	1	15	3
	3	Deflated by MV_{it-1}	5	0	0	5	5	0	0	4	0	3	2	0	0	1	12	13
1996	2	Deflated by BV_{it}	5	0	5	0	5	0	0	1	0	2	0	0	0	0	15	3
	3	Deflated by MV_{it-1}	4	0	5	0	5	0	0	1	0	1	0	2	1	0	15	4
1997	2	Deflated by BV_{it}	5	0	5	0	5	0	0	4	1	0	0	1	1	0	17	5
	3	Deflated by MV_{it-1}	5	0	0	5	3	1	1	3	3	0	0	0	0	0	12	9
1998	2	Deflated by BV_{it}	5	0	0	2	5	0	0	4	2	0	0	2	0	1	12	9
	3	Deflated by MV_{it-1}	5	0	0	5	5	0	0	4	0	0	0	0	0	0	10	9
1999	2	Deflated by BV_{it}	5	0	2	0	5	0	0	4	0	2	2	0	0	1	14	7
	3	Deflated by MV_{it-1}	0	5	5	0	5	0	0	2	0	1	2	0	0	1	12	9
Total	2	Deflated by BV_{it}	25	0	17	2	25	0	0	14	3	5	2	3	1	3	73	27
	3	Deflated by MV_{it-1}	19	5	10	15	23	1	1	14	3	5	4	2	1	2	61	44
Pool	2	Deflated by BV_{it}	5	0	5	0	5	0	0	4	0	0	0	0	0	0	15	4
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	4	3	0	1	0	0	1	9	5
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	1	0	1	0	1	15	3
	3	Deflated by MV_{it-1}	4	0	0	1	5	0	0	1	0	2	1	0	0	1	10	5
1996	2	Deflated by BV_{it}	5	0	5	0	5	0	0	1	0	0	0	0	0	0	15	1
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	0	0	1	0	2	0	0	5	3
1997	2	Deflated by BV_{it}	5	0	0	0	5	0	0	0	0	0	0	0	1	0	11	0
	3	Deflated by MV_{it-1}	0	0	0	3	3	0	0	3	3	0	0	0	0	0	6	6
1998	2	Deflated by BV_{it}	5	0	0	0	5	0	0	4	1	0	0	1	0	0	11	5
	3	Deflated by MV_{it-1}	0	0	0	4	5	0	0	4	0	0	0	0	0	0	5	8
1999	2	Deflated by BV_{it}	5	0	0	0	4	0	0	1	0	1	2	0	0	0	11	2
	3	Deflated by MV_{it-1}	0	0	0	0	2	0	0	0	0	0	1	0	0	0	3	0
Total	2	Deflated by BV_{it}	25	0	10	0	24	0	0	6	1	2	2	2	1	1	63	11
	3	Deflated by MV_{it-1}	4	0	0	8	20	0	0	8	3	3	2	2	0	1	29	22
Pool	2	Deflated by BV_{it}	5	0	0	0	5	0	0	3	0	0	0	0	0	0	10	3
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	3	3	0	0	0	0	0	8	3

Regressions are run from $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + e_{it}$, $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \varepsilon_{it}$, $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \alpha_{H-2} HR_{it-2} + e_{it}$ $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \alpha_{H-2} HR_{it-2} + \alpha_{H-3} HR_{it-3} + e_{it}$, $MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \alpha_{H-2} HR_{it-2} + \alpha_{H-3} HR_{it-3} + \alpha_{H-4} HR_{it-4} + e_{it}$ in terms of deflated by (1) $BVit$ (2) MV_{it-1}. Numbers are in t- and h-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 6.16c - Number of Significant Coefficients (t-Stat) (top) (h-Stat) of Current and Lagged DC for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	$\alpha_{DBV}(BV_{it})$		$\alpha_{DRI}(RI_{it})$		$\alpha_{D}(DC_{it})$		$\alpha_{D-1}(DC_{it-1})$		$\alpha_{D-2}(DC_{it-2})$		$\alpha_{D-3}(DC_{it-3})$		$\alpha_{D-4}(DC_{it-4})$		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	0	0	0	15	0
	3	Deflated by MV_{it-1}	5	0	0	5	5	0	3	0	3	0	2	0	0	0	18	5
1996	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	0	0	0	15	0
	3	Deflated by MV_{it-1}	5	0	5	0	5	0	0	0	0	0	2	0	1	0	18	0
1997	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	0	0	0	15	0
	3	Deflated by MV_{it-1}	5	0	0	1	2	0	4	0	0	3	0	2	1	0	12	6
1998	2	Deflated by BV_{it}	5	0	0	0	5	0	0	0	0	0	0	0	1	0	11	0
	3	Deflated by MV_{it-1}	5	0	0	1	5	0	0	4	0	3	0	2	0	0	10	10
1999	2	Deflated by BV_{it}	5	0	5	0	5	0	0	4	0	0	0	2	0	0	15	6
	3	Deflated by MV_{it-1}	2	0	5	0	5	0	1	0	0	3	2	0	0	1	15	4
Total	2	Deflated by BV_{it}	25	0	20	0	25	0	0	4	0	0	0	2	1	0	71	6
	3	Deflated by MV_{it-1}	22	0	10	7	22	0	8	4	3	9	6	4	2	1	73	25
Pool	2	Deflated by BV_{it}	5	0	5	0	5	0	0	4	0	0	0	0	0	0	15	4
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	4	3	0	1	0	0	1	9	5
1995	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	0	0	0	15	0
	3	Deflated by MV_{it-1}	4	0	0	0	5	0	0	0	3	0	2	0	0	0	14	0
1996	2	Deflated by BV_{it}	5	0	5	0	5	0	0	0	0	0	0	0	0	0	15	0
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	0	0	0	2	0	1	0	8	0
1997	2	Deflated by BV_{it}	5	0	0	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it-1}	2	0	0	0	0	0	4	0	0	0	0	2	1	0	7	2
1998	2	Deflated by BV_{it}	5	0	0	0	5	0	0	0	0	0	0	0	0	0	10	0
	3	Deflated by MV_{it-1}	5	0	0	0	5	0	0	2	0	0	0	0	0	0	10	2
1999	2	Deflated by BV_{it}	5	0	0	0	0	0	0	4	0	0	0	2	0	0	5	6
	3	Deflated by MV_{it-1}	0	0	1	0	5	0	0	0	0	0	2	0	0	1	8	1
Total	2	Deflated by BV_{it}	25	0	10	0	20	0	0	4	0	0	0	2	0	0	55	6
	3	Deflated by MV_{it-1}	11	0	1	0	20	0	4	2	3	0	6	2	2	1	47	5
Pool	2	Deflated by BV_{it}	5	0	0	0	5	0	0	3	0	0	0	0	0	0	10	3
	3	Deflated by MV_{it-1}	0	0	0	0	5	0	0	3	3	0	0	0	0	0	8	3

Regressions are run from $MV_{it} = \alpha_{DBV} BV_{it} + \alpha_{DRI} RI_{it} + \alpha_{D} DC_{it} + e_{it}$, $MV_{it} = \alpha_{DBV} BV_{it} + \alpha_{DRI} RI_{it} + \alpha_{D} DC_{it} + \alpha_{D-1} DC_{it-1} + \varepsilon_{it}$, $MV_{it} = \alpha_{DBV} BV_{it} + \alpha_{DRI} RI_{it} + \alpha_{D} DC_{it} + \alpha_{D-1} DC_{it-1} + \alpha_{D-2} DC_{it-2} + e_{it}$ $MV_{it} = \alpha_{DBV} BV_{it} + \alpha_{DRI} RI_{it} + \alpha_{D} DC_{it} + \alpha_{D-1} DC_{it-1} + \alpha_{D-2} DC_{it-2} + \alpha_{D-3} DC_{it-3} + e_{it}$, $MV_{it} = \alpha_{DBV} BV_{it} + \alpha_{DRI} RI_{it} + \alpha_{D} DC_{it} + \alpha_{D-1} DC_{it-1} + \alpha_{D-2} DC_{it-2} + \alpha_{D-3} DC_{it-3} + \alpha_{D-4} DC_{it-4} + e_{it}$ in terms of deflated by (1) BV_{it} (2) MV_{it-1}. Numbers are in t- and h-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

Table 6.17a,b,c - Polynomial Distributed Lags of *RD, HR, DC* for $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	Statistics	$\alpha_{R-2}\ (RD_{it-2})$	$\alpha_{R-3}\ (RD_{it-3})$	$\alpha_{R-4}\ (RD_{it-4})$	$\alpha_{R-5}\ (RD_{it-5})$	Obs
1995	2	Deflated by BV_{it}	Sum of Coeff	14.711	16.273	16.152	17.133	1,114
			AIC	5.082	5.090	5.125	5.140	
	3	Deflated by MV_{it-1}	Sum of Coeff	16.035	20.334	25.515	24.534	874
			AIC	3.387	3.395	3.298	3.205	
1996	2	Deflated by BV_{it}	Sum of Coeff	13.331	13.121	11.910	12.143	1,155
			AIC	5.432	5.432	5.439	5.443	
	3	Deflated by MV_{it-1}	Sum of Coeff	27.593	34.442	38.225	45.527	863
			AIC	3.080	3.070	2.680	2.574	
1997	2	Deflated by BV_{it}	Sum of Coeff	15.664	16.274	15.540	16.748	1,122
			AIC	6.059	6.066	6.084	6.090	
	3	Deflated by MV_{it-1}	Sum of Coeff	26.400	34.250	45.131	48.675	886
			AIC	2.970	2.903	2.905	2.794	
1998	2	Deflated by BV_{it}	Sum of Coeff	14.298	13.608	13.498	13.020	1,023
			AIC	6.405	6.408	6.414	6.420	
	3	Deflated by MV_{it-1}	Sum of Coeff	16.001	19.390	23.672	28.529	833
			AIC	3.020	3.040	3.000	3.000	
1999	2	Deflated by BV_{it}	Sum of Coeff	30.235	28.205	25.558	24.315	919
			AIC	7.222	7.225	7.224	7.229	
	3	Deflated by MV_{it-1}	Sum of Coeff	22.590	26.823	31.214	34.154	814
			AIC	3.725	3.700	3.686	3.675	
Pool	2	Deflated by BV_{it}	Sum of Coeff	16.013	15.642	15.875	15.918	5,339
			AIC	7.875	7.875	7.877	7.880	
	3	Deflated by MV_{it-1}	Sum of Coeff	23.292	28.281	33.461	36.796	4,276
			AIC	3.537	3.519	3.440	3.411	

1995	4	Deflated by MV_{it-1}	Sum of Coeff	2.086	1.680	3.278	-3.725	874
			AIC	2.790	2.845	2.755	2.490	
1996	4	Deflated by MV_{it-1}	Sum of Coeff	0.911	-0.227	1.443	1.570	863
			AIC	1.920	1.930	1.783	1.690	
1997	4	Deflated by MV_{it-1}	Sum of Coeff	0.933	-1.091	-1.738	1.704	886
			AIC	1.807	1.803	1.827	1.814	
1998	4	Deflated by MV_{it-1}	Sum of Coeff	1.575	0.818	0.965	1.199	833
			AIC	1.997	2.038	2.056	2.093	
1999	4	Deflated by MV_{it-1}	Sum of Coeff	6.513	6.815	7.274	6.968	814
			AIC	3.035	3.052	3.069	3.075	
Pool	4	Deflated by MV_{it-1}	Sum of Coeff	6.042	5.849	6.764	6.711	4,276
			AIC	3.042	3.032	2.965	2.970	

The lag structure is estimated using the Almon polynomial method. Lags are run from lag 1 to 5 years with a 2-degree polynomial. Lag 1 and higher degrees polynomial are not possible due to near perfect multicollinearity. The lag models are:

$$MV_{it} = \alpha_{RBV} BV_{it} + \alpha_{RRI} RI_{it} + \alpha_{R} RD_{it} + \alpha_{R-1} RD_{it-1} + \alpha_{R-2} RD_{it-2} + \alpha_{R-3} RD_{it-3} + \alpha_{R-4} RD_{it-4} + \alpha_{R-5} RD_{it-5} + e_{it}$$

$$MV_{it} = \alpha_{HBV} BV_{it} + \alpha_{HRI} RI_{it} + \alpha_{H} HR_{it} + \alpha_{H-1} HR_{it-1} + \alpha_{H-2} HR_{it-2} + \alpha_{H-3} HR_{it-3} + \alpha_{H-4} HR_{it-4} + \alpha_{H-5} HR_{it-5} + e_{it}$$

$$MV_{it} = \alpha_{DBV} BV_{it} + \alpha_{DRI} RI_{it} + \alpha_{D} DC_{it} + \alpha_{D-1} DC_{it-1} + \alpha_{D-2} DC_{it-2} + \alpha_{D-3} DC_{it-3} + \alpha_{D-4} DC_{it-4} + \alpha_{D-5} DC_{it-5} + e_{it}$$

The top table shows results from estimating the *RD* models without an intercept, and the bottom table shows the results from estimating the *RD* models deflated by MV_{it-1} with an intercept. Notice the differences in the results from these two tables. The results from estimating the *HR* and *DC* models are presented below:

Table 6.17a,b,c - Polynomial Distributed Lags of *RD, HR, DC* for $BV \geq$ £5 Millions

Year	No	Type	Statistics	$\alpha_{H-2}\ (HR_{it-2})$	$\alpha_{H-3}\ (HR_{it-3})$	$\alpha_{H-4}\ (HR_{it-4})$	$\alpha_{H-5}\ (HR_{it-5})$	Obs
1995	2	Deflated by BV_{it}	Sum of Coeff	0.554	0.806	0.718	0.941	1,114
			AIC	5.277	5.274	5.281	5.280	
	3	Deflated by MV_{it-1}	Sum of Coeff	1.379	1.547	1.526	1.500	874
			AIC	3.165	3.155	3.070	2.927	
1996	2	Deflated by BV_{it}	Sum of Coeff	1.074	1.039	0.950	1.000	1,155
			AIC	5.455	5.458	5.465	5.470	
	3	Deflated by MV_{it-1}	Sum of Coeff	1.372	1.535	1.455	1.529	863
			AIC	2.827	2.804	2.445	2.383	
1997	2	Deflated by BV_{it}	Sum of Coeff	2.249	2.097	1.967	2.009	1,122
			AIC	6.045	6.058	6.070	6.080	
	3	Deflated by MV_{it-1}	Sum of Coeff	0.938	1.204	1.430	1.765	886
			AIC	2.900	2.800	2.746	2.600	
1998	2	Deflated by BV_{it}	Sum of Coeff	1.820	1.658	1.632	1.622	1,023
			AIC	6.314	6.321	6.335	6.355	
	3	Deflated by MV_{it-1}	Sum of Coeff	1.094	1.251	1.367	1.496	833
			AIC	2.844	2.821	2.786	2.763	
1999	2	Deflated by BV_{it}	Sum of Coeff	0.685	0.560	0.545	0.514	919
			AIC	7.309	7.310	7.312	7.316	
	3	Deflated by MV_{it-1}	Sum of Coeff	1.215	1.462	1.614	1.694	814
			AIC	3.640	3.580	3.542	3.523	
Pool	2	Deflated by BV_{it}	Sum of Coeff	1.130	1.285	1.220	1.221	5,339
			AIC	7.881	7.882	7.883	7.884	
	3	Deflated by MV_{it-1}	Sum of Coeff	1.027	1.193	1.275	1.364	4,276
			AIC	3.454	3.403	3.320	3.280	

Year	No	Type	Statistics	$\alpha_{D-2}\ (DC_{it-2})$	$\alpha_{D-3}\ (DC_{it-3})$	$\alpha_{D-4}\ (DC_{it-4})$	$\alpha_{D-5}\ (DC_{it-5})$	Obs
1995	2	Deflated by BV_{it}	Sum of Coeff	1.800	2.100	2.585	2.332	1,114
			AIC	5.266	5.266	5.265	5.272	
	3	Deflated by MV_{it-1}	Sum of Coeff	4.055	4.881	5.249	5.395	874
			AIC	3.195	3.172	3.090	2.987	
1996	2	Deflated by BV_{it}	Sum of Coeff	2.768	2.746	2.582	2.470	1,155
			AIC	5.490	5.494	5.495	5.497	
	3	Deflated by MV_{it-1}	Sum of Coeff	3.556	4.229	4.143	4.883	863
			AIC	2.974	2.963	2.604	2.464	
1997	2	Deflated by BV_{it}	Sum of Coeff	4.227	4.121	3.905	4.000	1,122
			AIC	6.057	6.063	6.076	6.085	
	3	Deflated by MV_{it-1}	Sum of Coeff	2.284	3.231	4.183	5.172	886
			AIC	3.045	2.980	2.930	2.730	
1998	2	Deflated by BV_{it}	Sum of Coeff	2.493	2.403	2.450	2.623	1,023
			AIC	6.479	6.482	6.483	6.484	
	3	Deflated by MV_{it-1}	Sum of Coeff	2.678	3.196	3.711	4.466	833
			AIC	2.935	2.920	2.877	2.835	
1999	2	Deflated by BV_{it}	Sum of Coeff	1.367	1.172	0.790	0.924	919
			AIC	7.322	7.323	7.323	7.324	
	3	Deflated by MV_{it-1}	Sum of Coeff	3.196	3.884	4.295	4.748	814
			AIC	3.700	3.669	3.660	3.639	
Pool	2	Deflated by BV_{it}	Sum of Coeff	2.016	2.140	1.909	2.010	5,339
			AIC	7.885	7.886	7.885	7.886	
	3	Deflated by MV_{it-1}	Sum of Coeff	1.899	2.454	2.782	3.125	4,276
			AIC	3.557	3.534	3.450	3.415	

From Table 6.15a-c, for EDBV, the median $\bar{R}^2$ of *RD, HR* and *DC* are 0.15, 0.13, 0.07 (cross-section) and 0.12, 0.09 and 0.09 (pool) respectively. For EDMV-N, the median $\bar{R}^2$ of *RD, HR* and *DC* = –0.63, –0.48 and –0.54 (cross-section) and –0.63, –0.66 and –0.66 (pool) respectively. Though all the $\bar{R}^2$s of EDBV are low, they are higher than EDMV-N since all the median $\bar{R}^2$ of the later are negatives as in Akbar (2000). The poor median explanatory powers from both cross-sectional and pooled estimations for Prop-VM are due to the exclusion of an intercept.

The medians for the estimated coefficients of *RD* in Table 6.15a appears to be erratic with positive and negative signs for EDBV and EDMV-N. Only current *RD* (α_R) and lag-4 *RD* (α_{R-4}) (EDBV and EDMV-N) provides consistent information content beyond *BV* and *RI* in explaining market value. Similar to *RD*, the medians for the estimated coefficients of *HR* (α_H, α_{H-1}, α_{H-2}, α_{H-3}, α_{H-4}) in Table 6.15b are erratic with positive and negative signs where only current *HR* in both EDBV and EDMV-N provides consistent information beyond *BV* and *RI* in explaining market value. Like *RD* and *HR*, the medians for the estimated coefficients of *DC* in Table 6.15c are either positives or negatives for EDBV and EDMV-N with only current *DC* (EDBV and EDMV-N) provides consistent information content beyond *BV* and *RI* in explaining market value. This evidence shows that only lag-4 and current *RD*, current *HR* and *DC* are value relevant in explaining *MV* using either EDBV or EDMV-N, suggesting that *RD* may be long-lived but *DC* and *HR* are short-lived, inconsistent with findings that *HR* may be long-lived in Prop-LID.

In Table 6.16a, most of the estimated coefficients of *RD* are significant and of the correct sign (*t*-stat), particularly for α_R (25 and 20 for EDBV and EDMV-N respectively cross-sectionally and five for either equation in the pool). There are more number with the incorrect signs that are significant for α_{R-1} [6 (8)] (cross-section), α_{R-1} and α_{R-2} [4 (5) and 3 (6) respectively] (pool).

In Table 6.16b, α_H has the most numbers of significantly correct (incorrect) signs (*t*-stat), ie 25 (0) and 23 (1) for EDBV and EDMV-N respectively cross-sectionally and 5 (0) for EDBV and EDMV-N from pool estimations. For cross-sectional data, the number of significant α_{H-1}, α_{H-2} and α_{H-4} with the wrong signs outnumber that of the correct signs for both EDBV and EDMV-N. The results for the pooled data are mixed with positive and negative significant coefficients for EDBV and EDMV-N.

In Table 6.16c, the coefficients are erratic, either with positive or negative signs and neither EDBV nor EDMV-N outperforms the other for cross-sectional or pooled data. For most coefficients, the signs for EDBV and EDMV-N are inconsistent, for example, cross-sectionally the number of significant α_{D-1} with the correct (incorrect) signs for EDBV and EDMV-N are 0 (4) and 8 (4) respectively.

As in all previous estimations, results of estimated coefficients using White's heteroscedasticity test (*h*-stat) overstate the standard errors of coefficients, thereby reducing (increasing) the number of significant coefficients with the correct (incorrect) signs. In general, the net effect (ie number of significant coefficients with the correct signs minus the incorrect signs) between *t*- and *h*-stat of *RD, HR* and *DC* deteriorates, eg the total number of significant *RD* for EDMV-N estimated cross-sectionally reduces from 65 to 36 (Table 6.16a).

As the results of the median coefficients of *RD, HR* and *DC* indicate that they are likely to be short-lived, more robust techniques are needed to test for the longetivity for these coefficients. *RD, HR* and *DC* lags are then run from lag 1 to 5 years with a 2-degree polynomial. Lag 1 and higher degrees polynomial are not possible due to near perfect multicollinearity. Unlike Prop-LID where $\overline{R}^2$ is used to estimate for the lag coefficients, AIC is used here as the $\overline{R}^2$s for all of EDMV-N are negatives, which make them difficult to interpret. From Table 6.17a-b, results of Almon Polynomials fitted to estimate the lagged *RD, HR* and *DC* coefficients are consistent in which the sum of coefficients and AIC of *RD, HR* and *DC* stop increasing (decreasing) in (1) lag 2 for all years and pool for EDBV and (2) in lag 5 for almost all years (except in 1995 for *RD*) and pool for EDMV-N. As a matter of curiosity, results from estimating lagged *RD/MV* with an intercept is included (2nd. Table of Table 6.17a). Notice that the lags for equations with intercept are inconsistent as compared with those without an intercept. Thus, evidence from the Polynomials is interesting as it indicates that lag results were influenced by the intercept and deflator as the results consistently show that for EDBV, only current *RD, HR* and *DC* are relevant and no lag is required in explaining market value, but for EDMV-N, lagged-5 are relevant in explaining market value. More interestingly, it is the result from EDMV-N that is consistent with findings of lag of 3 and 4 for *RD* in Sougiannis (1994) and Green et al. (1996) in which both use closing book value as the deflator. However, their specifications are slightly different. In Sougiannis, advertisement costs are included in his

specification while Green et al. include a constant term but left out book value as an independent variable and the dependent variable is specified as $MV_{it} - BV_{it}$. As in this study, Sougiannis use Polynomial tests to determine the lag of *RD*, while Green et al. use a growth *(g)* ratio $\left(\frac{1+r}{1-g}\right)^{n}-1 \Big/ \left(\frac{1+r}{1-g}\right)-1$ [4] to determine the lag of *RD*. In general, the contradictory results from Polynomial test for EDBV and EDMV-N in this section contrast that of Prop-LID in which the results using EDBV and EDMV are consistent.

In summary, results from *t*-, *h*- and Polynomials tests for *RD, HR* and *DC* are mixed, and hence, inferences of their longetivity cannot be determined. However, evidence from *t*- and *h*-tests strongly support that current *RD, HR* and *DC* have information content beyond current *BV* and *RI* in the valuation model, implying that the Prop-VM ought to include these variables in addition to current *BV* and *RI*. Analysis of $\overline{R}^2$ indicates that all of the explanatory powers for EDMV-N are negatives, due to the exclusion of an intercept. Once again, results of estimated coefficients using White's heteroscedasticity test understate the test statistics (*h*-stat), thereby reducing the number of significant coefficients.

[4] where r = interest rate and n = number of years. For example, if $g = 0$, $r = 10\%$, $n = 3$, the magnitude of the estimated coefficient of *RD* □ 3.31.

6.5. Analysis of the Results from Estimating the Main Regression Equations containing lagged *Operating Assets (OA)*

This section examines the impact of lagged *OA* as against current *OA* on the Prop-VM using cross-sectional and pool data. The motivation for this investigation stems from the theoretical justification in Feltham and Ohlson (1996) that if CI_t is included in the linear information dynamics, conservatism is measured by OA_{t-1} not OA_t. Since sample where $BV \geq$ £5 millions and $r = 10\%$ for the deflated equations without an intercept gives the best statistical and econometric result as compared with other samples with/without outliers using $r = 15\%$ or 20% in the previous sections, all the tests in this section will be based on this sample estimated using deflated equations with an inverse of size term. The estimations using OLS are conducted by including OA_{t-1} instead of OA_t in MModel 1 to 8. The models are run on (1) equation deflated by closing book values (EDBV); and (2) equation deflated by opening market value of equity (EDMV-N). The estimations are first carried out by regressing cross-sectionally for each of the sample years from 1991 to 1999 (9 annual cross-sections). The data is then pooled over the entire sample periods to be estimated on a pooling basis. All regressions including the generation of output and statistical analysis are done automatically by specially self-written computer programs. The estimation basis and the numbers of regression runs are summarized as follows:

#	Basis	Estimation Type	Type *X* Equations *X* Years	Total
1	$BV \geq$ £5 millions, $r = 10\%$	Annual cross-section	3 X 8 X 9	216
		Pooled entire sample	3 X 8	24
Total				240

Table 6.18 – Estimation Basis, Type, and the Number of Regression Runs

Results from medians and percentiles, and the number of significant coefficients of all equations from cross-sectional and pooled data are depicted in Tables 6.19 and 6.20 respectively. Selected details of estimated coefficients and associated statistics for the undeflated equations are in **Appendix 6.2**.

From Table 6.19, cross-sectional and pool median $\overline{R}^2$s in equations that include one-period lag *OA* (LagOA) for EDBV and EDMV-N are 0.05, 0.03 and –0.49, –0.39 respectively, which are identical to the median $\overline{R}^2$s in equations that include current *OA* (CurOA) (Table 6.8). The cross-sectional and pool median $\overline{RSS}$ for EDBV and EDMV-N of LagOA are 55.97, 151.32 and 1.6, 2.25 respectively, which are slightly inferior to those in equations that include current *OA* (CurOA).

Table 6.19 - Medians and Percentiles of Estimated Coefficients, Adj. R^2 and RSS from Cross-sectional and Pool Estimations of Equations with Lagged OA deflated by BV_{it} and MV_{it-1} for Sample where $BV \geq$ £5 Millions and r = 10%

	Statistics	$\alpha_0 (BV_{it})$	$\alpha_1 (RI_{it})$	$\alpha_{2'} (OA_{it-1})$	$\alpha_3 (CI_{it})$	$\alpha_4 (RD_{it})$	$\alpha_5 (HR_{it})$	$\alpha_6 (DC_{it})$	$\alpha_7 (TD_{it})$	$\alpha_8 (DIV_{it})$	$A\text{-}R^2$	$\overline{RSS}$
Deflated by BV_{it}												
Cross-sectional	Median	1.69	2.08	0.31	1.17	11.31	0.23	0.42	0.05	14.14	0.05	54.97
	25% Percentile	1.13	1.75	0.10	0.74	9.76	0.01	0.12	-0.22	7.93	0.01	16.59
	75% Percentile	2.32	2.85	0.51	2.11	13.61	0.73	0.96	0.92	16.80	0.25	83.11
Pool	Median	1.54	2.04	0.35	1.60	12.57	0.37	0.30	0.52	14.06	0.03	151.32
	25% Percentile	1.37	1.85	0.18	1.43	12.32	0.29	0.16	0.50	14.06	0.02	151.15
	75% Percentile	1.79	2.05	0.43	1.75	13.41	0.40	0.34	1.09	15.42	0.04	153.46
Deflated by MV_{it-1}												
Cross-sectional	Median	0.35	-0.27	-0.08	0.10	6.11	0.33	0.55	-0.02	0.73	-0.49	1.60
	25% Percentile	0.19	-0.46	-0.18	-0.03	4.78	0.09	0.34	-0.10	-0.84	-1.81	1.08
	75% Percentile	0.52	0.34	-0.01	0.22	8.27	0.55	0.74	0.06	3.34	-0.20	2.43
Pool	Median	0.28	0.06	-0.07	0.02	6.42	0.41	0.12	-0.12	-0.82	-0.39	2.25
	25% Percentile	0.25	0.05	-0.07	-0.02	6.40	0.40	0.12	-0.12	-0.82	-0.46	2.11
	75% Percentile	0.40	0.07	-0.04	0.07	6.43	0.41	0.13	-0.12	-0.82	-0.36	2.27

Annual samples (1991-1999) range from 884 to 1,157 observations and the pooled samples consist of 8,666 to 9,302 observations. Regressions with NO intercept are run from Prop-VM':

MModel 1 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it+1}$

MModel 2 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \omega_2 OA_{it-1} + e_{it+1}$

MModel 3 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + e_{it+1}$

MModel 4 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + e_{it+1}$

MModel 5 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + e_{it+1}$

MModel 6 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \varepsilon_{it+1}$

MModel 7 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + e_{it+1}$

MModel 8 $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it+1}$

Table 6.20 - Number of Significant Coefficients from Cross-sectional and Pool Estimations with Lagged *OA* for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it-1})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
1991	2	Defl. by BV_{it}	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	3	Defl. by MV_{it-1}	7	1	7	0	6	1	4	0	5	0	3	0	0	0	2	0	1	0	35	2
1992	2	Defl. by BV_{it}	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
	3	Defl. by MV_{it-1}	8	0	8	0	2	0	0	5	0	4	4	0	0	3	0	2	0	1	22	15
1993	2	Defl. by BV_{it}	7	0	6	0	6	0	0	0	3	0	3	0	2	0	0	0	1	0	28	0
	3	Defl. by MV_{it-1}	8	0	0	8	0	7	6	0	5	0	0	3	3	0	0	0	0	0	22	18
1994	2	Defl. by BV_{it}	7	0	6	0	6	0	0	0	3	0	3	0	2	0	0	0	1	0	28	0
	3	Defl. by MV_{it-1}	8	0	0	8	0	7	6	0	5	0	0	3	3	0	0	0	0	0	22	18
1995	2	Defl. by BV_{it}	8	0	8	0	5	0	6	0	5	0	0	0	2	0	0	1	1	0	35	1
	3	Defl. by MV_{it-1}	8	0	0	7	0	5	6	0	5	0	4	0	3	0	0	2	0	1	26	15
1996	2	Defl. by BV_{it}	8	0	8	0	7	0	6	0	5	0	4	0	2	0	0	1	1	0	41	1
	3	Defl. by MV_{it-1}	8	0	8	0	0	4	0	2	5	0	4	0	3	0	0	0	0	0	28	6
1997	2	Defl. by BV_{it}	6	0	8	0	5	0	6	0	5	0	4	0	2	0	2	0	1	0	39	0
	3	Defl. by MV_{it-1}	7	0	0	6	1	0	2	0	5	0	2	0	3	0	0	2	1	0	21	8
1998	2	Defl. by BV_{it}	8	0	7	0	5	2	6	0	5	0	4	0	0	3	2	0	1	0	38	5
	3	Defl. by MV_{it-1}	8	0	0	8	0	6	0	6	5	0	4	0	3	0	2	0	1	0	23	20
1999	2	Defl. by BV_{it}	8	0	7	0	3	2	6	0	5	0	0	0	0	1	2	0	1	0	32	3
	3	Defl. by MV_{it-1}	1	0	7	0	0	7	6	0	5	0	4	0	3	0	0	0	0	0	26	7
Total	2	Defl. by BV_{it}	57	0	50	0	37	4	30	0	31	0	18	0	10	4	6	2	7	0	246	10
	3	Defl. by MV_{it-1}	63	1	30	37	9	37	30	13	40	4	25	6	21	3	4	6	3	2	225	109
Pool	2	Defl. by BV_{it}	8	0	8	0	5	1	6	0	5	0	3	0	0	0	2	0	1	0	38	1
	3	Defl. by MV_{it-1}	8	0	7	0	0	5	2	1	5	0	4	0	3	0	0	2	0	1	29	9

Annual cross-sectional and pool samples consist of 884 to 1,157 and 8,666 to 9,302 observations respectively. Regressions are run from MModel 1 to 8:

Deflated by BV_{it} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Deflated by MV_{it-1} (no intercept) $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + e_{it}$ to $MV_{it} = \alpha_B + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + e_{it}$

Hence BV_{it}, RI_{it}, OA_{it}, CI_{it}, RD_{it}, HR_{it}, DC_{it}, TD_{it} *and* DIV_{it} are included 8, 7, 6, 5, 4, 3, 2, and 1 time respectively in each equation. Numbers are in t-statistics of coefficients with at 10% statistically significant. Exp = expected signs and UnExp = unexpected signs.

From Tables 6.20 and 6.3a, the total number of significant coefficients with the correct (incorrect) signs in LagOA and CurOA for EDBV are 246 (10) vs. 245 (8) (cross-section); and 38 (1) vs. 38 (0) (pool). The corresponding figures for EDMV-N are 225 (109) vs. 219 (97) (cross-section); and 29 (9) vs. 32 (8) (pool), and the most marked difference are α_2 and α_3 with 3 (19) (CurOA) vs. 9 (37) (LagOA) and 42 (5) (CurOA) vs. 30 (13) (LagOA) respectively. The results indicate there are more significant coefficients with the correct signs in CurOA than LagOA for EDMV-N.

For EDBV, both the cross-sectional and pool median coefficients for all variables are positives in both CurOA and LagOA. CurOA has slightly higher estimated coefficients for *RI* (2.1 vs. 2.08), *RD* (11.88 vs. 11.31), *HR* (0.26 vs. 0.23), *DC* (0.45 vs. 0.42), *TD* (0.07 vs. 0.05) (cross-section) and *OA* (0.41 vs. 0.35), *HR* (0.4 vs. 0.37) (pool) than LagOA, whereas LagOA has slightly higher coefficients for *BV, OA, CI* and *DIV* (cross-section) and *BV, RI, CI, TD* and *DIV* (pool). For EDMV-N, LagOA has one more positive coefficient than CurOA (ie *DIV*: 0.73 vs. –0.53) but the former has more number of lower coefficients [*RI, OA, CI* (pool), *RD, DC* (pool)]. Except for α_8 (*DIV*) in EDMV-N (CurrOA: –0.53 vs. 0.73 for LagOA), there is little difference in the magnitudes of the rest of the estimated coefficients in EDBV and EDMV-N[5]. Closer examination reveals that one of the nine α_8 is exceptionally large, ie 12.84. For EDBV, cross-sectional and pool median α_2, (LagOA) = 0.31 and 0.35 respectively vs. 0.28 and 0.41 respectively (CurOA). The corresponding figures for EDMV-N are –0.08 and –0.07 (LagOA) and –0.04 and –0.04 (CurOA). The median α_2, (OA_{t-1}) is much lower than 4.047 in Ahmed et al. (2000). However, Ahmed et al. use per share basis and their dependent variable is unrecognised goodwill (ie $MV_{it} - BV_{it}$) instead of MV_{it} as used in this study. This shows that the magnitude of the coefficient of OA_t is slightly better than OA_{t-1}.

Overall, results using various tests and analysis indicate that the models estimated using OA_t is slightly better than OA_{t-1} but only those under EDBV are valid but its values are moderate. If we assume there is no measurement error for OA_t and OA_{t-1}, then OA_t instead of OA_{t-1} is the one to measure conservatism in Prop-VM and probably Prop-LID.

[5] to be considered as better, the difference in magnitudes must be at least 10%.

6.6. Analysis of the Results from Estimating the Ohlson-Feltham Model (OFM), Ohlson-Feltham Model+Intangible Assets (OFM+IA) and the Proposed Residual Income Valuation Model (Prop-VM)

In this final section, comparisons are made on the three valuation models based on (A) **Ohlson-Feltham Model** or **OFM** (*BV, RI, OA, CI*) ie MModel 3 of Prop-VM (B) **OFM + IA** (the three intangible proxies, *RD, HR, DC*) ie MModel 6 of Prop-VM; and (C) **OFM + IA + Sig** (the two signalling proxies, *TD, DIV*) ie MModel 8 of Prop-VM to determine which one of these models provide the most appropriate predictor (explanator) of market value. Estimations of the coefficients for the three valuation models are carried out (1) if they are the same across all firms within each year (pool); (2) by allowing the coefficients to vary cross-sectionally within each year (pool), as a function of parameters estimated from the Prop-LID; and (3) by allowing the coefficients to vary cross-sectionally within each year (pool), as a function of parameters estimated from the linear information models. Estimations for (1) and (2) were carried out earlier and hence only (3) are required to be estimated by regressing cross-sectionally and by pooling the sample where $BV \geq$ £5 millions and r = 10% for the period from 1991 to 1999. The estimation basis and the numbers of regression runs are summarized as follows:

Basic	Estimation Type	Type *X* Equations *X* Years	Total
$BV \geq$ £5 millions and r = 10%	Annual cross-section	2 X 8 X 9	144
	Pooled entire sample	2 X 8	16
Total			160

Table 6.21 – Estimation Basis, Type, and the Number of Regression Runs

For (2) and (3), the coefficients estimated from the linear information dynamics are then fed into the parameters of the closed-form VM, after which forecast errors are calculated and generated. Details of coefficients, adjusted R^2 and forecast errors of the three VMs estimated cross-sectionally and the pool are shown in Table 6.22a-b. Results from coefficients estimated from the Prop-LID and parameters and forecast errors of the VMs are depicted in Table 6.23a-b. The final analysis of the three VMs using the parameters estimated from the linear models (LID1 to 8) is contained in Table 6.24a while the parameters and forecast errors of the closed-form VMs are reported in Table 6.24b. As the amount of information generated is voluminous, cross-sectional results are only reported from 1995 onwards, and results for undeflated equations are in **Appendix 6.1.**

Table 6.22a - Coefficients, Adj. R^2 and Forecast Errors of (A) OFM (B) OFM+IA and (C) Full Prop-VM Models, all deflated by $\underline{BV}$ from Cross-sectional and Pool Estimations, for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	Adj-R^2	F-Test	MAFE	MSFE	Obs
1995	1	OFM	Coeff	7,262,967.999	1.982	2.434	0.076	1.603						0.092	***29.264	1.731	10.86	1,114
			t-Stat	***(3.629)	**(10.589)	***(6.177)	(1.024)	***(7.116)										
			h-Stat	**(2.399)	***(5.422)	**(2.070)	(0.343)	***(4.828)										
	2	OFM+IA	Coeff	4,806,600.082	1.556	3.091	0.104	0.858	15.445	0.145	0.761			0.247	***53.066	1.534	8.986	1,114
			t-Stat	**(2.574)	***(8.622)	***(8.439)	(1.521)	***(4.061)	**(14.175)	(1.230)	***(2.867)							
			h-Stat	(1.501)	***(5.109)	***(3.207)	(0.617)	***(2.747)	***(6.033)	(1.235)	*(1.830)							
	3	Prop-VM	Coeff	5,769,477.635	1.142	1.352	0.082	0.675	13.689	0.053	0.381	-0.172	10.910	0.326	***60.918	1.409	8.023	1,114
			t-Stat	***(3.264)	***(6.301)	***(3.576)	(0.676)	***(3.354)	**(13.130)	(0.471)	(1.487)	(-0.995)	**(11.396)					
			h-Stat	*(1.838)	***(3.656)	*(1.916)	(0.324)	**(2.076)	***(5.637)	(0.499)	(1.258)	(-0.627)	***(3.278)					
1996	1	OFM	Coeff	4,542,566.952	1.742	2.756	0.418	1.172						0.136	***46.572	2.002	13.32	1,157
			t-Stat	**(2.063)	***(9.427)	***(8.218)	***(7.042)	***(6.197)										
			h-Stat	*(1.882)	***(5.431)	**(2.410)	**(2.202)	**(2.381)										
	2	OFM+IA	Coeff	1,601,028.868	1.021	3.040	0.376	0.870	11.900	0.687	1.011			0.254	***57.144	1.767	11.48	1,157
			t-Stat	(0.776)	***(5.561)	***(9.668)	***(6.680)	***(4.890)	**(10.286)	***(5.396)	***(3.431)							
			h-Stat	(0.705)	***(2.926)	***(3.117)	**(2.420)	*(1.937)	***(4.350)	***(3.545)	(1.635)							
	3	Prop-VM	Coeff	4,987,232.391	0.649	1.379	0.128	0.465	10.633	0.295	0.178	-0.084	17.227	0.43	***97.906	1.565	8.737	1,157
			t-Stat	***(2.751)	***(3.953)	***(4.636)	(1.355)	***(2.937)	**(10.494)	***(2.603)	(0.678)	(-0.566)	**(18.874)					
			h-Stat	**(2.273)	***(2.723)	**(2.578)	(0.669)	*(1.684)	***(4.534)	*(1.774)	(0.489)	(-0.391)	***(5.164)					
1997	1	OFM	Coeff	504,463.511	1.387	4.018	0.685	2.748						0.241	***90.094	2.42	22.7	1,124
			t-Stat	(0.170)	***(6.107)	**(11.800)	**(15.794)	**(10.625)										
			h-Stat	(0.175)	***(3.128)	**(2.380)	***(2.839)	**(2.265)										
	2	OFM+IA	Coeff	-3,112,889.262	0.189	5.034	0.594	2.493	10.680	1.314	1.281			0.472	***127.31	2.072	15.71	1,124
			t-Stat	(-1.241)	(0.944)	**(16.507)	**(15.747)	**(11.494)	**(11.620)	***(9.233)	***(4.651)							
			h-Stat	(-1.233)	(0.516)	***(4.942)	***(5.498)	**(2.425)	***(7.198)	***(4.904)	***(3.240)							
	3	Prop-VM	Coeff	-879,648.072	-0.099	2.617	0.587	2.595	9.367	0.877	0.158	-0.271	12.863	0.533	***144.637	1.917	13.893	1,124
			t-Stat	(-0.371)	(-0.486)	***(7.396)	***(4.933)	**(12.709)	**(10.725)	***(6.290)	(0.573)	**(-2.011)	**(11.857)					
			h-Stat	(-0.366)	(-0.182)	**(2.500)	(1.115)	***(2.799)	***(6.781)	***(3.395)	(0.375)	(-0.469)	***(3.456)					
1998	1	OFM	Coeff	1,728,077.842	1.719	2.625	0.681	1.903						0.293	***146.843	2.922	27.26	1,025
			t-Stat	(0.523)	***(6.452)	***(6.427)	***(9.189)	**(11.808)										
			h-Stat	(0.501)	***(4.955)	***(2.744)	***(3.616)	***(3.180)										
	2	OFM+IA	Coeff	-3,772,543.078	0.801	2.180	0.545	1.709	11.104	1.487	-0.666			0.424	***108.651	2.484	22.1	1,025
			t-Stat	(-1.251)	***(3.196)	***(5.735)	***(7.886)	**(11.695)	***(9.306)	**(10.247)	*(-1.944)							
			h-Stat	(-1.293)	*(1.871)	***(2.660)	***(2.655)	***(3.160)	***(4.385)	***(4.583)	(-1.506)							
	3	Prop-VM	Coeff	-2,854,292.614	1.194	1.635	0.019	1.735	10.132	1.091	-0.910	0.587	4.335	0.447	***93.05	2.375	21.180	1,025
			t-Stat	(-0.964)	***(4.399)	***(4.262)	(0.159)	**(12.071)	***(8.597)	***(7.080)	***(-2.695)	***(4.601)	***(4.271)					
			h-Stat	(-1.016)	***(3.338)	**(2.193)	(0.085)	***(2.959)	***(3.736)	***(3.631)	*(-1.833)	***(2.956)	**(2.071)					

Table 6.22a - Coefficients, Adj. R^2 and Forecast Errors of (A) OFM (B) OFM+IA and (C) Full Prop-VM Models, all deflated by $\underline{BV}$ from Cross-sectional and Pool Estimations, for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	Adj-R^2	F-Test	MAFE	MSFE	Obs
1999	1	OFM	Coeff	16,420,298.042	2.550	2.327	0.420	1.967						0.093	***24.68	4.468	81.57	921
			t-Stat	***(2.694)	***(5.556)	***(3.916)	***(3.683)	***(6.414)										
			h-Stat	***(2.660)	***(3.477)	(1.561)	(1.318)	**(2.461)										
	2	OFM+IA	Coeff	13,379,331.537	1.623	1.892	0.255	2.674	28.617	0.381	-0.446			0.226	***39.451	3.864	69.38	921
			t-Stat	**(2.344)	***(3.709)	***(3.269)	*(1.824)	***(9.213)	**(12.330)	(1.607)	(-0.951)							
			h-Stat	**(2.364)	**(2.493)	*(1.755)	(0.999)	***(4.409)	***(7.867)	(0.472)	(-0.225)							
	3	Prop-VM	Coeff	15,895,065.626	1.972	0.564	-1.116	2.657	26.106	-0.224	-0.521	1.595	15.544	0.296	***43.978	3.628	63.006	921
			t-Stat	***(2.916)	***(4.187)	(0.990)	***(-4.464)	***(9.588)	**(11.710)	(-0.885)	(-1.150)	***(4.773)	***(7.662)					
			h-Stat	***(2.926)	***(3.980)	(0.764)	***(-4.384)	***(6.527)	***(7.190)	(-0.298)	(-0.295)	***(4.222)	***(3.381)					
Pool	1	OFM	Coeff	6,912,854.979	1.693	1.810	0.490	1.534						0.021	***50.901	2.426	153.3	9,302
			t-Stat	***(2.709)	***(8.100)	***(5.661)	***(8.314)	***(8.208)										
			h-Stat	**(2.353)	***(8.721)	***(3.444)	***(4.633)	***(4.278)										
	2	OFM+IA	Coeff	5,514,611.416	1.420	2.036	0.196	1.346	12.438	0.369	0.303	0.286		0.036	***49.69	2.2	151	9,302
			t-Stat	**(2.153)	***(6.130)	***(6.307)	(1.554)	***(7.229)	***(9.917)	**(2.560)	(1.023)	*(1.807)						
			h-Stat	*(1.775)	***(5.619)	***(4.404)	(1.199)	***(3.602)	***(6.712)	(1.613)	(0.602)	(1.251)						
	3	Prop-VM	Coeff	7,995,135.966	0.946	0.932	-0.021	1.310	10.703	0.131	0.006	0.328	13.479	0.047	***51.654	2.026	149.23	9,302
			t-Stat	***(3.126)	***(4.032)	***(2.760)	(-0.169)	***(7.079)	***(8.509)	(0.902)	(0.021)	**(2.082)	**(10.466)					
			h-Stat	***(2.645)	***(4.851)	**(2.400)	(-0.179)	***(3.722)	***(6.509)	(0.821)	(0.015)	**(1.972)	***(6.541)					

Comparison of three specifications (A) Ohlson-Feltham Framework (OFM), which is MModel 3 of Prop-VM (B) OFM + IA (Intangible Assets), which is MModel 6 of Prop-VM, and (C) Full Prop-VM (OFM + IA + TD + DIV), which is MModel 8 of Prop-VM, all deflated by $BVit$ are run from:

MModel 3 $MV_{it}=\alpha_B+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+e_{it+1}$

MModel 6 $MV_{it}=\alpha_B+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+\alpha_6 DC_{it}+e_{it+1}$

MModel 8 $MV_{it}=\alpha_B+\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+\alpha_6 DC_{it}+\alpha_7 TD_{it}+\alpha_8 DIV_{it}+e_{it+1}$

MAFE = Mean Absolute Forecast Errors, MSFE = Mean Square Forecast Errors. * , ** , *** = 90%, 95%, 99% confidence level respectively.

Table 6.22b - Coefficients, Adj. R^2 and Forecast Errors of (A) OFM (B) OFM+IA and (C) Full Prop-VM Models, all deflated by *MV* from Cross-sectional and Pool Estimations, for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	a_0 (BV_{it})	a_1 (RI_{it})	a_2 (OA_{it})	a_3 (CI_{it})	a_4 (RD_{it})	a_5 (HR_{it})	a_6 (DC_{it})	a_7 (TD_{it})	a_8 (DIV_{it})	Adj-R^2	F-Test	MAFE	MSFE	Obs
1995	1	OFM	Coeff	2,722,823.563	0.593	-1.308	-0.103	1.118						-0.585	***46.412	0.9186	1.6166	1,025
			t-Stat	***(3.533)	***(7.226)	***(-6.002)	***(-3.040)	***(9.507)										
			h-Stat	(1.145)	***(2.779)	(-1.297)	(-1.284)	***(2.903)										
	2	OFM+IA	Coeff	539,479.670	0.372	-0.844	-0.060	0.987	6.341	0.297	1.143			-0.404	***35.585	0.8339	1.4281	1,025
			t-Stat	(0.709)	***(4.454)	***(-4.009)	*(-1.860)	***(8.807)	***(5.849)	***(3.753)	***(6.735)							
			h-Stat	(0.246)	*(1.790)	(-0.792)	(-0.878)	***(2.767)	*(1.825)	(1.600)	***(3.148)							
	3	Prop-VM	Coeff	266,615.430	0.355	-0.281	0.092	0.985	6.083	0.358	1.128	-0.214	-2.521	-0.382	***55.058	0.8452	1.4023	1,025
			t-Stat	(0.350)	***(3.902)	(-0.994)	*(1.867)	***(8.860)	***(5.636)	***(4.493)	***(6.566)	***(-3.843)	**(-2.173)					
			h-Stat	(0.119)	(1.442)	(-0.463)	(0.844)	***(2.843)	*(1.784)	*(1.745)	***(2.906)	(-1.624)	(-0.559)					
1996	1	OFM	Coeff	5,907,097.207	0.412	0.240	-0.091	-0.024						-0.309	***70.541	0.9319	2.0038	1,049
			t-Stat	***(8.931)	***(5.080)	***(2.841)	**(-2.471)	(-0.745)										
			h-Stat	**(2.202)	*(1.762)	(0.876)	(-1.400)	(-0.269)										
	2	OFM+IA	Coeff	4,641,801.454	0.117	0.279	-0.053	0.063	4.756	0.518	0.677			-0.202	***47.989	0.8548	1.8351	1,049
			t-Stat	***(7.049)	(1.388)	***(3.392)	(-1.503)	*(1.939)	***(2.692)	***(6.865)	***(3.568)							
			h-Stat	**(2.150)	(0.529)	(1.066)	(-0.979)	(0.773)	*(1.661)	***(5.163)	(1.542)							
	3	Prop-VM	Coeff	4,191,304.443	0.145	0.287	-0.007	0.054	4.642	0.528	0.663	-0.067	-0.781	-0.203	***41.088	0.8553	1.8324	1,049
			t-Stat	***(5.154)	(1.273)	***(3.261)	(-0.120)	(1.313)	***(2.623)	***(6.945)	***(3.460)	(-0.885)	(-0.737)					
			h-Stat	**(2.479)	(0.979)	(1.138)	(-0.089)	(0.914)	(1.579)	***(4.638)	(1.551)	(-0.687)	(-0.313)					
1997	1	OFM	Coeff	5,137,606.246	0.199	-0.332	-0.039	0.036						-2.553	***10.351	0.9497	1.3281	1,040
			t-Stat	***(8.732)	***(3.183)	**(-2.185)	(-1.284)	(0.396)										
			h-Stat	***(3.791)	(1.171)	(-1.059)	(-0.569)	(0.172)										
	2	OFM+IA	Coeff	4,520,494.712	0.174	-0.192	-0.027	0.023	7.518	-0.064	0.308			-2.398	***7.654	0.9179	1.2665	1,040
			t-Stat	***(7.640)	**(2.325)	(-1.246)	(-0.899)	(0.253)	***(6.780)	(-0.964)	**(2.033)							
			h-Stat	***(3.901)	(1.132)	(-0.728)	(-0.475)	(0.119)	***(3.787)	(-0.401)	(1.157)							
	3	Prop-VM	Coeff	2,700,452.141	-0.002	-0.556	0.165	0.151	6.030	0.277	0.391	-0.405	2.600	-2.136	***8.307	0.852	1.166	1,040
			t-Stat	***(4.347)	(-0.029)	***(-3.453)	***(3.457)	*(1.690)	***(5.598)	***(3.691)	***(2.680)	***(-6.719)	***(3.443)					
			h-Stat	***(2.905)	(-0.016)	*(-1.868)	**(2.262)	(0.942)	***(3.539)	**(2.307)	(1.266)	***(-3.760)	(1.490)					
1998	1	OFM	Coeff	1,959,963.790	0.374	-0.521	-0.005	-0.278						-1.83	***10.637	0.8744	1.2549	958
			t-Stat	***(3.356)	***(5.651)	***(-3.826)	(-0.191)	***(-6.041)										
			h-Stat	*(1.663)	**(2.132)	*(-1.813)	(-0.072)	***(-2.712)										
	2	OFM+IA	Coeff	597,370.459	0.293	-0.475	-0.033	-0.178	5.549	0.332	0.551			-1.557	***10.553	0.8134	1.1301	958
			t-Stat	(1.028)	***(4.604)	***(-3.640)	(-1.184)	***(-3.955)	***(5.633)	***(4.453)	***(3.889)							
			h-Stat	(0.492)	**(1.998)	(-1.522)	(-0.547)	*(-1.881)	***(3.536)	***(3.325)	***(2.630)							
	3	Prop-VM	Coeff	556,401.266	0.304	-0.443	-0.036	-0.181	5.578	0.343	0.553	0.011	-0.342	-1.562	***11.16	0.8152	1.1299	958
			t-Stat	(0.929)	***(4.329)	***(-2.825)	(-0.691)	***(-3.902)	***(5.628)	***(4.272)	***(3.886)	(0.155)	(-0.427)					
			h-Stat	(0.481)	*(1.774)	**(-2.020)	(-0.453)	*(-1.818)	***(3.624)	***(3.803)	***(2.704)	(0.104)	(-0.205)					

Table 6.22b - Coefficients, Adj. R^2 and Forecast Errors of (A) OFM (B) OFM+IA and (C) Full Prop-VM Models, all deflated by *MV* from Cross-sectional and Pool Estimations, for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	a_0 (BV_{it})	a_1 (RI_{it})	a_2 (OA_{it})	a_3 (CI_{it})	a_4 (RD_{it})	a_5 (HR_{it})	a_6 (DC_{it})	a_7 (TD_{it})	a_8 (DIV_{it})	A-R^2	F-Test	MAFE	MSFE	Obs
1999	1	OFM	Coeff	9,312,320.519	0.029	0.416	-0.066	0.515						-0.439	***14.628	1.1774	3.8863	884
			t-Stat	***(8.166)	(0.214)	*(1.884)	(-1.046)	***(3.657)										
			h-Stat	***(2.899)	(0.098)	(0.886)	(-0.493)	*(1.863)										
	2	OFM+IA	Coeff	8,083,898.957	-0.103	0.783	-0.115	0.618	10.656	0.512	0.474			-0.316	***11.757	1.0868	3.5435	884
			t-Stat	***(7.285)	(-0.797)	***(3.610)	*(-1.848)	***(4.442)	***(6.523)	***(4.100)	**(1.968)							
			h-Stat	***(2.691)	(-0.441)	*(1.698)	(-1.276)	**(2.259)	***(3.969)	***(3.720)	**(2.103)							
	3	Prop-VM	Coeff	7,622,838.420	-0.177	0.825	0.072	0.592	10.625	0.560	0.435	-0.283	-0.530	-0.314	***9.553	1.081	3.529	884
			t-Stat	***(6.626)	(-1.244)	***(3.553)	(0.610)	***(4.172)	***(6.505)	***(4.381)	*(1.794)	*(-1.797)	(-0.564)					
			h-Stat	***(2.747)	(-0.634)	(1.606)	(0.347)	**(2.194)	***(3.937)	***(3.711)	**(1.998)	(-0.990)	(-0.496)					
Pool	1	OFM	Coeff	3,362,405.246	0.402	0.092	-0.052	0.007						-0.465	***221.942	0.957	2.2788	8,666
			t-Stat	***(18.101)	**(18.754)	***(3.447)	***(-5.615)	(0.378)										
			h-Stat	***(3.568)	***(3.376)	(0.824)	(-1.092)	(0.073)										
	2	OFM+IA	Coeff	2,713,000.821	0.150	-0.003	0.080	0.099	6.329	0.426	0.123	-0.204		-0.346	***159.054	0.8983	2.1227	8,666
			t-Stat	***(14.878)	***(6.541)	(-0.121)	***(5.692)	***(5.185)	**(13.043)	**(18.210)	**(2.385)	**(-11.132)						
			h-Stat	***(3.074)	(1.470)	(-0.031)	(0.967)	(1.019)	***(3.888)	**(2.075)	(0.534)	*(-1.959)						
	3	Prop-VM	Coeff	2,488,238.595	0.185	0.038	0.085	0.090	6.441	0.430	0.131	-0.203	-1.012	-0.344	***180.595	0.904	2.0899	8,666
			t-Stat	***(12.866)	***(7.390)	(1.295)	***(6.065)	***(4.625)	**(13.252)	**(18.354)	**(2.550)	**(-11.126)	***(-3.472)					
			h-Stat	**(2.195)	(1.495)	(0.284)	(1.119)	(0.885)	***(4.236)	**(2.062)	(0.593)	**(-2.002)	(-0.483)					

Comparison of three specifications (A) Ohlson-Feltham Framework (OFM), which is MModel 3 of Prop-VM (B) OFM + IA (Intangible Assets), which is MModel 6 of Prop-VM, and (C) Full Prop-VM (OFM + IA + *TD* + *DIV*), which is MModel 8 of Prop-VM, all deflated by MV_{it} are run from:

MModel 3 $MV_{it}=\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+e_{it+1}$

MModel 6 $MV_{it}=\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+\alpha_6 DC_{it}+e_{it+1}$

MModel 8 $MV_{it}=\alpha_0 BV_{it}+\alpha_1 RI_{it}+\alpha_2 OA_{it}+\alpha_3 CI_{it}+\alpha_4 RD_{it}+\alpha_5 HR_{it}+\alpha_6 DC_{it}+\alpha_7 TD_{it}+\alpha_8 DIV_{it}+e_{it+1}$

MAFE = Mean Absolute Forecast Errors, MSFE = Mean Square Forecast Errors. * , ** , *** = 90%, 95%, 99% confidence level respectively.

Table 6.23a - Coefficients estimated from Prop-LID, deflated by BV (top) and MV for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Year	No	Type	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	Obs
1995	1	OFM	0.502	0.024	0.106						1,114
	2	OFM+IA	0.479	0.022	0.104	-0.161	0.034	0.049			
	3	Prop-VM	0.380	0.010	0.092	-0.265	0.027	0.032	0.008	0.632	
1996	1	OFM	0.335	0.021	0.073						1,157
	2	OFM+IA	0.353	0.016	0.061	-0.153	0.065	0.009			
	3	Prop-VM	0.262	0.008	0.041	-0.221	0.045	-0.036	-0.013	0.903	
1997	1	OFM	0.227	0.033	0.080						1,124
	2	OFM+IA	0.298	0.026	0.063	0.469	0.036	0.208			
	3	Prop-VM	0.281	-0.084	0.064	0.368	0.008	0.181	0.121	0.622	
1998	1	OFM	0.689	-0.016	-0.064						1,025
	2	OFM+IA	0.623	-0.030	-0.069	0.012	0.108	0.069			
	3	Prop-VM	0.557	-0.061	-0.063	-0.066	0.071	0.044	0.025	0.666	
1999	1	OFM	-0.088	0.054	0.532						921
	2	OFM+IA	0.186	0.154	0.486	-0.828	0.015	-0.543			
	3	Prop-VM	-0.155	0.027	0.469	-1.408	-0.010	-0.475	0.020	4.972	
Pool	1	OFM	0.260	0.020	0.114						9,302
	2	OFM+IA	0.260	0.021	0.113	0.038	0.028	-0.067			
	3	Prop-VM	0.108	-0.012	0.108	-0.204	-0.006	-0.108	0.010	1.867	
1995	1	OFM	0.621	0.024	-0.072						1,025
	2	OFM+IA	0.609	0.024	-0.074	-0.744	0.016	0.089			
	3	Prop-VM	0.422	-0.016	-0.069	-0.724	-0.005	0.075	0.036	1.299	
1996	1	OFM	0.290	0.045	-0.012						1,049
	2	OFM+IA	0.322	0.033	-0.032	0.752	0.081	-0.198			
	3	Prop-VM	0.214	0.002	0.007	0.470	0.080	-0.153	-0.009	1.607	
1997	1	OFM	0.146	0.051	0.047						1,040
	2	OFM+IA	0.147	0.044	0.045	-0.103	0.041	-0.111			
	3	Prop-VM	0.085	-0.069	0.016	-0.146	-0.016	-0.071	0.123	2.444	
1998	1	OFM	0.678	-0.033	-0.036						958
	2	OFM+IA	0.674	-0.026	-0.030	-0.068	-0.072	0.010			
	3	Prop-VM	0.495	-0.066	-0.064	-0.233	-0.108	0.008	0.045	1.438	
1999	1	OFM	0.591	-0.005	0.083						884
	2	OFM+IA	0.554	-0.004	0.074	-0.553	0.005	-0.151			
	3	Prop-VM	0.527	0.029	0.113	-0.561	-0.004	-0.148	-0.096	0.392	
Pool	1	OFM	0.456	-0.002	0.045						8,666
	2	OFM+IA	0.447	-0.008	0.040	-0.247	0.049	-0.065			
	3	Prop-VM	0.408	-0.091	0.009	-0.287	0.032	-0.062	0.093	1.639	

All these regressions were run under the following RI information dynamics (Prop-LID) as in Chapter 5.

OFM $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + e_{it}$

OFM+IA $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it}$

Prop-VM $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$

Information of above were obtained from **Table 5.12**.

Table 6.23b - Parameters and Forecast Errors of (A) OFM (B) OFM+IA and (C) Full Prop-VM Models, deflated by *BV* (top) and *MV* from Closed-form Estimations (Prop-LID) for Sample where *BV* ≥ £5 Millions and *r* = 10%

Year	No	Type	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	MAFE	MSFE	Obs
1995	1	OFM	0.84	0.05	0.21						1.90	14.73	1,114
	2	OFM+IA	0.80	0.04	0.21	-0.33	0.07	0.10			1.86	14.54	
	3	Prop-VM	0.64	0.02	0.19	-0.54	0.05	0.06	0.02	1.28	1.83	14.22	
1996	1	OFM	0.44	0.03	0.12						2.07	18.77	1,157
	2	OFM+IA	0.46	0.03	0.10	-0.24	0.10	0.01			2.03	18.49	
	3	Prop-VM	0.34	0.01	0.06	-0.35	0.07	-0.06	-0.02	1.43	2.00	17.96	
1997	1	OFM	0.26	0.05	0.11						2.30	33.78	1,124
	2	OFM+IA	0.34	0.04	0.09	0.65	0.05	0.29			2.23	32.32	
	3	Prop-VM	0.32	-0.12	0.09	0.51	0.01	0.25	0.17	0.86	2.37	35.87	
1998	1	OFM	1.68	-0.05	-0.19						3.77	55.24	1,025
	2	OFM+IA	1.52	-0.09	-0.20	0.04	0.32	0.20			2.73	46.40	
	3	Prop-VM	1.36	-0.18	-0.19	-0.19	0.21	0.13	0.07	1.96	2.73	46.15	
1999	1	OFM	-0.07	0.06	0.54						3.69	99.49	921
	2	OFM+IA	0.16	0.16	0.50	-0.84	0.02	-0.55			3.70	100.46	
	3	Prop-VM	-0.13	0.03	0.48	-1.43	-0.01	-0.48	0.02	5.06	3.60	96.92	
Pool	1	OFM	0.31	0.03	0.16						2.31	160.68	8,666
	2	OFM+IA	0.31	0.03	0.16	0.05	0.04	-0.10			2.30	160.58	
	3	Prop-VM	0.13	-0.02	0.16	-0.29	-0.01	-0.16	0.01	2.69	2.24	159.67	
1995	1	OFM	1.30	0.06	-0.18						2.32	19.24	1,025
	2	OFM+IA	1.27	0.06	-0.19	-1.88	0.04	0.22			2.32	19.29	
	3	Prop-VM	0.88	-0.04	-0.17	-1.83	-0.01	0.19	0.09	3.28	2.29	19.12	
1996	1	OFM	0.36	0.07	-0.02						2.46	23.86	1,049
	2	OFM+IA	0.40	0.05	-0.05	1.12	0.12	-0.30			2.46	23.75	
	3	Prop-VM	0.26	0.00	0.01	0.70	0.12	-0.23	-0.01	2.40	2.43	23.56	
1997	1	OFM	0.26	0.05	0.11						2.65	38.19	1,040
	2	OFM+IA	0.34	0.04	0.09	0.65	0.05	0.29			2.64	38.40	
	3	Prop-VM	0.32	-0.12	0.09	0.51	0.01	0.25	0.17	0.86	2.63	37.88	
1998	1	OFM	1.61	-0.09	-0.10						3.23	50.98	958
	2	OFM+IA	1.60	-0.07	-0.09	-0.19	-0.21	0.03			3.25	51.16	
	3	Prop-VM	1.17	-0.19	-0.18	-0.67	-0.31	0.02	0.13	4.12	3.22	50.86	
1999	1	OFM	1.16	-0.01	0.20						4.20	110.13	884
	2	OFM+IA	1.09	-0.01	0.18	-1.31	0.01	-0.36			4.21	110.42	
	3	Prop-VM	0.80	-0.22	0.02	-0.68	0.08	-0.15	0.22	3.90	4.17	109.95	
Pool	1	OFM	0.71	-0.00	0.08						2.17	159.58	8,666
	2	OFM+IA	0.69	-0.02	0.08	-0.46	0.09	-0.12			2.16	159.66	
	3	Prop-VM	0.82	0.05	0.21	-1.05	-0.01	-0.28	-0.18	0.74	2.20	160.46	

Table 6.24a - Coefficients of LID Models (LID2 to LID8), deflated by BV (top) and MV from Cross-sectional & Pool Estimations, for Sample where $BV \geq$ £5 Millions and r = 10%

Dep. Var	Year	ω_{22} (OA_{it})	ω_{33} (CI_{it})	ω_{44} (RD_{it})	ω_{55} (HR_{it})	ω_{66} (DC_{it})	ω_{77} (TD_{it})	ω_{88} (DIV_{it})	Obs
OA_{it+1}	1995	0.973							1,117
	1996	1.026							1,160
	1997	0.982							1,248
	1998	0.960							1,192
	1999	0.709							1,063
CI_{it+1}	1995		0.232						1,117
	1996		0.092						1,160
	1997		0.457						1,248
	1998		0.328						1,192
	1999		0.002						1,063
RD_{it+1}	1995			1.150					1,117
	1996			1.166					1,160
	1997			1.203					1,248
	1998			0.693					1,192
	1999			0.943					1,063
HR_{it+1}	1995				1.027				1,117
	1996				1.037				1,160
	1997				0.985				1,248
	1998				0.772				1,192
	1999				0.928				1,063
DC_{it+1}	1995					1.009			1,117
	1996					0.912			1,160
	1997					1.069			1,248
	1998					0.928			1,192
	1999					0.982			1,063
TD_{it+1}	1995						0.964		1,117
	1996						0.964		1,160
	1997						1.029		1,248
	1998						0.911		1,192
	1999						0.876		1,063
DIV_{it+1}	1995							0.416	1,117
	1996							0.719	1,160
	1997							0.756	1,248
	1998							0.447	1,192
	1999							0.688	1,063
OA_{it+1}	Pool	0.959							10,289
CI_{it+1}			0.058						10,289
RD_{it+1}				0.910					10,289
HR_{it+1}					0.963				10,289
DC_{it+1}						0.982			10,289
TD_{it+1}							0.960		10,289
DIV_{it+1}								0.601	10,289

Table 6.24a - Coefficients of LID Models (LID2 to LID8), deflated by BV (top) and MV from Cross-sectional & Pool Estimations, for Sample where $BV \geq$ £5 Millions and $r = 10\%$

Dep. Var	Year	$\omega_{22}\ (OA_{it})$	$\omega_{33}\ (CI_{it})$	$\omega_{44}\ (RD_{it})$	$\omega_{55}\ (HR_{it})$	$\omega_{66}\ (DC_{it})$	$\omega_{77}\ (TD_{it})$	$\omega_{88}\ (DIV_{it})$	Obs
OA_{it+1}	1995	0.957							1,112
	1996	1.181							1,158
	1997	0.619							1,245
	1998	0.193							1,187
	1999	0.947							1,062
CI_{it+1}	1995		0.224						1,112
	1996		0.550						1,158
	1997		0.387						1,245
	1998		0.264						1,187
	1999		0.587						1,062
RD_{it+1}	1995			0.865					1,112
	1996			0.971					1,158
	1997			0.881					1,245
	1998			0.887					1,187
	1999			0.971					1,062
HR_{it+1}	1995				0.894				1,112
	1996				1.257				1,158
	1997				1.015				1,245
	1998				0.101				1,187
	1999				0.960				1,062
DC_{it+1}	1995					0.999			1,112
	1996					1.140			1,158
	1997					0.807			1,245
	1998					0.300			1,187
	1999					0.903			1,062
TD_{it+1}	1995						0.910		1,112
	1996						1.199		1,158
	1997						0.587		1,245
	1998						0.177		1,187
	1999						0.990		1,062
DIV_{it+1}	1995							0.851	1,112
	1996							1.022	1,158
	1997							0.913	1,245
	1998							0.325	1,187
	1999							0.645	1,062
OA_{it+1}	Pool	0.718							10,248
CI_{it+1}			0.475						10,248
RD_{it+1}				0.892					10,248
HR_{it+1}					0.755				10,248
DC_{it+1}						0.765			10,248
TD_{it+1}							0.807		10,248
DIV_{it+1}								0.681	10,248

Regressions are run from the following Linear Information Dynamic Models:

LID 2 $OA_{it+1} = \omega_{22} OA_{it} + e_{it+1}$

LID 3 $CI_{it+1} = \omega_{33} CI_{it} + e_{it+1}$

LID 4 $RD_{it+1} = \omega_{44} RD_{it} + e_{it+1}$

LID 5 $HR_{it+1} = \omega_{55} HR_{it} + e_{it+1}$

LID 6 $DC_{it+1} = \omega_{66} DC_{it} + e_{it+1}$

LID 7 $TD_{it+1} = \omega_{77} TD_{it} + e_{it+1}$

LID 8 $DIV_{it+1} = \omega_{88} DIV_{it} + e_{it+1}$

Result for LID 1 $RI_{it+1} = \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$ in **Table 5.13.**

Table 6.24b - Parameters and Forecast Errors of (A) OFM (B) OFM+IA and (C) Full Prop-VM Models, deflated by *BV* (top) and *MV* from Closed-form Estimations (LID2 to LID8) for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	MAFE	MSFE	Obs
1995	1	OFM	0.839	0.006	0.169						1.945	15.048	1,114
	2	OFM+IA	0.801	0.005	0.166	0.015	0.005	0.008			1.943	15.028	
	3	Prop-VM	0.635	0.002	0.147	0.024	0.004	0.005	0.002	0.795	1.907	14.701	
1996	1	OFM	0.438	0.002	0.106						2.101	19.084	1,157
	2	OFM+IA	0.461	0.002	0.088	0.015	0.006	0.002			2.101	19.075	
	3	Prop-VM	0.342	0.001	0.059	0.021	0.004	-0.010	-0.003	0.495	2.084	18.848	
1997	1	OFM	0.260	0.005	0.065						2.348	34.676	1,124
	2	OFM+IA	0.341	0.036	0.087	0.650	0.050	0.288			2.231	32.317	
	3	Prop-VM	0.322	-0.012	0.052	-0.048	0.001	0.007	0.011	0.270	2.347	34.874	
1998	1	OFM	1.676	-0.006	-0.132						3.677	53.492	1,025
	2	OFM+IA	1.516	-0.011	-0.143	0.013	0.095	0.032			2.766	46.314	
	3	Prop-VM	1.355	-0.023	-0.130	-0.072	0.062	0.020	0.013	1.164	2.714	45.317	
1999	1	OFM	-0.074	0.020	0.836						3.688	98.82	921
	2	OFM+IA	0.157	0.056	0.764	-0.120	0.002	-0.059			3.662	98.40	
	3	Prop-VM	-0.130	0.010	0.737	-0.205	-0.002	-0.052	0.004	1.897	3.629	97.19	
Pool	1	OFM	0.310	0.004	0.156						2.332	161.01	8,666
	2	OFM+IA	0.310	0.004	0.154	0.009	0.005	-0.010			2.331	161.00	
	3	Prop-VM	0.129	-0.002	0.147	-0.051	-0.001	-0.017	0.002	1.220	2.280	160.30	
1995	1	OFM	1.296	0.008	-0.145						2.325	18.887	1,025
	2	OFM+IA	1.271	0.008	-0.149	-0.402	0.008	0.021			2.326	18.896	
	3	Prop-VM	0.881	-0.005	-0.139	-0.391	-0.002	0.017	0.016	0.743	2.320	18.828	
1996	1	OFM	0.358	-0.005	-0.009						2.462	23.337	1,049
	2	OFM+IA	0.398	-0.004	-0.024	0.132	-0.017	0.011			2.463	23.325	
	3	Prop-VM	0.264	-0.000	0.005	0.082	-0.017	0.008	0.001	0.170	2.461	23.346	
1997	1	OFM	0.260	0.020	0.072						2.651	37.800	1,040
	2	OFM+IA	0.341	0.016	0.057	0.129	0.004	0.077			2.648	37.822	
	3	Prop-VM	0.322	-0.051	0.057	0.102	0.001	0.067	0.078	0.147	2.646	37.641	
1998	1	OFM	1.607	-0.078	-0.078						3.226	51.158	958
	2	OFM+IA	1.597	0.005	0.166	0.015	0.005	0.008			3.232	52.604	
	3	Prop-VM	1.173	-0.156	-0.139	-0.129	-0.281	0.017	0.108	2.905	3.220	50.924	
1999	1	OFM	1.161	-0.002	0.092						4.196	110.11	884
	2	OFM+IA	1.088	-0.001	0.082	-0.154	0.002	-0.064			4.199	110.14	
	3	Prop-VM	0.802	-0.030	0.010	-0.080	0.010	-0.026	0.022	1.612	4.191	110.19	
Pool	1	OFM	0.708	-0.001	0.048						2.174	159.65	8,666
	2	OFM+IA	0.694	-0.005	0.043	-0.088	0.029	-0.037			2.171	159.66	
	3	Prop-VM	0.818	0.019	0.121	-0.199	-0.002	-0.085	-0.048	0.281	2.164	159.60	

Table 6.25 - Number of Significant Coefficients from (1) LID2-8 (top) (2) Prop-LID (3) Prop-VM for Sample where $BV \geq$ £5 Millions and r = 10%

		Type	α_0 (BV_{it})		α_1 (RI_{it})		α_2 (OA_{it})		α_3 (CI_{it})		α_4 (RD_{it})		α_5 (HR_{it})		α_6 (DC_{it})		α_7 (TD_{it})		α_8 (DIV_{it})		Total	
			Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp	Exp	UnExp
LID2-8	C/S	Defl. by BV_{it}					9	0	9	0	9	0	9	0	9	0	9	0	9	0		
		Defl. by MV_{it-1}					9	0	9	0	9	0	9	0	9	0	9	0	9	0		
	Pool	Defl. by BV_{it}					1	0	1	0	1	0	1	0	1	0	1	0	1	0		
		Defl. by MV_{it-1}					1	0	1	0	1	0	1	0	1	0	1	0	1	0		
Prop-LID	C/S	Defl. by BV_{it}			66	2	40	11	32	12	20	11	22	3	17	6	7	3	9	0	213	48
		Defl. by MV_{it-1}			72	0	30	24	28	14	5	10	14	5	4	10	12	3	9	0	174	66
	Pool	Defl. by BV_{it}			8	0	6	1	6	0	0	1	3	0	0	3	0	0	1	0	24	5
		Defl. by MV_{it-1}			8	0	1	4	5	0	0	3	4	0	0	3	2	0	1	0	21	10
Prop-VM	C/S	Defl. by BV_{it}	56	0	51	0	37	2	31	0	33	0	16	0	10	4	4	2	7	0	245	8
		Defl. by MV_{it-1}	57	1	32	36	8	27	30	12	37	4	29	4	21	3	2	8	3	2	219	97
	Pool	Defl. by BV_{it}	8	0	8	0	5	0	6	0	5	0	3	0	0	0	2	0	1	0	38	0
		Defl. by MV_{it-1}	8	0	6	0	2	5	4	0	5	0	4	0	3	0	0	2	0	1	32	8

Table 6.26 - Medians of Estimated Coefficients from (1) LID2-8 (top) (2) Prop-LID (3) Prop-VM for Sample where $BV \geq$ £5 Millions and r = 10%

LID2-8	C/S	Defl. by BV_{it}			0.960	0.232	0.971	0.957	0.955	0.911	0.719
		Defl. by MV_{it-1}			0.957	0.532	0.886	0.960	0.878	0.937	0.913
	Pool	Defl. by BV_{it}			0.959	0.058	0.910	0.963	0.982	0.960	0.601
		Defl. by MV_{it-1}			0.718	0.475	0.892	0.755	0.765	0.807	0.681
Prop-LID	C/S	Defl. by BV_{it}		0.344	0.022	0.060	0.115	0.034	0.047	0.014	0.903
		Defl. by MV_{it-1}		0.363	0.006	0.042	-0.068	0.014	0.010	0.043	1.543
	Pool	Defl. by BV_{it}		0.020	0.261	0.020	0.113	0.036	0.021	-0.067	0.007
		Defl. by MV_{it-1}		0.456	-0.007	0.039	-0.216	0.038	-0.062	0.082	1.639
Prop-VM	C/S	Defl. by BV_{it}	1.611	2.098	0.281	0.977	11.884	0.264	0.448	0.074	12.863
		Defl. by MV_{it-1}	0.295	-0.224	-0.038	0.100	6.321	0.332	0.553	0.020	-0.530
	Pool	Defl. by BV_{it}	1.415	1.968	0.405	1.353	12.569	0.400	0.303	0.307	13.479
		Defl. by MV_{it-1}	0.252	0.087	-0.044	0.075	6.495	0.412	0.131	-0.204	-1.012

Comparison of coefficients estimated from (1) Individual LID ie LID2-8 (2) RI LID ie Prop-LID (3) Valuation model ie Prop-VM. Results obtained from regressions runs from C/S (cross-sectional) (1991-1999) and pool samples consisting of 884 to 1,157 and 8,666 to 9,302 observations respectively. Numbers are in t-statistics of coefficients with at least 10% statistically significant. Exp = expected signs and UnExp = unexpected signs. The C/S medians are calculated from 9 yearly samples (1991-1999) while the pooled medians are calculated from pooling 1991-1999 samples.

The first analysis concerns the coefficients and the fit for (A) OFM (B) OFM+IA and (C) OFM+IA+Sig (Prop-VM) estimated cross-sectionally and by pooling as if they are the same across all firms within each year (pool). In Table 6.22a, for EDBV, almost all the estimated coefficients for the three models are positives (correct signs) and highly significant[6]. The *F*-test of no association for the coefficients is rejected in every case, and $\overline{R}^2$ for the models estimated cross-sectionally is reasonably high (eg 53% for Prop-VM in 1997) but is disappointing in the pool ($\overline{R}^2 < 4.7\%$). Analysis of forecast accuracy is evaluated using mean absolute forecast error (MAFE) and mean square forecast error (MSFE) scaled by either *BV* or *MV* as the comparison is made using different metrics, ie using data from different firms. The MSFE provides higher weighting to larger error values than to lower ones. The percentage forecast error (PFE) is not appropriate for cross-sectional analysis because the same percentage errors may not mean the same thing if the earnings of one of them has a larger scale. The cross-sectional (pool) MAFE and the MSFE are small with an average of 2 (2) and 21 (150) respectively. Thus, *F*-tests, $\overline{R}^2$, MAFE and MSFE indicate that for EDBV, Prop-VM is the most reliable model, suggesting that it is the most appropriate model to explain market value.

In Table 6.22b, though most of the estimated coefficients for the three models in EDMV-N are positives and significant, some of α_1 (*RI*) α_2 (*OA*) α_7 (*TD*) and α_8 (*DIV*) are negatives. While the *F*-tests of no association are all highly significant, $\overline{R}^2$ are negatives in all years (pool). Both the cross-sectional and pool MAFE and MSFE are close to zero with a median of 0.9 and 1.7 respectively, suggesting that there is little likelihood of forecast bias, and on average, firms obtained slightly higher return on equity equal to the assumed cost of capital = 10%. While results for EDMV-N in terms of *F*-Test, MAFE and MSFE are impressive, $\overline{R}^2$ is poor, suggesting that $\overline{R}^2$ is a poor measure of model reliability. While the results for individual coefficients and $\overline{R}^2$ for EDMV-N are less impressive than EDBV, the forecasting accuracy of the former is better.

Overall, while *t*-tests and *F*-tests reveal that most of the coefficients are significantly positives, some are negatives for EDMV-N, all the individual coefficients for EDBV are positives and significant, implying that all the nine independent variables are value-relevant in explaining market value and they ought to be included in the respective

[6] Since the individual coefficients were discussed in details in Section 5.3, only their salient points are discussed here.

models. Results of $\bar{R}^2$ (EDBV), *F*-Tests, MAFE and MSFE show that the valuation models for EDBV and EDMV-N are valid and reliable, and that the inclusion of *RD, HR, DC, TD* and *DIV* improved model reliability.

The second analysis examine the three valuation models in which the coefficients are allowed to vary cross-sectionally within each year (pool), as a function of parameters estimated from the full Prop-LID (Table 6.23a). As the various linear information models (ie LID2 to 8) are not utilized, the coefficients estimated from the Prop-LID are then fed into the following closed-form parameters (variables in brackets) of the valuation model.

- $\alpha_1 = \dfrac{\omega_{11}}{(1+r-\omega_{11})}$ (RI)
- $\alpha_2 = \dfrac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r)}$ (OA)
- $\alpha_3 = \dfrac{\omega_{13}(1+r)}{(1+r-\omega_{11})(1+r)}$ (CI)
- $\alpha_4 = \dfrac{\omega_{14}(1+r)}{(1+r-\omega_{11})(1+r)}$ (RD)
- $\alpha_5 = \dfrac{\omega_{15}(1+r)}{(1+r-\omega_{11})(1+r)}$ (HR)
- $\alpha_6 = \dfrac{\omega_{16}(1+r)}{(1+r-\omega_{11})(1+r)}$ (DC)
- $\alpha_7 = \dfrac{\omega_{17}(1+r)}{(1+r-\omega_{11})(1+r)}$ (TD)
- $\alpha_8 = \dfrac{\omega_{18}(1+r)}{(1+r-\omega_{11})(1+r)}$ (DIV)

Since the valuation models are closed-form, the analysis of model reliability is confined to forecast errors. The MAFE averages between 2-3 and 3-4 for EDBV and EDMV-N respectively while the MSFE averages 51 for both EDBV and EDMV-N (Table 6.23b). This shows that both the MAFE and MSFE for this closed-form VM are close to that of the VMs estimated cross-sectionally and by pooling, particularly for EDBV.

By allowing the coefficients to vary cross-sectionally within each year (pool), as a function of parameters estimated from the linear information models, the third analysis is a more elaborate analysis of the second analysis. Estimations of the linear models are based on the proposed LID1 to 8, after which, the coefficients estimated are then fed into the following closed-form parameters (variables in brackets) of the valuation modes.

- $\alpha_1 = \dfrac{\omega_{11}}{(1+r-\omega_{11})}$ (RI)
- $\alpha_2 = \dfrac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})}$ (OA)
- $\alpha_3 = \dfrac{\omega_{13}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{33})}$ (CI)
- $\alpha_4 = \dfrac{\omega_{14}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{44})}$ (RD)
- $\alpha_5 = \dfrac{\omega_{15}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{55})}$ (HR)
- $\alpha_6 = \dfrac{\omega_{16}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{66})}$ (DC)
- $\alpha_7 = \dfrac{\omega_{17}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{77})}$ (TD)
- $\alpha_8 = \dfrac{\omega_{18}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{88})}$ (DIV)

All the coefficients of the LIDs are positives, which conforms to theory of the OFF and there is not much difference in the magnitudes of the coefficients between EDBV and EDMV (Table 6.24a). The cross-sectional median ω_{11} = 0.34 (EDBV) and 0.36 (EDMV) (Table 5.13), implying that *RI* is sufficiently persistence. The conservatism parameter, ω_{22} is close to 1 (almost perfect), suggesting that in general, firms in the sample practice conservatism. All the parameters for *CI* (ω_{33}) are positives but less than one, and according to the OFF, there is no growth in investment. The three proxies for intangibles (ω_{44}, ω_{55}, ω_{66}) are close or slightly exceeding 1, suggesting that these expenditures can be treated as intangibles are still valid. Both ω_{77} and ω_{88} are positives suggesting that they can predict future *RI*. Thus, evidence of individual variables estimated from LID1 to 8 shows that *RI*, *OA, RD, HR, DC, TD, DIV* strongly support my hypothesis and the OFF while *CI* partially supports my hypothesis and the OFF.

Since the valuation model is a closed-form model, the analysis of model reliability is confined to forecast errors. The MAFE and MSFE average between 2-3 and 51 respectively for all three models for both EDBV and EDMV-N (Table 6.24b), and in general, the Prop-VM slightly outperforms the OFM and the OFM+IA models cross-sectionally and the pool for both EDBV and EDMV-N. The MAFE and MSFE here is close to the (1) VMs estimated cross-sectionally and by pooling, and (2) VMs in which the parameters are fed from the parameters estimated from the full Prop-LID. Moreover, the MSFE is only slightly larger than the MAFE for all models regardless of the estimation techniques suggesting that there are not many errors with large values in the sample. Interestingly, the addition of the various linear models (ie LID2 to 8) to the information dynamics add little or not at all to the RI model (Prop-LID).

The fourth and final analysis of this section investigates the pattern of coefficients estimated from (1) individual LID, ie LID2 to 8 (2) RI LID, ie Prop-LID and (3) Prop-VM (Tables 6.25 and 6.26). All the coefficients estimated from LID2-8 are of the right sign and are highly significant (1%), and the median coefficients of all variables are high, many of them are close to 1. Except for *OA* (EDMV, pool), *RD* (EDBV, pool & EDMV) and *DC* (EDMV, C/S), all other coefficients in the Prop-LID are of the right sign. For the Prop-VM, while all the coefficients for EDBV are of the right sign, *OA, TD* and *DIV* (pool) for EDMV are of the wrong sign. The magnitudes of many of the estimated coefficients for Prop-LID and Prop-VM are low-to-moderate (< 1), however *RD* and C/S medians of *BV*,

RI, CI and *DIV* are high (> 1). When comparing Prop-LID with Prop-VM, only the signs for *RD, DC* (more negatives in Prop-LID), *TD* and *DIV* (more negatives in Prop-VM) are not consistent between these two models, most probably due to the use of different scalars. This evidence indicates that largely, the pattern of the coefficients for the selected variables in Prop-LID and Prop-VM are similar.

Discussion and summary, the three valuation models based on (A) OFM (B) OFM + IA and (C) OFM + IA + Sig (Prop-VM) are compared to determine which one of these models provide the best predictor (explainer) of market value. Evidence from *t*-, *h*-, *F*-tests, AIC, SC, RSS on the basis for EDBV supports my hypothesis that all the estimated coefficients of the Prop-LID and the Prop-VM are of the right signs, which suggest that variables that are able to predict future *RI* are also value-relevant[7]. The $\overline{R}^2$ are all negatives for the VMs deflated by *MV* estimated cross-sectionally and by pooling, thus suggesting that the traditional use of $\overline{R}^2$ as a measure of the fit in CMRA is not a reliable measure. Nevertheless, results of various estimating techniques from $\overline{R}^2$ (EDBV), *F*-Tests, MAFE and MSFE show that the valuation models for EDBV and EDMV-N are valid and reliable, and that the inclusion of *RD, HR, DC, TD* and *DIV* improved model reliability, where Prop-VM has lower forecast errors than OFM and the OFM+IA every year (pool). The evidence strongly suggest that the use of an integrated OFF consisting of the CSV with multiple measures for other information improves the alignment of *BV* and *MV* which conforms to my hypothesis. Interestingly, the addition of the various linear models (ie LID2 to 8) to the information dynamics add little or not at all to the RI model (Prop-LID) even though all their coefficients are highly statistically positives.

The results of the valuation models for this study will now be compared with other relevant studies. I will discuss those studies that have included the LID first. Stober (1996); Myers (1999); and Ahmed et al. (2000) estimate the LID on time-series and the VM cross-sectionally and find that in most years, the coefficients of *BV, OA, CI* of the VMs are positively significant, and the fit of the FO (1995) of Stober is exceptionally high, many of $\overline{R}^2 > 70\%$ but in Myers, only the specification of FO (1996) is valid with *V/P* = 0.924. However, all these studies report negative coefficients for *OA* in the LID, and *CI* in the LID for Myers and Ahmed et al. is also negative, unlike the positive coefficients of *OA* and

[7] While *RD* and *DC* has 1 and 3 significant coefficients with the wrong sign respectively, but the median coefficients for both variables are positives. Thus, on balance of probability, *RD* and *DC* cannot be construed to be incompatible to theory of the OFF or the hypothesis.

CI for this study, which conforms to the OFF. This suggests that even without considering econometric issues, the integrated OFF consisting of the CSV of this study are theoretically and empirically more valid than previous studies.

Basing on the parsimonious O (1995) and a pool sample to estimate the LID and VM, Dechow et al. (1999); and Hand and Landsman (1999) use analysts' earnings forecasts and *DIV* respectively as a proxy for v_t in predicting future *RI*. The result of Dechow et al. suggests that the use of analysts' data as a proxy for v_t in predicting future *RI* show only modest improvements in explanatory power over past empirical researches using analysts' forecasts using the DDM, and when ω and γ were fed into the parameters of the valuation model, the forecasting accuracy of the model improves slightly over other competing models. While the estimated coefficients of the LID and VM of Hand and Landsman suggest that they are largely positives and statistically significant with $\overline{R}^2$ = 95% for the VM, however, the signs and magnitudes changed when Lo and Lys (2000a) replicated the test using the same sample and by scaling the equations by MV_{t-1}, eg coefficient for *DIV* is now negative and R^2 reduces to a mere 41%. Hence, the results of Hand and Landsman and Dechow et al. should be viewed with caution considering that the later use per share basis in their estimation.

The inclusion of other information (*CI, TD, DIV*) in Rees's (1997) VM improves the explanatory power of the model from 54% to 64%. Frankel and Lee (1998) examine the usefulness of the EBO by estimating cross-sectionally firms' fundamental values (*V*). They find that *V* explains more than 80% and 70% of the cross-sectional variation in security prices using analysts' forecasts and historical data respectively. Book value of equity alone accounts for 60% of the correlation. Lee et al. (1999) use various accounting ratios (*P/B, P/D, P/E*) based on EBO estimated cross-sectionally. They find that accounting ratios fail to capture fundamental valuation but *V/P* consistently able to explain MVE and predicts future DJII and S&P. Giner and Reverte (2001) estimate a EBO that include debt-to-equity ratio as one of the dependent variables, and find that the debt ratio provides positive signal for firms facing good earnings prospects, and $\overline{R}^2$ averages 60% for the yearly and pooled data. Ittner and Larcker (1998); and Black et al. (1999) find other information in the form of customer satisfaction and firm reputation respectively are statistically significant, but $\overline{R}^2$ is only 2% for the former while the later find $\overline{R}^2$ increased from 74.2% to 75.4% when the nonfinancial variable is included in the model.

On closer examination, Rees; and Giner and Reverte[8] use per share basis in their estimating equations. Brown et al. (1999) show that using per share basis where the dependent variable is price, result in higher R^2 because scale has not been controlled for. Lo and Lys (2000a) consider analysts data and accounting ratios may be noisy, and hence, the high correlations *(V/P)* obtained by Frankel and Lee; and Lee et al.; and high $\overline{R}^2$ by Giner and Reverte may be due to scale effect. When Lo and Lys replicated Frankel and Lee's studies, the explanatory power declined by 36% (from 80%). Although customer satisfaction and firm reputation are statistically significant and the high $\overline{R}^2$ of Black et al. are encouraging, however Black et al. use unscaled equations. Given the suspected noisiness of the data, the small sample size, and the variation in the measurement of customer satisfaction across firms, and the 'newness' of conducting customer satisfaction in empirical accounting research, the result must be treated with caution (Lambert, 1998).

Considering that the proposed linear information dynamics and the valuation models for this study are formulated under severe constraints, such as the inability to use an appropriate proxy for other information and a lack of certain data (eg *RD* is only available after 1990 and *AD* is not available in UK), the results largely support the theoretical expectations of the models and the OFF. In addition, the results compared favourably with other studies suggesting that the theoretical and estimation techniques used to estimate a prediction model for market valuation for this study are valid.

6.7. Summary and Conclusions

Following the previous chapter in testing for the validity and the specification of the proposed RI model, the main aim of this chapter is to conduct tests to determine (1) the validity of the specification of the proposed valuation model; (2) estimate a valuation model and identify which of these non-earnings accounting variables are value-relevant.

Except for one study each that used UK and Spanish data, all previous studies testing the valuation of the OFF used US data. These studies used various methodologies, without much regard of an integrated framework of the OFF and most used single proxy for other information in valuing prices. As a result, the contribution to existing literature by these studies is limited, just like the LID. While the *BV, RI, OA* and *CI* coefficients of these studies largely conform to the valuation model of the OFF, the *OA* and *CI* coefficients are

[8] Their sample size is small where the yearly sample range from 80-90 and pool sample of 599 observations.

inconsistent with those estimated from the LID. Studies that implement other information generally found that the nonfinancial measures (eg customer satisfaction) and accounting measures (eg dividends, analysts' forecasts, debts) are value relevant and they contribute to improved explanatory power. While there are merits in such studies, the lack of appropriate definition and measure for nonfinancial measures, results from such studies must be treated with caution. Most of the studies report good fit with some as high as $\overline{R}^2$ = 95% (Hand and Landsman, 1999), but all of these have either used unscaled equations (eg Hand and Landsman), per share basis (eg Rees, 1997) or noisy variables (eg Lee et al., 1999) in their cross-section or pool estimation, and hence, these results should be viewed with caution since scale or/and heteroscedasticity is/are unaccounted for.

Therefore, in avoiding the issues identified in past studies, using UK data, this study formulate models based on an integrated OFF to estimate a valuation model and identifying which of these non-earnings accounting variables (CSV) are value-relevant; and the results are encouraging and contribute substantially to existing literature.

As in the Prop-LID, this chapter uses deflation, residual analysis and White's consistent standard errors to mitigate heteroscedasticity, but the White's test can severely understate the true coefficients for the deflated equations, causing many of the *t*-stat for the coefficients to drop in such a large magnitude that they have become insignificant (see Barth and Kallapur, 1996; Green et al., 1996; Stober, 1996; and Prop-LID). Hence, inferences are mostly based on *t*-stat rather than on the White's adjusted statistic (*h*-stat).

The results of this study indicate that *BV, RI* and *CI* are strongly value-relevant while *OA* is value-relevant for EDBV only. The coefficients of these variables are consistent with the LID (OFF). This result is encouraging considering that all previous studies that used these variables find the coefficients of *CI, OA* and OA_{t-1} in the LID are inconsistent with that of the VM. Specifications that include OA_{t-1} instead of OA_t show that OA_t has slightly more significant coefficients with the correct signs and hence, OA_t instead of OA_{t-1} ought to be the one to measure conservatism in Prop-VM, consistent with expectation but not FO (1996). The coefficients of *RD, HR* and *DC* are mostly positively significant, as expected, and the magnitudes of the coefficients for *RD* (but not *HR* and *DC*) are large suggesting that *RD* may be long-lived but not *HR* and *DC*, thus only *RD* can be considered intangible. While *TD* provides strong positive signal to the market, the evidence of *DIV* is mixed with positive signal (EDBV) and negative signal (EDMV-N).

Results of various estimating techniques show that the valuation models for EDBV and EDMV-N are valid and reliable, that *RI, OA, CI, RD, HR, DC, TD* and *DIV* have incremental information content beyond *BV*, that the inclusion of *RD, HR, DC, TD* and *DIV* improved model reliability, where Prop-VM outwits the OFM and the OFM+IA as the most appropriate model to explain and forecast market values. Interestingly, the additions of the various linear models (ie LID2-8) to the information dynamics add little or not at all to the RI model (Prop-LID). By and large, the evidence also indicates that the coefficients of all the variables in the LID and VM have the same sign. Thus, a wide range of statistical tests support my hypothesis that the CSV are value-relevant in explaining *MV* and they ought to be included in the Prop-VM. This implies that the integrated approach using carefully selected CSV that are theoretically and empirically based on the OFF, GAAP and previous studies to measure (1) value creation (*RI*); (2) conservatism (*OA*); (3) current +NPV projects (*CI*); (4) intangibles (*RD, HR, DC*); and (5) expectations of future profitability (*TD, DIV*) are able to predict future *RI*, and to be used in equity valuation. The results are unlikely to be affected by incorrect inferences as a wide range of statistical tests are used to (1) test for the validity of the individual variables and model specifications; (2) mitigate scale and heteroscedasticity; and (3) detect multicollinearity.

The secondary aim of this chapter reveals the following. The evidence from this chapter indicates that the omission of outliers not only does not contribute to an improvement in statistical performance; it has a negative impact on individual independent variables as well as explanatory powers, suggesting that deletion of outliers in a sample may be more complex than one would expect, consistent with Prop-LID. There is little difference in statistical results using different cost of capital, unlike but not inconsistent with Prop-LID where r = 10% outwits r = 15% and 20%. This study also reveals that scaling by *BV, MV* with no intercept and *MV* with an intercept produce different statistical results, and that scaling by *BV* consistently generates more impressive results, as in Prop-LID, thus refuting the claim that statistical results are not affected by differential scalars in Barth and Kallapur (1996). Finally, this chapter reveals that $\overline{R}^2$ is mostly negatives for both cross-sectional and pool results, thus suggesting that the traditional use of $\overline{R}^2$ as a measure of the fit in capital market research in accounting (CMRA) is not a reliable measure, and evidence supports that multiple statistical measures as used in this study provide more reliable inferences.

SUMMARY, CONCLUSIONS AND CONTRIBUTIONS OF THIS RESEARCH

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CHAPTER 7
SUMMARY, CONCLUSIONS AND CONTRIBUTIONS OF THE RESEARCH

7.1. Outcomes of this Research

This chapter summarises the debates and results from the preceding chapters, in an attempt to address the main issues arising from the analysis of the role of residual income (*RI*) in equity valuation, focusing on the RI linear information dynamics (LID) and the Ohlson and Feltham's framework (OFF). The chapter concludes by summarising the main areas in which the study has sought to contribute to analysis of the usefulness of such information to investors and policymakers, and the various avenues future research might take arising from such analysis.

The purpose of this research is based on the belief that the (1) relative merits of fundamental valuation-based approach, particularly the role of *RI* is a topic of central importance for equity valuation; and (2) reporting system can satisfy the information needs of investors. The motivating forces for this research stems from the identification of (1) mounting evidence of apparent market inefficiency; (2) the decline in the usefulness of current financial reporting and the needs for the inclusion of alternative measures in the reports; and (3) the growth in the interest of residual income valuation modelling approach in equity valuation

The academic literature has so far not fully addressed the usefulness of accounting information, particularly the use of accounting information in relating to share prices (returns). The usefulness of accounting information in meeting the needs of investors, in particular the somewhat negative view of GAAP in arbitrary allocating and valuing entities using the historical cost convention resulting in conservatism that causes the book values and market values to differ has been questioned by many quarters-academics and policymakers in recent years in the US, UK and Australia. The main problem with conservatism is that it indicates growth but does not add value, which confuses investors. These critiques suggest that both accounting and other information (eg cash flows, research & development expenditures, nonaccounting) should provide a richer set of value-relevant information to be used by investors, thus reflects a movement from the event basis of allocation characteristics to a more forward-looking usefulness of information to investors in relation to their decisions to buy, hold or sell their investment assets.

7-SUMMARY, CONCLUSIONS & CONTRIBUTIONS KK CHOONG

The **main objective of this thesis** is to test for the validity of the residual income and market valuation models formulated on an integrated OFF and to identify which of these non-earnings accounting variables (Comprehensive set of variables, CSV) are significant in the prediction model and which variables are relevant for valuing the equity of firms. The CSV considered are based on the theoretical justifications of the OFF and GAAP, and from previous studies which suggest that these variables might be relevant in predicting future financial performance of firms in the form of residual income. The OFF best fits with the objective of this thesis because the OFF provides a powerful argument for a change of emphasis away from the excessive attention on returns/earnings models to the direction of the fundamental measurement perspective. The OFF relies on the concept of the clean surplus relation (CSR) and the role of residual income and bases on the fundamental valuation of firms by taking accounting book values, earnings, non-earnings and other information data directly into the valuation process rather than correlating earnings with returns. In over thirty-five years of MBAR research, earnings are regarded as the premier explanatory variable in predicting prices (returns) but its usefulness to market participants is unimpressive with $R^2 < 10\%$ in most MBAR studies, and recent empiricists tend to focus on the valuation approach.

This research is empirically focused. The empirical study hope to address unresolved issues identified in past studies using the OFF such as inconsistency of the signs of coefficients and the fit between the linear information dynamics and the valuation model, use of unsatisfactory variable to proxy for other information and the lack of an appropriate methodology in specifying testable models. The empirical test for this study is carried out in two steps. Firstly, past and current residual income and other accounting variables are used to estimate a prediction model for future residual income. Secondly, from the information dynamics, variables that are able to predict future residual income are identified, and are then used as fundamental variables to explain market value of equity. The approach taken here is consistent with the OFF in which variables that are able to predict expected *RI* are also value-relevant in determining a firm's value. The *RI* prediction model, based on the *RI* information dynamics (Prop-LID) and the *RI* valuation model (Prop-VM) are estimated cross-sectionally and by pooling 9,302 observations of nonfinancial firms in the UK over the period 1990-2001. Cross-sectional and pooling of time-series and cross-sectional data are increasingly being used to investigate the value-relevance of accounting and other information, particularly the OFF.

Table 7.1 - Pool Coefficients and associated statistics for Prop-LID deflated by BV_{it} for Sample where $BV \geq$ £5 Millions and r = 10%

Estim	1	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	*RSS*	Obs
Coeff	-429,265	0.045	0.262								4.0%	0.30	9,302
Std Err	113,314	0.000	0.014										
t-Stat	***(-3.788)	***(5.551)	***(18.891)										
Ad Std Err	126,034	0.011	0.082										
h-Stat	***(-3.406)	***(3.990)	***(3.175)										
Coeff	-391,089	-0.004	0.287	0.028							5.2%	0.30	9,302
Std Err	112,658	0.000	0.014	0.002									
t-Stat	***(-3.471)	(-0.456)	***(20.565)	***(10.900)									
Ad Std Err	113,007	0.05	0.07	0.03									
h-Stat	***(-3.461)	(-0.082)	***(4.136)	(0.836)									
Coeff	-414,164	-0.015	0.260	0.020	0.114						7.1%	0.29	9,302
Std Err	111,506	0.009	0.014	0.002	0.008								
t-Stat	***(-3.714)	(-1.625)	***(18.604)	***(7.913)	***(14.007)								
Ad Std Err	126,156	0.061	0.092	0.027	0.124								
h-Stat	***(-3.283)	(-0.242)	***(2.813)	(0.760)	(0.920)								
Coeff	-414,658	0.02	0.261	0.020	0.114	0.036					7.1%	0.29	9,302
Std Err	111,511	0.01	0.014	0.002	0.008	0.005							
t-Stat	***(-3.719)	*(-1.695)	***(18.597)	***(7.891)	***(13.918)	(0.677)							
Ad Std Err	125,909	0.059	0.093	0.027	0.125	0.361							
h-Stat	***(-3.293)	(-0.262)	***(2.789)	(0.755)	(0.907)	(0.101)							
Coeff	-457,035	-0.020	0.257	0.018	0.113	0.008	0.015				7.2%	0.29	9,302
Std Err	112,616	0.009	0.014	0.020	0.080	0.054	0.005						
t-Stat	***(-4.058)	**(-2.178)	***(18.240)	***(6.819)	***(13.815)	(0.143)	***(2.651)						
Ad Std Err	170,643	0.074	0.089	0.023	0.125	0.393	0.065						
h-Stat	***(-2.678)	(-0.277)	***(2.855)	(0.808)	(0.906)	(0.020)	(0.228)						
Coeff	-449,639	-0.022	0.260	0.021	0.113	0.038	0.028	-0.067			7.4%	0.29	9,302
Std Err	112,472	0.009	0.014	0.002	0.008	0.055	0.006	0.012					
t-Stat	***(-3.998)	**(-2.318)	***(18.439)	***(7.575)	***(13.814)	(0.692)	***(4.516)	***(-5.134)					
Ad Std Err	169,645	0.072	0.089	0.023	0.124	0.399	0.053	0.105					
h-Stat	***(-2.650)	(-0.301)	***(2.902)	(0.866)	(0.907)	(0.096)	(0.520)	(-0.633)					
Coeff	-446,424	-0.019	0.261	0.018	0.113	0.036	0.027	-0.067	0.004		7.4%	0.29	9,302
Std Err	112,605	0.010	0.014	0.005	0.008	0.005	0.006	0.013	0.006				
t-Stat	***(-3.965)	*(-1.900)	***(18.364)	***(3.201)	***(13.796)	(0.656)	***(4.252)	***(-5.155)	(0.596)				
Ad Std Err	166,581	0.070	0.091	0.031	0.125	0.401	0.052	0.104	0.029				
h-Stat	***(-2.680)	(-0.276)	***(2.857)	(0.570)	(0.904)	(0.090)	(0.518)	(-0.644)	(0.140)				
Coeff	-102,825	-0.085	0.108	-0.012	0.108	-0.204	0.000	-0.108	0.010	1.867	18.1%	0.26	9,302
Std Err	106,354	0.009	0.014	0.005	0.007	0.052	0.006	0.012	0.006	0.053			
t-Stat	(-0.967)	***(-8.706)	***(7.668)	**(-2.343)	***(14.033)	***(-3.902)	(-1.001)	***(-8.798)	(1.515)	***(34.867)			
Ad Std Err	139,599	0.075	0.119	0.019	0.113	0.379	0.039	0.095	0.021	0.644			
h-Stat	(-0.737)	(-1.131)	(0.900)	(-0.633)	(0.956)	(-0.546)	(-0.156)	(-1.134)	(0.465)	***(2.896)			

Regressions are run from Prop-LID $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$ to $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$

$1 = 1/BV_{it}$ Ad Std Err = White's adjusted Std. Errors, h-Stat = White's adjusted statistic * , ** , *** = 90%, 95%, 99% confidence level respectively.

Table 7.2 - Pool Coefficients and associated statistics for Prop-VM deflated by BV_{it} for Sample where $BV \geq$ £5 Millions and r = 10%

Estim	1	a_0 (BV_{it})	a_1 (RI_{it})	a_2 (OA_{it})	a_3 (CI_{it})	a_4 (RD_{it})	a_5 (HR_{it})	a_6 (DC_{it})	a_7 (TD_{it})	a_8 (DIV_{it})	A-R^2	RSS	MAFE	MSFE	Obs
Coeff	6,412,417	2.88	1.64								0.3%	156.168			9,302
Std Err	2,573,266	0.183	0.315												
t-Stat	**(2.492)	***(15.684)	***(5.203)												
Ad Std Err	2,954,229	0.098	0.562												
h-Stat	**(2.171)	***(29.173)	***(2.913)												
Coeff	7,222,261	1.836	2.178	0.589							1.4%	154.449			9,302
Std Err	2,560,436	0.209	0.317	0.058											
t-Stat	***(2.821)	***(8.783)	***(6.859)	***(10.174)											
Ad Std Err	2,928,843	0.220	0.438	0.134											
h-Stat	**(2.466)	***(8.347)	***(4.970)	***(4.372)											
Coeff	6,912,855	1.693	1.810	0.490	1.534						2.1%	153.338	2.426	153.34	9,302
Std Err	2,551,625	0.209	0.319	0.059	0.187										
t-Stat	***(2.709)	***(8.100)	***(5.661)	***(8.314)	***(8.208)										
Ad Std Err	2,937,835	0.194	0.525	0.105	0.358										
h-Stat	**(2.353)	***(8.721)	***(3.444)	***(4.633)	***(4.278)										
Coeff	6,727,288	1.409	2.099	0.471	1.379	13.660					3.4%	151.303			9,302
Std Err	2,534,827	0.209	0.318	0.058	0.186	1.221									
t-Stat	***(2.654)	***(6.734)	***(6.588)	***(8.054)	***(7.409)	***(11.182)									
Ad Std Err	2,928,121	0.192	0.497	0.099	0.368	1.685									
h-Stat	**(2.297)	***(7.312)	***(4.224)	***(4.752)	***(3.749)	***(8.106)									
Coeff	5,328,926	1.250	1.974	0.405	1.353	12.717	0.493				3.5%	151.062			9,302
Std Err	2,558,864	0.213	0.320	0.060	0.186	1.245	0.128								
t-Stat	**(2.083)	***(5.864)	***(6.170)	***(6.639)	***(7.267)	***(10.214)	***(3.849)								
Ad Std Err	3,086,073	0.249	0.466	0.091	0.372	1.775	0.247								
h-Stat	*(1.727)	***(5.017)	***(4.238)	***(4.435)	***(3.639)	***(7.164)	**(1.998)								
Coeff	5,292,808	1.256	1.962	0.394	1.353	12.569	0.430	0.326			3.5%	151.042	2.2	151.04	9,302
Std Err	2,559,045	0.213	0.320	0.062	0.186	1.252	0.140	0.295							
t-Stat	**(2.068)	***(5.892)	***(6.126)	***(6.370)	***(7.272)	***(10.037)	***(3.066)	(1.102)							
Ad Std Err	3,089,078	0.253	0.456	0.089	0.375	1.822	0.226	0.500							
h-Stat	*(1.713)	***(4.960)	***(4.304)	***(4.407)	***(3.608)	***(6.896)	*(1.904)	(0.652)							
Coeff	5,514,611	1.420	2.036	0.196	1.346	12.438	0.369	0.303	0.286		3.6%	150.989			9,302
Std Err	2,561,674	0.232	0.323	0.126	0.186	1.254	0.144	0.296	0.158						
t-Stat	**(2.153)	***(6.130)	***(6.307)	(1.554)	***(7.229)	***(9.917)	**(2.560)	(1.023)	*(1.807)						
Ad Std Err	3,107,666	0.252	0.462	0.163	0.373	1.853	0.229	0.503	0.228						
h-Stat	*(1.775)	***(5.619)	***(4.404)	(1.199)	***(3.602)	***(6.712)	(1.613)	(0.602)	(1.251)						
Coeff	7,995,136	0.946	0.932	-0.021	1.310	10.703	0.131	0.006	0.328	13.479	4.7%	149.23	21.654	149.23	9,302
Std Err	2,557,848	0.234	0.338	0.127	0.185	1.258	0.145	0.295	0.157	1.288					
t-Stat	***(3.126)	***(4.032)	***(2.760)	(-0.169)	***(7.079)	***(8.509)	(0.902)	(0.021)	**(2.082)	**(10.466)					
Ad Std Err	3,023,144	0.195	0.388	0.120	0.352	1.644	0.159	0.407	0.166	2.061					
h-Stat	***(2.645)	***(4.851)	**(2.400)	(-0.179)	***(3.722)	***(6.509)	(0.821)	(0.015)	**(1.972)	***(6.541)					

Regressions are run from Prop-LID $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \varepsilon_{it}$ to $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + \varepsilon_{it}$

$1 = 1/BV_{it}$ Ad Std Err = White's adjusted Std. Errors, h-Stat = White's adjusted statistic * , ** , *** = 90%, 95%, 99% confidence level respectively.

Table 7.3 - Market Valuation Estimations for (A) OFM (B) OFM+IA and (C) Full Prop-MV Models (all deflated by $BVit$) using (1) coefficients estimated as though they are the same across all firms (2) coefficients estimated from the Prop-LID, and (3) coefficients estimated from the LID 1 to 8 for Sample where $BV \geq$ £5 Millions and r = 10%

#	*RI/MV*	Models		a_1 (RI_{it})	a_2 (OA_{it})	a_3 (CI_{it})	a_4 (RD_{it})	a_5 (HR_{it})	a_6 (DC_{it})	a_7 (TD_{it})	a_8 (DIV_{it})	MAFE	MSFE	Obs
		RModel 3		0.260	0.020	0.114								9,302
		RModel 6		0.260	0.021	0.113	0.038	0.028	-0.067					
		Prop-LID		0.108	-0.012	0.108	-0.204	0.000	-0.108	0.010	1.867			
1	Coefficients are the same across all firms	OFM		1.810	0.490	1.534						2.43	153.34	9,302
		OFM+IA		1.962	0.394	1.353	12.569	0.430	0.326			2.20	151.04	9,302
		Prop-VM		0.932	-0.021	1.310	10.703	0.131	0.006	0.328	13.479	2.03	149.23	9,302
2	Closed-form, parameters fed from Prop-LID	OFM		0.31	0.03	0.16						2.31	160.68	8,666
		OFM+IA		0.31	0.03	0.16	0.05	0.04	-0.10			2.30	160.58	
		Prop-VM		0.13	-0.02	0.16	-0.29	0.00	-0.16	0.01	2.69	2.24	159.67	
3		DIV_{it+1} (LID8)									0.601			
		TD_{it+1} (LID7)								0.960				
		DC_{it+1} (LID6)							0.982					
		HR_{it+1} (LID5)						0.963						
		RD_{it+1} (LID4)					0.910							
		CI_{it+1} (LID3)				0.058								
		OA_{it+1} (LID2)			0.959									
		RModel 3		0.260	0.020	0.114								
		RModel 6		0.260	0.021	0.113	0.038	0.028	-0.067					
		Prop-LID		0.108	-0.012	0.108	-0.204	-0.006	-0.108	0.010	1.867			
	Closed-form, parameters fed from LID1-8	OFM		0.310	0.004	0.156						2.33	161.01	8,666
		OFM+IA		0.310	0.004	0.154	0.009	0.005	-0.010			2.33	161.00	
		Prop-VM		0.129	-0.002	0.147	-0.051	-0.001	-0.017	0.002	1.220	2.28	160.30	

For (1) and (2), the linear dynamics are estimated from RModel 3, 6 and 8 (Prop-LID). For (3), the linear models are estimated from LID 1 to 8.
For (2), the estimated coefficients from Prop-LID are then fed into the following formulae for the respective parameters of the Prop-VM.

$$\alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})} \ (RI) \quad \alpha_2 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r)} \ (OA) \quad \alpha_3 = \frac{\omega_{13}(1+r)}{(1+r-\omega_{11})(1+r)} \ (CI) \quad \alpha_4 = \frac{\omega_{14}(1+r)}{(1+r-\omega_{11})(1+r)} \ (RD) \quad \alpha_5 = \frac{\omega_{15}(1+r)}{(1+r-\omega_{11})(1+r)} \ (HR) \quad \alpha_6 = \frac{\omega_{16}(1+r)}{(1+r-\omega_{11})(1+r)} \ (DC) \quad \alpha_7 = \frac{\omega_{17}(1+r)}{(1+r-\omega_{11})(1+r)} \ (TD) \quad \alpha_8 = \frac{\omega_{18}(1+r)}{(1+r-\omega_{11})(1+r)} \ (DIV)$$

For (3), the estimated coefficients from LID1 to 8 are then fed into the following formulae for the respective parameters of the Prop-VM.

$$\alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})} \ (RI) \quad \alpha_2 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})} \ (OA) \quad \alpha_3 = \frac{\omega_{13}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{33})} \ (CI) \quad \alpha_4 = \frac{\omega_{14}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{44})} \ (RD) \quad \alpha_5 = \frac{\omega_{15}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{55})} \ (HR) \quad \alpha_6 = \frac{\omega_{16}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{66})} \ (DC) \quad \alpha_7 = \frac{\omega_{17}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{77})} \ (TD) \quad \alpha_8 = \frac{\omega_{18}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{88})} \ (DIV)$$

Results reported are those deflated by *BVit*

The findings of the usefulness of accounting variables and model reliability in the information dynamics (Prop-LID) and the valuation model (Prop-VM) indicate that the various models (RRModel 1 to 8 and MModel 1 to 8) are reliable, however, the signs and the significance of the coefficients of some variables are quite erratic across years. The cross-sectional properties for equations deflated by closing book value (EDBV) indicate that most of the estimated coefficients of all the variables selected for this research (*DIV, BV, RI, OA, CI, HR, RD, DC, TD*) are of the right sign (positive) and are statistically significant. However, for equations deflated by closing market value (EDMV), there are more statistically negative coefficients for *RD* and *DC* (Prop-LID) and *OA, TD* and *DIV* (Prop-VM). The coefficients of *CI, RD, HR* and *CI* are either positives or negatives with no consistent pattern of the sign across years. For instance in the linear information dynamics, for EDBV, the coefficients of *RD* are mostly positives in 1991-94, 1997-98 but are mostly negatives in 1995 and 1999. Overall (for both Prop-LID and Prop-VM, either cross-sectionally or in the pool), EDBV has more positive coefficients than EDMV, suggesting that the choice of deflators affect statistical results (see Tables 5.8a, 5.12, 5.13 for Prop-LID; 6.2a, 6.8 for Prop-VM).

Analysis of the various estimating models in the pool sample indicates that the fit ($\bar{R}^2$, $\overline{RSS}$) of the **RI model** improves as additional variable is added to the model. This shows that *OA, CI, RD, HR, DC, TD* and *DIV* have incremental information content beyond *RI,* implying that the best model is the full Prop-LID (Table 7.1[1]). Further analysis of the results also reveals statistically significant coefficients with the correct (positive) signs for six out of the eight variables (Table 7.1). While the coefficients for *DC* are significantly negatives for all models, *OA, RD* and *HR* are only negatives for the full Prop-LID. This is unexpected considering that in the cross-section data, there are about eight, four, three and two times more positive significant coefficients for *HR* (22 vs. 3, Table 5.8a), *OA* (40 vs. 11), *DC* (17 vs. 6) and *RD* (20 vs. 11) respectively. More analysis of *DC* will be made subsequently when analysing the valuation model.

The magnitudes for all the coefficients are low with most values ≤ 0.2, and so are their standard errors where most values are < 0.02. Almost all of the values of the adjusted standard errors (using White's (1980) Heteroscedasticity-consistent Covariance Estimator)

[1] Since the results generated by EDBV are in general, statistically better than EDMV, and hence, the reported pool results are based solely on EDBV.

are higher than the standard errors, suggesting that the White's test overstates the standard errors of most of the coefficients, thereby reducing (increasing) the number of significant coefficients with the correct (incorrect) signs. For example, in 1992, the coefficient for *OA* is significant based on *t*-stat (7.913) but becomes insignificant after adjusting for White's consistent covariance matrix (*h*-stat = 0.76). More strikingly, in RModel 5, the statistically significant (at 1% level) *t*-statistics for *OA, CI* and *HR* become insignificant after invoking the White's test.

The pool median of ω_{11} (*RI*) = 0.26, which is within the plausible bounds ($0 \leq 1$) set by the OFF suggests that it is sufficiently persistent, and is higher than all of Myer's (1999) specifications [0.234 for O (1995), 0.036 for FO (1995) and 0.167 for FO (1996)], but is lower than the median = 0.61, 0.62 and 0.39 in Hand and Landsman (1999); Dechow et al. (1999); and Stober (1996) respectively. Stober uses FO (1995) and his equations are deflated by the number of shares outstanding, Hand and Landsman use undeflated equations based on O (1995), Dechow et al. use MVE_{it-1} as the deflator for O (1995) while Myers uses time-series estimations. Therefore, the results of the *RI* persistent parameter in the other studies are not comparable with the ω_{11} of this study due to the varying methodology used in the respective estimations.

Except for RModel 8, the result of positive ω_{12} for RModel 1 to 7 indicates that in general, UK firms practises conservatism. The evidence for this study is inconsistent with the findings of Stober (1996) (70% are negatives), Myers (1999) (60% are negatives), and Ahmed et al. (2000) (mean = –0.041). Like Stober, Ahmed et al. use per share basis for their cross-sectional estimations. **This is the first study that finds that the coefficient of *OA* in the LID is largely consistent with the OFF**.

All the ω_{13} (*CI*) for this study is positives, which conforms to expectation and the OFF, implying that investment in capital expenditures can generate +NPV projects. This is inconsistent to the findings of Myers and Ahmed et al. Myers obtains a median ω_{13} = –0.048, while Ahmed et al. (2000) obtain a mean ω_{13} = –0.064. **This is the first study that finds that the coefficient of *CI* in the LID is consistent with the OFF**.

Results of various statistical measures show that the **valuation models (Prop-VM)** are valid and reliable, that *RI, OA, CI, RD, HR, DC, TD* and *DIV* have incremental information content beyond *BV*, and that the inclusion of *RD, HR, DC, TD* and *DIV*

improve model reliability, implying that the best model is the full Prop-VM (Table 7.2). Except for the small negative coefficient of *OA* for the full Prop-VM (α_2 = –0.021), all other coefficients are of the right sign and most of them are 1% statistically significant.

Unlike the pool results of the Prop-LID, the magnitudes for most of the coefficients are reasonably high with values > 1, however, most of their standard errors remain low with values < 0.02. Almost all of the values of the adjusted standard errors (using White's (1980) test) are higher than the standard errors, suggesting that the White's test overstates the standard errors of most of the coefficients, thereby reducing (increasing) the number of significant coefficients with the correct (incorrect) signs. This finding is consistent with Prop-LID in which the White's consistent matrix penalises some of the test statistics. Thus, this research highlights the tremendous impact of the White's test on the standard errors of coefficients in a regression, and suggests that more research in the use of the White's test or a better technique in mitigating heteroscedasticity should be an interesting avenue for future research in CMRA. Therefore, the analysis of the coefficients that follow will be based on the *t*-statistic rather than the *h*-statistic.

While the positive coefficients of *BV, RI,* OA^2 and *CI* conform to expectation, the OFF and previous studies, however, this is the **first study to find the coefficients of *OA* and *CI* in the LID are consistent with those of the valuation model**. Interestingly, *CI* is defined in cash flows term, not accruals and yet, it is found to be useful in both the Prop-LID and Prop-VM. This suggests that cash flow may be a more reliable measure for *CI* than accrual.

The coefficient of α_0 (*BV*) are all positives and are statistically significant with a pool median α_0 = 1.41, which is higher than all previous studies (ie Sougiannis, 1994; Stober, 1996; Green et al., 1996; Rees, 1997; Hands and Landsman, 1999; Dechow et al., 1999; Myers, 1999; Ahmed et al., 2000; Akbar, 2000). The evidence suggests that *BV* provides value-relevant fundamental information, consistent to expectation and the OFF.

All the pool α_1 (*RI*) are highly positively significant, ie *RI* is positively relevant in explaining prices (market value), suggesting that in general, UK firms create values, consistent with the theory of the OFF and empirical studies that have operationalised the

[2] If we exclude the negative coefficient of *OA* in the full Prop-LID and Prop-VM.

OFF (all US). The pool median of α_1 = 1.97 is higher than all of Myer's models [median α_1 = 1.358, 0.481, 0.438 for O (1995), FO (1995) and FO (1996) respectively] but is much lower than that of Stober [mean *RI* per share (*RIPS*) = 4.96] and Ahmed et al. (mean *RIPS* = 4.047).

While the characteristics of current *OA* is similar to lagged *OA*, current *O*A is statistically more appropriate to measure conservatism in Prop-VM, consistent with expectation but not FO (1996). However, the odd negative coefficient of *OA* for the full Prop-VM is unexpected, and if this model is excluded, evidence from other models indicate that in general, UK firms practises conservatism. The pool median α_2 (*OA*) = 0.41 is higher than the mean coefficient of *OAPS* in Stober (0.22) and Ahmed et al. (0.365), all are significant at 1%.

The coefficients of *CI* (α_3) for the pool data are all positives and significant, suggesting that these expenditures represent positive NPV investments. The pool median = 1.35 is higher than the mean coefficient of *CI* in Ahmed et al. (0.262), Myers (0.007) and Rees (0.958), all are significant at 1%.

While *RD, HR* and *DC* (cross-sectional) are able to predict one-year ahead *RI* and are value-relevant, only *RD* has characteristics of intangibles, consistent with findings in UK (eg Green et al., 1996) and US (eg Hirschey and Spencer, 1992; and Lev and Zarowin, 1999). A plausible reason for the unexpected lower than expected magnitudes of the coefficients of *HR* and *DC* could be due to measurement errors as *HR* only include direct labour costs, while *DC* includes other costs such as transportation, warehousing, freight charges and distribution costs in addition to advertising costs. Interestingly, the pool coefficients of *DC* are all negatives for all models in the Prop-LID (ie RModel 6 to 8), but the coefficients are all positives for all models in the Prop-VM (ie MModel 6 to 8). Since differential cost of capital affects models in the linear dynamics but not the valuation models, a plausible explanation for the inconsistent behaviour of *DC* in the Prop-LID and Prop-VM is that the cost of capital used for the Prop-LID may not be the most desirable one. One solution to overcome the inconsistency of the cost of capital used in the Prop-LID and Prop-VM in cross-sectional studies is to use a firm-specific required rate of return, for example, using the Capital Asset Pricing Model (CAPM) to derive an approximate

required rate of return for each firm (see Sharpe, 1964)[3]. Nevertheless, *RD, HR* and *DC* should be viewed as intangible or invisible assets since they result in financial benefits to the firm (see Edvinsson and Malone, 1997).

This study finds *TD* is able to predict future *RI* and is value-relevant, which supports the hypothesis of this study that debt signal 'good' news about a firm's value. While *DIV* is a good predictor of future *RI*, it tends to support the 'good' news hypothesis when *BV* is the scalar, but it tends to support the 'bad' news hypothesis when market value is the scalar, consistent with Akbar (2000). Since *DIV* has no measurement error, a likely explanation for this phenomenon is that the scalar dictates the direction of the *DIV* signal.

The above findings raised a new issue in the relation to the usefulness of the above variables which has not been explicitly addressed in the CMRA literature. The study is robust as a wide range of statistical tests is used to test for the usefulness of these variables as well as the reliability of the model.

In the final analysis, comparisons are made on the three valuation models based on (A) **Ohlson-Feltham Model** or **OFM** (*BV, RI, OA, CI*) ie MModel 3 (B) **OFM + IA** (the three intangible proxies, *RD, HR, DC*) ie MModel 6; and (C) **OFM + IA + Sig** (the two signalling proxies, *TD, DIV*) ie MModel 8 to determine which one of these models provide the most appropriate predictor (explanator) of market value. Estimations of the coefficients for the three valuation models are carried out (1) if they are the same across all firms within each year (pool); (2) by allowing the coefficients to vary cross-sectionally within each year (pool), as a function of parameters estimated from the Prop-LID; and (3) by allowing the coefficients to vary cross-sectionally within each year (pool), as a function of parameters estimated from the linear information models (ie LID1 to 8). Summarised results in terms of coefficients (parameters), and errors of the three valuation models estimated using (1), (2) and (3) by pooling are reported in Table 7.3.

From Table 7.3, the parameters of *DC* is negative for OFM+IA where the (2) coefficients estimated from Prop-LID are fed into the closed-form parameters of the valuation modes; and (3) coefficients estimated from LID1 to 8 are fed into the closed-form parameters of the valuation modes. For OFM+IA+Sig (Prop-VM) estimated using (2)

[3] Recent empirical studies found that beta (β) is sensitive to firm size (see Fama, 1991; Fama and French, 1992). Hence, control for size is essential when firm-specific required rate of return is used.

and (3), the parameters for *OA, RD* in addition to *DC* are negatives. The MAFE and MSFE for all the valuation models are similar though they are slightly lower for the non-closed form models. The above analysis show that the most appropriate estimation of the coefficients of the valuation models is by allowing the coefficients to vary each year (pool)[4]. This finding is consistent to Myers (1999) in which he finds that the valuation coefficients of bv_t, RI_t and $capx_t$ fed by the time-series LID of FO (1995, 1996) do not provide the best estimates of firm price, suggesting that the parameters estimated from the LID are not useful in valuing market value of equity.

The evidence reported also indicates that Prop-VM outwits the OFM and the OFM+IA as the most appropriate model to explain and forecast market values. Interestingly, the addition of the various linear models (ie LID2 to 8) to the information dynamics adds little or not at all to the RI model (Prop-LID).

The reliability of Prop-VM compares favourably with Ittner and Larcker (1998); ($\bar{R}^2 = 2\%$); Myers (1999) where two of his three models have low *V/P* ratios [*V/P* = 0.411, 0.644 and 0.924 for O (1995), FO (1995) and FO (1996) respectively] and that the coefficients for *OA* and *CI* in the LID for Myers are negatives. Consequently, the fit of Prop-VM compares unfavourably with the following studies.

Hand and Landsman (1999) use analysts' earnings forecasts and *DIV* as a proxies for v_t in predicting future *RI* and in equity valuation, and find $\bar{R}^2 = 95\%$ for the valuation model. Black et al. (1999) find other information in the form of firm reputation is statistically significant, and that $\bar{R}^2$ increased from 74.2% to 75.4% when the nonfinancial variable is included in the model. However, both Hand and Landsman; and Black et al. use unscaled equations. When Lo and Lys (2000a) replicated the sample of Hand and Landsman by scaling the equations by MV_{t-1}, the coefficient for *DIV* changed from positive to negative and R^2 reduces to a mere 41%. Given the 'newness' of conducting firm reputation in empirical accounting research, and the suspected noisiness of the data, the result of Black et al. must be treated with caution. The inclusion of other information (*CI, TD, DIV*) in Rees's (1997) valuation model improves the explanatory power of the model from 54% to 64%. Giner and Reverte (2001) estimate a EBO that include debt-to-equity

[4] This study as well as most studies that operationalised the OFF use pooling of cross-sectional and time-series data while Feltham and Ohlson specify that the closed-form parameters of the valuation modes are fed by the coefficients of the linear dynamics that are estimated on time-series, not by pooling across-time.

ratio as one of the dependent variables, and find that the debt ratio provides positive signal for firms facing good earnings prospects, and $\bar{R}^2$ averages 60% for the yearly and pooled data. However, Rees; and Giner and Reverte use per share basis in their estimating equations. Brown et al. (1999) show that using per share basis where the dependent variable is price result in higher R^2 because scale has not been controlled for. Frankel and Lee (1998) find that the firm's fundamental values (V) explains more than 80% and 70% of the cross-sectional variation in security prices using analysts' forecasts and historical data respectively. Lo and Lys (2000a) consider analysts data may be noisy, and when they replicated Frankel and Lee's studies, the explanatory power declined by 34%.

Even though the fit of the valuation model (Prop-VM) of this study is not as impressive as those reported by some studies, however, there are serious scale or/and heteroscedasticity is/are problems (Rees, 1997; Hand and Landsman, 1999; Black et al., 1999), invalid model specification (Stober, 1996 ignores v), and noisy variables (Frankel and Lee, 1998; Giner and Reverte, 2001 used ratios), and hence, their results should be viewed with caution.

The secondary aim of this chapter reveals the following. The omission of outliers has a negative impact on individual independent variables as well as explanatory powers, suggesting that deletion of outliers in a sample may be more complex than one would expect. Differential cost of capital affects statistical results in Prop-LID (where r = 10% is best) but not in Prop-VM. Equations with/without an intercept generate different statistical results, where the inclusion of an intercept in Prop-LID improves results, consequently, the inclusion of an intercept for EDMV in Prop-VM erodes results. Scaling by BV and MV produces different results for Prop-LID and Prop-VM, and evidence from this study shows that EDBV consistently outperforms EDMVN&I for both Prop-LID and Prop-VM. Finally, this study reveals that $\bar{R}^2$ is not a reliable measure as they are mostly negatives in Prop-VM, equations with highly significant coefficients are associated with low $\bar{R}^2$, and low MAFE and MSFE are associated with low $\bar{R}^2$, thus suggesting that the traditional use of $\bar{R}^2$ as a measure of the fit in CMRA should now be viewed with caution.

7.2. Contributions of this Research

This study has considered arguments and evidence concerning the relative merits to investors and policymakers of accounting and other data in financial reporting. The study has sought to contribute to knowledge in this area in a number of different respects. Firstly, normative proposals for an increased emphasis on variables other than earnings in financial reporting has been analysed with a view to predicting future direction for this research and a proposal consistent with recent interest in the use of alternative measures (other information) in fundamental valuation. Secondly, the issue of the relative ability of accrual and cash flow data to predict future residual income and in equity valuation has been highlighted as an area of relevance for assessing the relative usefulness of these approaches to financial reporting, consistent with established valuation theory, professional accounting pronouncements and regulatory compliances.

Thirdly, the theoretical model for this study is formulated with at least five rationales not found in CMRA as this study: (1) integrates Ohlson (1995); Feltham and Ohlson (1995, 1996) into an integrated framework linking the LID and the VM, coined as the Ohlson-Feltham Framework (OFF) in this thesis; (2) uses a comprehensive sets of variables (CSV) to measure value creation, conservatism, intangibles, and future expectations of a firm; (3) employs multiple variables to proxy for 'other' information; (4) is the first CMRA to empirically test for the relevance of HR in predicting residual income and equity valuation; and (5) is the first to use information obtained from the cash flow statement in addition to the income statement and balance sheet in the formulation of the model under the auspices of the OFF.

Fourthly, an empirical analysis of the usefulness of a range of accounting data (accrual + cash flows) as predictors of future residual income and their usefulness as explanatory variables for security prices in the UK has been conducted, and the result suggests that the variables that are able to predict expected *RI* are also value-relevant in determining a firm's value, thus providing new and interesting evidence, and insights into the nature of equity valuation and such data.

Fifthly, the secondary aim of this study reveals that (1) omission of outliers has a negative impact on statistical results; (2) differential cost of capital affects statistical results for Prop-LID; (3) inclusion of an intercept in Prop-LID improves results, consequently, the

inclusion of an intercept for EDMV in Prop-VM erodes results; (4) scaling by *BV* and *MV* produces different results, and evidence from this study shows that EDBV consistently outperforms EDMVN&I for both Prop-LID and Prop-VM; and (5) $\bar{R}^2$ is not a reliable measure of fit, and that multiple statistical measures provide more reliable inferences. Sixthly, this study is probably the second (after Akbar, 2000) to include dead firms in the sample, thus avoiding the issue of survivorship bias. Seventhly, this is probably the first study that extensively uses self-programmed software to automate the data extraction, processing and dissemination of information. Due to this, this extensive study with 7,860 regression runs can be accomplished with reliable results.

7.3. Limitations of this Research

This research is conducted under certain constraints and as a consequence, some limitations are expected. The first limitation is the sample period. Due to the use of research and development expenditures, the sample period cannot be extended prior to 1989 because of the lack of disclosure of these expenditures prior to 1989. Even though research and development expenditures (*RD)* is required to be disclosed thereafter, only 25% of UK firms disclose these expenditures. A related limitation is that advertising costs (*AD*) are not disclosed in UK, and hence distribution costs (*DC*) are used as proxy for *AD*. The consequence is the use of a noisy *DC* may induce measurement errors in the variable as the variable includes costs such as transportation, warehousing, insurance, freight charges, distribution and other costs in addition to advertising costs. Human resource costs is also noisy as it only includes direct labour costs.

Thirdly, this research is restricted to the study of financial data provided by past financial statements instead of 'other' or alternate or nonfinancial information, and this is due to practical reason because in formulating hypotheses, only decisions that can be observable and be accompanied by sources of information ought to be used (McNichols and O'Brien, 1997; and Lo and Lys, 2000a). As a result, this study is unable to provide (1) a direct test on the consistency of the *RI* information dynamics as well as the valuation models within the OFF; and (2) evidence on the extent to which alternative reporting systems that is based on alternative sources of information.

Fourthly, the linear information dynamics of the OFF is a series of time-series models for a single firm, but this study estimate the LID cross-sectionally and by pooling.

Methodologically, estimating the LID cross-sectionally and by pooling is not an issue since the OFF imposes a one-lag structure (Bar-Yosef et al., 1996), and moreover, this study finds little difference when the valuation models are estimated cross-sectionally and by pooling; and when they are estimated in closed-form by feeding the parameters estimated cross-sectionally and by pooling from the linear information models. The issue of not using time-series is attributed to the lack of a long series of data availability in UK, and it would be of interest if similar estimations are carried out using time-series.

Fifthly, since discount rates are notoriously difficult to estimate (Kothari, 2001; Siegel and Thaler, 1997), the discount rates used are based on previous studies rather than directly estimated, but at least, the various estimating equations are robustly tested using varying cost of capital of 10%, 15% and 20%. Sixthly, there are numerous limitations due to the use of valuation models estimated cross-sectionally. To mitigate scale and heteroscedasticity, the level equations are deflated by BV_{it} and MV_{it} for the linear information dynamics (Prop-LID) and BV_{it} and MV_{it-1} for the valuation models (Prop-VM). While the values of the intercepts and residuals have greatly reduced, the fit for the scaled equation deteriorates, and scaling by book value and market value produces different statistical results. Examination of the inverse of size terms $\frac{1}{BV}$ and $\frac{1}{MV}$ reveal that their values are large and are mostly statistically significant, suggesting a likelihood of the omission of a relevant unscaled variable in the deflated equations (see Green et al., 1996). As a consequence, model misspecification may be a possibility but due to limited theoretical development, it is difficult to formulate and test valuation models that can be defended unequivocally.

The limitations in this study are attributed to problems relating to dataset, disclosure policy in UK, theoretical framework of the OFF, operationalization and econometric issues. Since these limitations are recognized, misapplying the models is unlikely, and hence, incorrect inferences drawn from the results obtained are avoided.

7.4. Scope of Future Research

As discussed throughout this thesis, there would be a considerable number of interesting avenues for future research in CMRA. These include the use of normative methodology to examine, say, other information data in relation to performance measure of

firms and equity valuation, and the use of more sophisticated empirical research methods and techniques to examine the use of earnings, nonaccounting and other information by investors, and to assess the relationship between such data and observed share prices.

The evidence of this research indicates that *RD*, *HR* and *DC* are useful variables in the LID and they are value-relevant, but *HR* and *DC* may be noisy and hence, they are not considered intangibles in this study and the selection of more appropriate *HR* and *DC* (proxy for *AD*) should provide an avenue for future research. Due to definitional and operationalization problems in the OFF, this study is forced to use accounting data to proxy for 'other' information, however, the few studies examining the use of nonfinancial information in relating share prices are innovative and are interesting and should provide the motivation for future research in the areas of fundamental analysis using nonfinancial information in CMRA.

Due to the difficulty of obtaining an appropriate discount rate, three discount rates are used for this study, and the results suggest that the use of different cost of capital affect regressional outcomes. Hence, a more appropriate method in determining the cost of capital for firms may be an avenue for future research. The evidence of this study indicates that statistical results are affected by the scalar, and the White's Heteroscedasticity-Consistent Covariance Estimator (White's test) can severely undermine the true coefficients for the deflated equations, such that may statistically significant coefficients become insignificant when the White's test is invoked. As such, the search for an appropriate deflator, or a better technique in mitigating scale/heteroscedasticity should be an interesting avenue for future research in capital market research in accounting.

Appendix 3.1 – Proposed Models for the Research

Assuming in an efficient market with no arbitrage, no information asymmetry, and price is equal to the present value of expected dividends (PVED):

$$P_t = \sum_{\tau=1}^{\infty} \frac{E_t\left[DIV_{t+\tau}\right]}{(1+r)^{\tau}} \quad \text{(PVED)} \tag{A.1}$$

where

- P_t = Price (market value) of the firm's security at time t
- DIV_t = Net dividends paid at time t.

The basis of the value of a firm is matched with the creation and distribution of value, known as the Clean Surplus Relation (CSR):

$$BV_{t-1} = BV_t + DIV_t - NI_t \tag{A.2}$$

where:

- BV_t = Book value of equity at time t
- NI_t = Earnings (Net income) for the period from t-1 to t.

The performance measure, residual income (RI) is defined as earnings for year t minus a charge for the use of capital:

$$RI_t \equiv NI_t - rBV_{t-1} \tag{A.3}$$

By rearranging the CSR in equation (A.2), and substitute equation (A.3) into the rearranged equation (A.2):

$$DIV_t = BV_{t-1}(1+r) + RI_t - BV_t \tag{A.4}$$

Substituting equation (A.4) into equation (A.1) produces:

$$P_t = \sum_{\tau=1}^{\infty} \frac{E_t\left[BV_{t+\tau-1}(1+r) + RI_{t+\tau} - BV_{t+\tau}\right]}{(1+r)^{\tau}} \tag{A.5}$$

Transforming equation (A.5) algebraically becomes:

$$P_t = \frac{E_t\left[BV_t(1+r) + RI_{t+1} - BV_{t+1}\right]}{(1+r)} + \frac{E_t\left[BV_{t+1}(1+r) + RI_{t+2} - BV_{t+2}\right]}{(1+r)^2} +$$

$$\frac{Et\left[BV_{t+2}(1+r) + RI_{t+3} - BV_{t+3}\right]}{(1+r)^3} + \ldots + \frac{E_t\left[BV_{t-1+\infty}(1+r) + RI_{t+\infty} - BV_{t+\infty}\right]}{(1+r)^{\infty}}$$

Expanding, cancelling and rearranging the terms of the above leads to:

$$P_t = BV_t + \sum_{\tau=1}^{\infty} \frac{E_t\left[RI_{t+\tau}\right]}{(1+r)^{\tau}} - \frac{E_t\left[BV_{t+\infty}\right]}{(1+r)^{\infty}} \tag{A.6}$$

The final term of equation (A.6), $\frac{E_t\left[BV_{t+\infty}\right]}{(1+r)^{\infty}}$ is assumed to be zero, thus price can be expressed as the sum of book value and the present value of future (anticipated) residual income, which is also known as the **Residual Income Valuation Model (RIVM)**:

$$V_t = BV_t + \sum_{\tau=1}^{\infty} \frac{E_t\left[RI_{t+\tau}\right]}{(1+r)^{\tau}} \tag{A.7}$$

But equation (A.7) is an infinite series, and in order to operationalize (A.7), the relation between current information and residual income can be specified in the form of a **linear information dynamic (LID)** structure. The LID structure consists of individual univariate autoregressive disturbance models represented by operating assets (*OA*), capital investments (*CI*), research & development expenditures (*RD*), human resource costs (*HR*), distribution costs (*DC*), total debt (*TD*) and ordinary dividends (*DIV*) plus an *'innovation'* (ε_t). The value of each variable plus an *'innovation'* (ε_t) are expected to have a positive impact on one-period-ahead residual income. The LID can be formally stated as:

$$RI_{t+1} = \omega_{11}RI_t + \omega_{12}OA_t + \omega_{13}CI_t + \omega_{14}RD_t + \omega_{15}HR_t + \omega_{16}DC_t + \omega_{17}TD_t + \omega_{18}DIV_t + \varepsilon_{1t+1} \quad \text{Prop-LID} \tag{A.8}$$

$$OA_{t+1} = \omega_{22}OA_t + \varepsilon_{2t+1} \tag{A.9}$$

$$CI_{t+1} = \omega_{33}CI_t + \varepsilon_{3t+1} \tag{A.10}$$

$$RD_{t+1} = \omega_{44}RD_t + \varepsilon_{4t+1} \tag{A.11}$$

$$HR_{t+1} = \omega_{55}HR_t + \varepsilon_{5t+1} \tag{A.12}$$

$$DC_{t+1} = \omega_{66}DC_t + \varepsilon_{6t+1} \tag{A.13}$$

$$TD_{t+1} = \omega_{77}TD_t + \varepsilon_{7t+1} \tag{A.14}$$

$$DIV_{t+1} = \omega_{88}DIV_t + \varepsilon_{8t+1} \tag{A.15}$$

The LIDs for DIV_{t+1}, TD_{t+1}, DC_{t+1}, HR_{t+1}, RD_{t+1}, CI_{t+1}, OA_{t+1}, RI_{t+1} are known as LID8, LID7, LID6, LID5, LID4, LID3, LID2 and LID1 (Prop-LID) respectively.

where:

- The parameter of dividends are hypothesized to signal 'good' news (future profitability) to the market, but have no long run effect on the variable, and that its values are expected to decay to 0 over a relatively short-period of time.

$$0 \leq \omega_{88} < 1 \tag{A.16}$$

- The parameter of total debts are hypothesized that debt financing signals a firm's has investment projects that could generate future benefits to the firm, but its benefits are expected to decay to 0 over a relatively short-period of time.

$$0 \leq \omega_{77} < 1 \tag{A.17}$$

- The inclusion of DC_t, HR_t and RD_t are used to proxy for intangibles, and their parameters are expected to have an impact on one-period-ahead *RI*.

$$\omega_{66} > 0,\ \omega_{55} > 0,\ \omega_{44} > 0 \tag{A.18}$$

- The parameter of capital investments in operating assets are set to ensure that there is growth in these variables as long as the firm is a going concern. If $\omega_n = 1$, there is no growth, and if $\omega_n > 1$, growth is ensures.

$$1 \leq \omega_{33} < (1 + g) \tag{A.19}$$

- The parameter that represents the operating assets effect on conservatism is based on FO (1995) rather than FO (1996) because the latter assumes that conservatism is the result of accelerated depreciation and positive NPV investments is too restrictive and simplilistic. Studies by Basu (1997); Beaver and Ryan (1997, 2000); and Ahmed et al. (2000) have documented that conservatism is the result of multiple sources in addition to accelerated depreciation, such as inventory methods, prudence concept of recognition of losses, financial leverages, firm size, growth, and unrecognised intangibles. Hence, following FO (1995), when accounting is conservative, $\omega_{22} > 0$, and when $\omega_{22} = 0$, accounting is unbiased:

$$0 \leq \omega_{22} \leq 1 \tag{A.20}$$

- The parameter that measures the persistence in residual income is restricted to (1) $\omega_{11} \geq 0$ (lower bound) eliminates implausible oscillating persistence, and (2) $\omega_{11} < 1$ (upper bound) permits positive (or zero) persistence, but implies the (marginal) effect decays (geometrically) with time.

$$0 \leq \omega_{11} < 1 \tag{A.21}$$

With the above restrictions applying to equations (A.8) to (A.15), residual income follows an autoregressive process; and equations (A.9) to (A.15) imposes an AR(1) dynamics on DIV_{t+1}, TD_{t+1}, DC_{t+1}, HR_{t+1}, RD_{t+1}, CI_{t+1} and OA_{t+1} in which these variables are incorporated into residual income with a lag of one.

Since residual income is defined as the difference between market and book values, therefore, **unrecorded goodwill** ***(UG)*** equals the discounted expected future abnormal earnings of a firm, thus (A.7) becomes:

$$UG_t \equiv V_t - BV_t \tag{A.22}$$

Using (A.7) and (A.22), one derives UG at time t and at time t+1:

$$\boxed{(1+r)UG_t = E_t\left[UG_{t+1} + RI_{t+1}\right]} \tag{A.23}$$

Since residual income is expected to influence a firm's value, using (A.8) and UG_t,, one can conjecture a linear solution for equation (A.23):

$$\boxed{UG_t = \alpha_1 RI_t + \alpha_2 OA_t + \alpha_3 CI_t + \alpha_4 RD_t + \alpha_5 HR_t + \alpha_6 DC_t + \alpha_7 TD_t + \alpha_8 DIV_t} \tag{A.24}$$

Substitute (A.24) and (A.8) into (A.23):

$$(1+r)(\alpha_1 RI_t+\alpha_2 OA_t+\alpha_3 CI_t+\alpha_4 RD_t+\alpha_5 HR_t+\alpha_6 DC_t+\alpha_7 TD_t+\alpha_8 DIV_t)=$$
$$(\alpha_1 RI_{t+1}+\alpha_2 OA_{t+1}+\alpha_3 CI_{t+1}+\alpha_4 RD_{t+1}+\alpha_5 HR_{t+1}+\alpha_6 DC_{t+1}+\alpha_7 TD_{t+1}+\alpha_8 DIV_{t+1})+ \quad (A.25)$$
$$(\omega_{11} RI_t+\omega_{12} OA_t+\omega_{13} CI_t+\omega_{14} RD_t+\omega_{15} HR_t+\omega_{16} DC_t+\omega_{17} TD_t+\omega_{18} DIV_t)$$

Substitute all the LID ((A.8) to (A.15)) into (A.25) produces:

$$(1+r)\alpha_1 RI_t+(1+r)\alpha_2 OA_t+(1+r)\alpha_3 CI_t+(1+r)\alpha_4 RD_t+(1+r)\alpha_5 HR_t+$$
$$(1+r)\alpha_6 DC_t+(1+r)\alpha_7 TD_t+(1+r)\alpha_8 DIV_t=$$
$$(\alpha_1+1)+(\omega_{11} RI_t+\omega_{12} OA_t+\omega_{13} CI_t+\omega_{14} RD_t+\omega_{15} HR_t+\omega_{16} DC_t+\omega_{17} TD_t+\omega_{18} DIV_t)+$$
$$\alpha_2\omega_{22} OA_t+\alpha_3\omega_{33} CI_t+\alpha_4\omega_{44} RD_t+\alpha_5\omega_{55} HR_t+\alpha_6\omega_{66} DC_t+\alpha_7\omega_{77} TD_t+\alpha_8\omega_{88} DIV_t$$

$$(1+r)\alpha_1 RI_t+(1+r)\alpha_2 OA_t+(1+r)\alpha_3 CI_t+(1+r)\alpha_4 RD_t+(1+r)\alpha_5 HR_t+$$
$$(1+r)\alpha_6 DC_t+(1+r)\alpha_7 TD_t+(1+r)\alpha_8 DIV_t=\alpha_1\omega_{11} RI_t+\alpha_1\omega_{12} OA_t+$$
$$\alpha_1\omega_{13} CI_t+\alpha_1\omega_{14} RD_t+\alpha_1\omega_{15} HR_t+\alpha_1\omega_{16} DC_t+\alpha_1\omega_{17} TD_t+\alpha_1\omega_{18} DIV_t+$$
$$\omega_{11} RI_t+\omega_{12} OA_t+\omega_{13} CI_t+\omega_{14} RD_t+\omega_{15} HR_t+\omega_{16} DC_t+\omega_{17} TD_t+\omega_{18} DIV_t+$$
$$\alpha_2\omega_{22} OA_t+\alpha_3\omega_{33} CI_t+\alpha_4\omega_{44} RD_t+\alpha_5\omega_{55} HR_t+\alpha_6\omega_{66} DC_t+\alpha_7\omega_{77} TD_t+\alpha_8\omega_{88} DIV_t$$

Since the equation must hold for all values of RI_t, OA_t, CI_t, RD_t, HR_t, DC_t, TD_t and DIV_t, rearranging the equation will produce:

(1) $(1+r)\alpha_1 RI_t=\alpha_1\omega_{11}\alpha_1 RI_t+\omega_{11}\alpha_1 RI_t$

$$\therefore\ \alpha_1=\frac{\omega_{11}}{(1+r-\omega_{11})} \quad (A.26)$$

(2) $(1+r)\alpha_2 OA_t=\alpha_1\omega_{12} OA_t+\omega_{12} OA_t+\alpha_2\omega_{22} OA_t$

$$\therefore\ \alpha_2=\frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})} \quad (A.27)$$

(3) $(1+r)\alpha_3 CI_t=\alpha_1\omega_{13} CI_t+\omega_{13} CI_t+\alpha_3\omega_{33} CI_t$

$$\therefore\ \alpha_3=\frac{\omega_{13}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{33})} \quad (A.28)$$

(4) $(1+r)\alpha_4 RD_t=\alpha_1\omega_{14} RD_t+\omega_{14} RD_t+\alpha_4\omega_{44} RD_t$

$$\therefore\ \alpha_4=\frac{\omega_{14}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{44})} \quad (A.29)$$

(5) $(1+r)\alpha_5 HR_t=\alpha_1\omega_{15} HR_t+\omega_{15} HR_t+\alpha_5\omega_{55} HR_t$

$$\therefore\ \alpha_5=\frac{\omega_{15}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{55})} \quad (A.30)$$

(6) $(1+r)\alpha_6 DC_t=\alpha_1\omega_{16} DC_t+\omega_{16} DC_t+\alpha_6\omega_{66} DC_t$

$$\therefore\ \alpha_6=\frac{\omega_{16}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{66})} \quad (A.31)$$

(7) $(1+r)\alpha_7 TD_t=\alpha_1\omega_{17} TD_t+\omega_{17} TD_t+\alpha_{777} HR_t$

$$\therefore\ \alpha_7=\frac{\omega_{17}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{77})} \quad (A.32)$$

(8) $(1+r)\alpha_8 DIV_t = \alpha_1\omega_{18}DIV_t + \omega_{18}DIV_t + \alpha_8\omega_{88}DIV_t$

$$\therefore\ \alpha_8 = \frac{\omega_{18}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{88})} \tag{A.33}$$

By substituting (A.24) into (A.22), V_t can be expressed as a linear function of book values, current residual income, current operating assets, current investments in operating assets, current research & development expenditures, current human resource costs, current distribution costs, current total debt and current ordinary dividends as follows:

$$\boxed{V_t = BV_t + \alpha_1 RI_t + \alpha_2 OA_t + \alpha_3 CI_t + \alpha_4 RD_t + \alpha_5 HR_t + \alpha_6 DC_t + \alpha_7 TD_t + \alpha_8 DIV_t \quad \text{[Prop-VM]}} \tag{A.34}$$

Since the coefficients of the proposed valuation models are based on the fixed parameters of the LID, the **expected signs** for the coefficients of the valuation model should be consistent with the assumptions for the parameters of the LID. Assuming the required rate of return is 10%, the analysis of the expected signs and magnitudes of the coefficients of this proposed valuation model are as follows.

If $\omega_{11} > 0$, α_1 must be positive, ie the parameter of residual income is value relevant. Following the theory of the LID, if $\omega_{12} > 0$, and ω_{11} and ω_{22} are within the limits imposed by the LID, α_2 must be positive, implying that the firm practices conservatism. Assuming that ω_{11} and ω_{33} are positives, and if ω_{13} is negative, then $\alpha_3 < 0$, implying negative NPV investments. On the other hand, if ω_{11}, ω_{33} and ω_{13} are all positives, then $\alpha_3 > 0$, implying positive NPV investments.

The parameters of α_4, α_5 and α_6, are influenced by the parameters of ω_{14}, ω_{15} and ω_{16} respectively from the *RI* autoregressive model (Prop-LID) and ω_{44}, ω_{55} and ω_{66} respectively are from the individual autoregressive models (LID4 to 6), and ω_{11}. For instance, for *RD*, if $\omega_{11} > 0$, ω_{44}, > 0 and $\omega_{14} > 0$ (say all are 0.5), α_4, □ 1.5 , suggesting *RD* is long-lived, and ought to be capitalized. The same assumption applies for α_5 and α_6. Significantly negative signs for α_4, α_5 and α_6, indicate that *RD*, *HR* and *DC* respectively are short-lived, which imply that they are treated as accounting expenses.

If ω_{17} and ω_{77}, and ω_{18} and ω_{88} are expected to be positives in the LID, and if ω_{11} is positive, α_7 and α_8 will be positives, implying that they signal 'good' news to the market. Significant negative signs forα_7 and α_8 indicate that *TD* and *DIV* respectively signal 'bad' news to the market.

Appendix 4.1 – Program Listing for the generation of DSW macros to extract Share Prices

```
Private Sub cmdCoreMacros_Click()
On Error GoTo Err_cmdCoreMacros_Click
  Dim db As Object
  Dim obj As AccessObject
  Dim db1 As Database
  Dim rs As Recordset
  Dim stDataFile As String
  Dim stCSVFile As String
  Dim stYear1, stYear2
  Dim arTable(40), arMacro(40), arCSVFilesNo(600) ' subj. to change
  Dim yeDate
  Dim yeDay
  Dim yeMonth
  Dim yeYear
  Dim firstMonth
  Dim LastMonth
  Dim NewDate
  Dim a, b, i CSVNo As Integer
  Dim intCSVFilesNo As Integer
  Dim stCLEAR As String
  Dim stSTART As String
  Dim stSTARTDATE 'As String
  Dim stENDDATE As String
  Dim stENDDC As String
  Dim stCODE As String
  Dim stSEND As String
  Dim stCALL As String
  Dim Msg, Style, Title, Help, Ctxt, Response

  Msg = "Do you want to continue ?"
  Style = vbYesNo + vbCritical + vbDefaultButton2
  Title = m_path    ' Define title.
  Help = "DEMO.HLP"    ' Define Help file.
  Ctxt = 1000    ' Define topic

  Response = MsgBox(Msg, Style, Title, Help, Ctxt)
  If Response = vbNo Then Exit Sub

  Set db1 = CurrentDb()
  Set rs = db1.OpenRecordset("Years", dbOpenTable)
  rs.Index = "Year"

  a = 0
  With rs
    .MoveFirst
    Do While Not .EOF
       stYear1 = .Fields("Year")
       stYear1 = Right$(stYear1, 2)

       arTable(a) = "StockCross" & stYear1
       arMacro(a) = "CSP" & stYear1  'Name of Macros Files

       a = a + 1

       .MoveNext
    Loop
  End With

  rs.Close

'900B
  stCLEAR = "SEND(" & """" & "[CLEAR]" & """" & ")"
  stENDDC = "ENDDC()"

  intCSVFilesNo = 0
```

```
Set db = Application.CurrentData

For Each obj In db.AllTables
  i = 0
  For i = 0 To a - 1
    stDataFile = arTable(i)
    stCSVFile = arMacro(i)

    If obj.Name = stDataFile Then

      Set db1 = CurrentDb
      Set rs = db1.OpenRecordset(stDataFile, dbOpenTable)
      rs.Index = "code"

      If rs.EOF Then
        arMacro(i) = ""
        Exit For
      End If

      With rs
        .MoveFirst

        CSVNo = 0
        Do While Not .EOF
          CSVNo = CSVNo + 1
          intCSVFilesNo = intCSVFilesNo + 1
          arCSVFilesNo(intCSVFilesNo) = stCSVFile & CSVNo

          stSTART = "STARTDC(CSVFILE," & """" & "A:\" _
              & stCSVFile & CSVNo & ".CSV" & """" & ")"

          Open m_path & stCSVFile & CSVNo & ".mac" For Output As #1
          Print #1, stCLEAR; ""
          Print #1, stSTART; ""

          b = 0
          Do While b <= 200
            b = b + 1

            stCODE = .Fields("Code")
            yeDate = .Fields("Date")
            yeDay = Day(yeDate)
            yeMonth = Month(yeDate)
            yeYear = Year(yeDate)
            firstMonth = yeMonth '+ 1

            If yeDay > 28 Then
              If firstMonth = 2 Then
                chkLeapYear yeYear
                If booReturnFunction = True Then
                  yeDay = 29
                Else
                  yeDay = 28
                End If
              End If

              If firstMonth = 4 Or firstMonth = 6 Or firstMonth = 9 Or_
                  firstMonth = 11 Then
                yeDay = 30
              End If
            End If

            stSTARTDATE = yeDay & "/" & firstMonth & "/" & yeYear

            LastMonth = firstMonth + 12   '11

            If LastMonth > 12 Then
              LastMonth = LastMonth - 12
              yeYear = yeYear + 1
            End If
```

```
If yeDay > 28 Then
  If LastMonth = 2 Then
    chkLeapYear yeYear
    If booReturnFunction = True Then
      yeDay = 29
    Else
      yeDay = 28
    End If
  End If

  If LastMonth = 4 Or LastMonth = 6 Or LastMonth = 9 Or LastMonth = 11_
       Then
    If yeDay > 30 Then
      yeDay = 30
    End If
  End If

  stENDDATE = yeDay & "/" & LastMonth & "/" & yeYear
  stSEND = "SEND(" & """" & "900B," & stCODE & "," & stSTARTDATE & "," &_
    stENDDATE & "," & "M" & """" & ")"

  Print #1, Spc(5); stSEND; ""

  .MoveNext

  If .EOF Then Exit Do
 Loop ' <= 200

 Print #1, stENDDC
 Close #1

 Loop ' file
End With

    rs.Close

  End If  ' end of obj.
 Next I
Next obj

Open m_path & "CSP.MAC" For Output As #1
  Print #1, stCLEAR; ""

  For i = 1 To intCSVFilesNo
    If arCSVFilesNo(I) <> "" Then
      stCALL = "CALL  " & """" & arCSVFilesNo(I) & ".MAC" & """" & ":"

      Print #1, stCALL; ""
    End If
  Next i

  Print #1, stCLEAR; ""
    Close #1

    MsgBox "Done, the Main Macros is CSP.MAC, " & _
        "followed by CSP*.* files."

Exit_cmdCoreMacros_Click:
  Exit Sub

Err_cmdCoreMacros_Click:
  MsgBox Err.Description
  Resume Exit_cmdCoreMacros_Click
End Sub
```

Appendix 4.2 – Description of the Software used for the Empirical Studies

A. The DataStream Relational Database System (DSRDS)

This is a computer software written by me with the intention of better managing the data management and providing speedy and efficient data processing system.

1. Import Databases

This function imports the reformatted 'txt' files containing data from companies, industry sectors and account codes (eg book values, dividends) taken from DSW into the system. These files serve as master files in which subsequent data extraction process is based.

2. Database Analysis

After process (1), all data is checked for accuracy, duplication and coding consistencies. Once the data has been checked for accuracy, selection of relevant nonfinancial industry sectors and account codes for the sample will then be made.

3. Database Macros

In DSW, macros are command-like programs which direct DSW to provide the relevant data as specified. This function generates the relevant DSW macros to extract the required companies and the relevant accounting and industry sector data. The account and sector code macros are based on the method of data extraction of DSW Program F113, and 900C respectively.

4. Import Spreadsheets

This function allows spreadsheet files (.xls or CSV extension) to be imported and stored in the DSRDS, and then combines with the master file data (company codes, industry sector codes and accounts codes). This is the data preparation process for function (5), ie to generate DSW macros to be used to extract dead companies from DSW Program 900A.

5. Dead Company Data

Together with (4), DSRDS Function (5) 'Dead Company Data', all the relevant dead firms data will be automatically extracted. This data is for subsequent use for DSW Program 301X.

6. Other Data

The objective of this function is to ensure data extracted from the older DataStream Window terminal (DSW) is consistent with the newer DataStream Advanced System (DSA). Before using this function, we need to extract the required data from DSA and then, import the data into the DSRDS using Function (4) 'Import Spreadsheets'. Activating DSRDS, (6) 'Other Data' the new data from DSA is compared with existing live and dead companies obtained from DSW, and a list of the differences can be generated.

7. Stock Data

DSRDS, Function (7) 'Stock Data' generates all the relevant DSW macros to extract the share prices for different dates for both live and dead firms using DSW's Program 900B.

8. Data Analysis

Using DSRDS, Function (8) 'Data Analysis', pressing a series of buttons on DSRDS, generates the various reports that aid in the sampling process. They are:

- Analysis of Industry Sectors and Companies (Ordered by Sectors)
- Analysis of Industry Sectors and Companies (Ordered by Years)
- Analysis of Distribution of Samples by Industrial Sectors based on DS Level 6
- Analysis of Live and Dead Companies

9. Utilities

These are NOT part of the data processing functions. The various utility functions are required and necessary when using the DSRDS. They are:

- Setting data path
- Maintaining and changing passwords
- Viewing various tables (files) for maintenance and checking for data integrity
- Viewing System reference
- Find specific (or generic) files
- Copy files and
- Compact and repair files

B. The DataStream Spreadsheet Automation System (DSSAS)

The DSRDS is a multi-purpose software that compliments the DSRDS. With DSRDS, Function (1) data can be imported from various sources, eg from DSW, spreadsheet, text files and other databases to provide an integrated dataset; (2) data can be stored centrally with no duplication of data; (3) data can be manipulated, updated, processed and sorted more speedily and efficiently than spreadsheets.

1-3 Sector File, Years File & Accounts File

These are the master files that contained the required industry sectors, sample period and accounts codes. These functions allow us to search whether these files are located in the computer system.

4-6 Import Sector, Import Years & Import Accounts

These files must be imported to the spreadsheet (excel) before any processing or data manipulation work can be done.

7-9 Convert to Live Sectors, Dead Sectors & Convert to Other Sectors

These functions convert the specified sector codes to extract live, dead and other companies in the LSE.

10-12 Save Live Sectors, Save Dead Sectors & Save Other Sectors

Since the file containing the data extracted from DSW or DSA are in CSV format (spreadsheet compatible files but they are not fully compatible to excel due to copyright reason), these functions will convert data extracted from DS to excel (.xls) format.

13-15 Save Live Sectors, Save Dead Sectors & Save Other Sectors

Once the data from the live, dead and other data sectors have been converted to excel (.xls) format, the files are to be imported to the system.

16 Select Dead Companies

Arrange essential data to build macros to extract details of dead companies

17 Correct Dates

Correct Errors in Dates in DataStream CSV Files. DSSAS, Function (17) corrects the year-end dates for those that were incorrectly recorded by DSW eg date recorded as 5/2/93 will be corrected to 31/1/93. In addition, 'NA' and blanks are assigned 0 indicating they have zero value.

18-21 Cross-section-Add New, Cross-section-Add Live, Cross-section-Add Dead & Cross-section-Add Other

The objective of these functions is arrange/add live, dead and other data in a format suitable for Cross-section Regressions.

22-23 Remove Rows-Sectors & Remove Rows-A/c

These functions enable us to remove any unwanted Rows or accounts codes.

24 Share Prices

Import Share Prices for Cross-section Regressions

25 Remove Dead Price Prices

Remove any duplicate dead share prices.

26 Aggregate Current

This function aggregates the data in accounting numbers, eg book value of equity is obtained by aggregating ordinary share capital, share premium account, associate reserves (O/W), grants, legal reserve and profit & loss account (see Definition of Variables).

27 Lag Variables

This Function imports any lag variables specified for subsequent regressions.

28-29 Lag Variables, Aggregate-Lag (*RI*) and Ahead Variables (*RI*)

Function 28 aggregates lag RI data while function 29 aggregates one-period ahead residual income (*RI*) data for Cross-section Regressions

30-31 Add Thousands and Remove Thousands

Since the DS's accounting data are truncated by £000 and share prices are in terms of pence, three zeros (000) must be added to the end of each accounting data, and the share prices must be divided by 100 to express them in pounds, these processes can be achieved using Function 30. Function 31 reverses Function 30.

32 Cross-section Regress

This function arranged data in a form suitable for regression estimations.

33 Currency check

Since the currency units must be in £, currency units other than £ or blanks are deleted by pressing Function (33) 'Currency Check'.

34 EViews Remove *X*

Some of the regression output generated by Eviews is presented in the form:

	OA_{it}
Coeff	5.3
t-stat	(1.63)
h-stat	(1.26)

However, when the above information is exported to Excel, the *t*-stat and *h*-stat of 1.63 and 1.26 will be in the form of –1.63 and –1.26 respectively. To prevent this problem, an '*X*' is placed before any brackets, eg (1.63) will be X(1.63) for all output generated by Eviews, and the *X* will be removed after the data has been exported to excel.

35-36 EViews Result and Print

Function 35 generates the 'Number of *t*- or *h*-Statistical Analysis' for the required regressions, and Function 36 prints the required results.

Appendix 4.3 – Program Listing to generate Coefficients and associated Statistics for Regression Models

```
' subroutine to reformat regression output
subroutine regPrg3(equation eq1, equation eq2, table tab1, scalar format, scalar !no, string %stType, scalar
!endline, scalar !ColumnSkip)

' assign useful values
!ncoef = eq1.@ncoef
!obs = eq1.@regobs
!ssr = eq1.@ssr
!m_ssr = !ssr/!obs
!line = !line + 1
!vline = !line

freeze(temp_table) eq1.results
%temp = temp_table(1,1)
setcell(tab1, 2, 1, @left(%temp,23), "l")    'dependent variable

%stObs = temp_table(5, 1)
%stobsCut = @mid(%stObs, 23,6)

setcell(tab1, !line, 1, @str(!no),"c")
setcell(tab1, !line, 2, %stType,"c")
setcell(tab1, !line, 3, "Coeff","c")
setcell(tab1, !line, !lastno, eq1.@rbar2, "r", format )
setcell(tab1, !line, !lastno+1, %stobscut,"r", format )
setcell(tab1, !line, !lastno+2, !m_ssr,"r", format )

if !no = 1 then
  !columnskip = !noIntercept1
endif

if !no = 2 then
  !columnskip = !noIntercept2
endif

if !no = 3 then
  !columnskip = !noIntercept3
endif

if !no = 4 then
  !columnskip = !noIntercept4
endif

include D:\2-3-Master\mMV2.prg ‘ subroutine to position statistics

!vline = !vline + 1

' coefficients
for !i = 1 to !ncoef
    if !i = 2 then
       !column = !column + !columnskip
    endif

    !est=eq1.@coefs(!i)
    setcell(tab1, !line, !column, !est, "r", format )
    !column = !column+1

    if !ColumnSkip = !column then
       !column = !column+1
    endif
next
```

```
include D:\2-3-Master\mMV2.prg ‘ subroutine to position statistics

!line = !line+1

't-stats
setcell(tab1, !line, 3, "t-Stat","c")

for !i = 1 to !ncoef
    ' compute statistics

    if !i = 2 then
       !column = !column + !columnskip
    endif

    !est=eq1.@tstats(!i)
    !se = sqr(eq1.@covariance(!i, !i))
    !tstat = !est/!se
    '!tprob = @tdist(!tstat, !obs-!ncoef)
!tprob = @tdist(!est, !obs-!ncoef)

' write t-statistic output
    setcell(tab1, !line, !column, !est, "r", format )
%str_t = "(" + tab1(!line, !column) + ")"

if !tprob < .01 then
    %str_t = "***" + %str_t
else
    if !tprob < .05 then
        %str_t = "**" + %str_t
    else
        if !tprob < 0.1 then
            %str_t = "*" + %str_t
        else
            if !est > 0 then
                %str_t = "X" + %str_t
            endif
        endif
    endif
  endif

  tab1(!line, !column) = %str_t

  !column = !column+1

 if !ColumnSkip = !column then
    !column = !column+1
 endif

next

include D:\2-3-Master\mMV2.prg ‘ subroutine to position statistics

!line = !line+1

'h-stats
setcell(tab1, !line, 3, "h-Stat","c")

for !i = 1 to !ncoef
    ' compute statistics

    if !i = 2 then
       !column = !column + !columnskip
    endif
```

```
!est=eq2.@tstats(!i)
        !se = sqr(eq2.@covariance(!i, !i))
        !tstat = !est/!se
        '!tprob = @tdist(!tstat, !obs-!ncoef)
!tprob = @tdist(!est, !obs-!ncoef)

' write t-statistic output
        setcell(tab1, !line, !column, !est, "r", format )
        %str_t = "(" + tab1(!line, !column) + ")"

 if !tprob < .01 then
         %str_t = "***" + %str_t
 else
       if !tprob < .05 then
             %str_t = "**" + %str_t
     else
          if !tprob < 0.1 then
              %str_t = "*" + %str_t
          else
              if !est > 0 then
                  %str_t = "X" + %str_t
              endif
          endif
    endif
endif

tab1(!line, !column) = %str_t

!column = !column+1

if !ColumnSkip = !column then
   !column = !column+1
    endif
next

!line = !line+1
delete temp_table

if !no = !endline then
  setline(tab1, !line)
endif

endsub


'subroutine to position statistics
if !no = 1 then
  !column = !Type_no1 '5
endif

if !no = 2 then
  !column = !Type_no2 '4
endif

if !no = 3 then
  !column = !Type_no3 '4
endif

if !no = 4 then
  !column = !Type_no4 '4
endif

endsub
```

Appendix 4.4 - Distribution of Unadjusted Sample by Industrial Sectors and the number of firms in each classification based on Datastream Level 6

Sector	Description	No. Companies	Percentage
AEROS	AEROSPACE	18	0.7
AIRLN	AIRLINES + AIRPORTS	12	0.4
AUPRT	AUTO PARTS	24	0.9
AUTOS	AUTOMOBILES	2	0.1
BMATS	BUILDING MATERIALS	61	2.3
BMERC	BUILDERS MERCHANTS	20	0.7
BRCAS	BROADCASTING	54	2
BREWS	BREWERS	5	0.2
BUSUP	BUSINESS SUPPORT	128	4.8
CABLE	CABLE + SATELLITE	5	0.2
CHEMS	CHEMICALS, COMMODITY	15	0.6
CHMAV	CHEMS.ADVANCED MATS.	12	0.4
CHMSP	CHEMICALS, SPECIALITY	27	1
CLTHG	CLOTHING + FOOTWEAR	48	1.8
CMPSV	COMPUTER SERVICES	59	2.2
COMMV	COMMERCIAL VEHICLES	2	0.1
COMPH	COMPUTER HARDWARE	19	0.7
DCOMP	DISTRIB. IND. COMPS.	47	1.7
DEFEN	DEFENCE	6	0.2
DISTV	DISTILLERS + VINTNERS	13	0.5
DIVIN	DIVERSIFIED INDUSTRY	20	0.7
DSCST	DISCOUNT STORES	2	0.1
DSOTH	OTHER DISTRIBUTORS	32	1.2
DSVHL	VEHICLE DISTRIBUTION	40	1.5
EDUTR	EDUCATION + TRAINING	47	1.7
ELECT	ELECTRICITY	20	0.7
ELEQP	ELECTRICAL EQUIPMENT	36	1.3
ELETR	ELECTRONIC EQUIPMENT	111	4.1
ENGCO	ENG. CONTRACTORS	21	0.8
ENGFA	ENGINEERING FABRICATORS	27	1
ENGIN	ENGINEERING, GENERAL	115	4.3
ERETL	RETAILERS E-COMMERCE	7	0.3
FDPRD	FOOD PROCESSORS	65	2.4
FDRET	FOOD + DRUG RETAILERS	33	1.2
FMFSH	FARMING AND FISHING	9	0.3
GAMNG	GAMING	13	0.5
GASDS	GAS DISTRIBUTION	3	0.1
GOLDS	GOLD MINING	6	0.2
HAPPL	HSEHOLD APPS+HSEWARES	17	0.6
HARDL	RETAIL, HARDLINES	65	2.4
HOMEN	HOME ENTERTAINMENT	21	0.8
HOSPM	HOSPITAL MANAGEMENT	12	0.4
HOTEL	HOTELS	28	1
HOUSE	HOUSE BUILDING	63	2.3
HSEPR	HOUSEHOLD PRODUCTS	5	0.2
INTNT	INTERNET	31	1.2
LEISR	LEISURE FACILITIES	93	3.5
LSREQ	LEISURE EQUIPMENT	12	0.4
MEDAG	MEDIA AGENCIES	55	2
MEDEQ	MED EQUIP + SUPPLIES	45	1.7
MINES	OTHER MINING	19	0.7
MULTI	RETAILERS, MULTI DEPT	30	1.1
NOFMS	NON FERROUS METALS	9	0.3
OILEP	OIL + GAS EXPL/PROD.	44	1.6
OILIN	OIL INTEGRATED	8	0.3
OILSV	OIL SERVICES	11	0.4
OTHBU	OTHER BUSINESSES	38	1.4
OTHCN	OTHER CONSTRUCTION	41	1.5
OTHCR	OTHER HEALTH CARE	9	0.3
PAPER	PAPER	4	0.1

Appendix 4.4 - Distribution of Unadjusted Sample by Industrial Sectors and the number of firms in each classification based on Datastream Level 6

Sector	Description	No. Companies	Percentage
PCKGN	PACKAGING	42	1.6
PHARM	PHARMACEUTICALS	57	2.1
PHOTO	PHOTOGRAPHY	2	0.1
PRNSL	PERSONAL PRODUCTS	8	0.3
PRPAG	PROPERTY AGENCIES	13	0.5
PUBLS	PUBLISHING&PRINTING	125	4.6
RESTS	BREWERIES,PUBS,RESTS	66	2.4
RLDEV	REAL ESTATE DEV.	172	6.4
RROAD	RAIL, ROAD, FREIGHT	46	1.7
SECAL	SECURITY AND ALARMS	16	0.6
SEMIC	SEMICONDUCTORS	9	0.3
SHPNG	SHIPPING AND PORTS	23	0.9
SOFTD	SOFT DRINKS	3	0.1
SOFTG	RETAILERS, SOFT GOODS	38	1.4
SOFTW	SOFTWARE	94	3.5
STEEL	STEEL	9	0.3
TELEQ	TELECOM EQUIPMENT	13	0.5
TELFL	TELECOM FIXED LINE	26	1
TELWR	TELECOM WIRELESS	9	0.3
TEXOT	TEXTILES+LEATHER GDS	33	1.2
TOBAC	TOBACCO	5	0.2
WASTE	ENVIRONMENTAL CONTROL	8	0.3
WATER	WATER	33	1.2
TOTAL		2,694	100.0

Appendix 5.1 - Coefficients and associated statistics from C/s & Pool Estimations of Undeflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1991	Coeff	-5,748,689.1	0.880								0.401	962
	t-Stat	**(-2.078)	***(25.361)									
	h-Stat	*(-1.960)	***(5.314)									
1992	Coeff	8,214,474.3	0.496								0.234	940
	t-Stat	***(2.706)	***(16.986)									
	h-Stat	***(3.023)	***(3.128)									
1993	Coeff	7,533,122.5	0.815								0.528	998
	t-Stat	***(2.968)	***(33.425)									
	h-Stat	**(2.041)	***(4.780)									
1994	Coeff	4,788,680.5	0.932								0.7	1,061
	t-Stat	**(2.281)	***(49.761)									
	h-Stat	**(2.097)	***(11.958)									
1995	Coeff	-1,297,230.8	1.010								0.676	1,114
	t-Stat	(-0.503)	***(48.182)									
	h-Stat	(-0.829)	***(8.203)									
1996	Coeff	1,218,479.1	0.948								0.705	1,157
	t-Stat	(0.459)	***(52.600)									
	h-Stat	(0.740)	***(7.877)									
1997	Coeff	7,390,020.7	0.585								0.496	1,124
	t-Stat	**(2.471)	***(33.256)									
	h-Stat	***(2.737)	***(5.841)									
1998	Coeff	5,189,841.1	0.811								0.508	1,025
	t-Stat	(1.384)	***(32.543)									
	h-Stat	(1.360)	***(4.892)									
1999	Coeff	-7,856,710.7	0.655								0.043	921
	t-Stat	(-0.452)	***(6.491)									
	h-Stat	(-1.077)	(1.365)									
1991	Coeff	1,920,203.4	1.036	-0.030							0.508	962
	t-Stat	(0.750)	***(31.207)	***(-14.544)								
	h-Stat	(0.826)	***(6.156)	**(-2.566)								
1992	Coeff	2,148,241.4	0.511	0.017							0.284	940
	t-Stat	(0.709)	***(18.065)	***(8.089)								
	h-Stat	(0.561)	***(3.403)	(1.293)								
1993	Coeff	67,019.6	0.756	0.024							0.613	998
	t-Stat	(0.028)	***(33.692)	***(14.804)								
	h-Stat	(0.019)	***(4.440)	*(1.941)								
1994	Coeff	4,307,946.4	0.921	0.002							0.7	1,061
	t-Stat	**(2.017)	***(44.335)	(1.214)								
	h-Stat	*(1.908)	***(8.666)	(0.206)								
1995	Coeff	-5,056,052.8	0.918	0.016							0.689	1,114
	t-Stat	*(-1.958)	***(37.600)	***(6.962)								
	h-Stat	(-1.450)	***(9.686)	(1.056)								

Appendix 5.1 - Coefficients and associated statistics from C/s & Pool Estimations of Undeflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	A-R^2	Obs
1996	Coeff	1,099,169.5	0.946	0.000							0.705	1,157
	t-Stat	(0.401)	***(42.627)	(0.180)								
	h-Stat	(0.502)	***(7.478)	(0.053)								
1997	Coeff	-904,863.3	0.480	0.029							0.55	1,124
	t-Stat	(-0.311)	***(25.474)	***(11.706)								
	h-Stat	(-0.219)	***(5.829)	*(1.826)								
1998	Coeff	1,436,172.9	0.720	0.013							0.519	1,025
	t-Stat	(0.379)	***(23.217)	***(4.873)								
	h-Stat	(0.281)	***(3.223)	(0.637)								
1999	Coeff	27,795,477.5	1.553	-0.085							0.661	921
	t-Stat	***(2.678)	***(24.314)	***(-40.995)								
	h-Stat	***(4.134)	***(5.012)	***(-5.767)								
1991	Coeff	1,820,498.2	1.006	-0.031	0.041						0.509	962
	t-Stat	(0.711)	***(26.551)	***(-14.327)	*(1.666)							
	h-Stat	(0.722)	***(6.131)	***(-2.667)	(0.380)							
1992	Coeff	1,826,011.9	0.500	0.014	0.040						0.285	940
	t-Stat	(0.602)	***(17.153)	***(4.674)	(1.579)							
	h-Stat	(0.535)	***(3.501)	(0.673)	(0.266)							
1993	Coeff	-2,845,814.9	0.689	0.018	0.182						0.643	998
	t-Stat	(-1.247)	***(30.271)	***(10.202)	***(9.214)							
	h-Stat	(-1.035)	***(4.269)	(1.314)	*(1.720)							
1994	Coeff	442,149.8	0.858	-0.001	0.177						0.767	1,061
	t-Stat	(0.233)	***(45.892)	(-0.551)	***(17.380)							
	h-Stat	(0.236)	***(8.862)	(-0.108)	***(2.978)							
1995	Coeff	-5,443,663.8	0.882	0.012	0.053						0.699	1,114
	t-Stat	**(-2.143)	***(35.714)	***(4.914)	***(6.204)							
	h-Stat	(-1.529)	***(9.154)	(0.631)	(0.936)							
1996	Coeff	330,328.5	0.940	-0.005	0.053						0.708	1,157
	t-Stat	(0.121)	***(42.516)	(-1.570)	***(3.768)							
	h-Stat	(0.136)	***(7.503)	(-0.409)	(0.833)							
1997	Coeff	-1,007,429.7	0.489	0.026	0.028						0.552	1,124
	t-Stat	(-0.346)	***(25.463)	***(9.119)	**(2.192)							
	h-Stat	(-0.253)	***(6.095)	(1.403)	(0.549)							
1998	Coeff	1,507,481.4	0.722	0.014	-0.006						0.518	1,025
	t-Stat	(0.397)	***(22.378)	***(4.513)	(-0.289)							
	h-Stat	(0.298)	***(3.592)	(0.574)	(-0.072)							
1999	Coeff	7,414,054.4	1.003	0.035	-0.420						0.778	921
	t-Stat	(0.877)	***(17.472)	***(6.092)	***(-22.016)							
	h-Stat	(0.690)	***(3.318)	(0.606)	**(-2.284)							
1991	Coeff	2,249,616.9	1.126	-0.024	-0.005	-0.460					0.549	962
	t-Stat	(0.917)	***(29.217)	***(-10.824)	(-0.202)	***(-9.289)						
	h-Stat	(0.901)	***(5.347)	**(-2.137)	(-0.043)	(-1.294)						

Appendix 5.1 - Coefficients and associated statistics from C/s & Pool Estimations of Undeflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	ω_{11} (RI_{it})	ω_{12} $(OA_{i\tau})$	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	Obs
1992	Coeff	1,491,205.7	0.511	0.012	0.018	0.287					0.296	940
	t-Stat	(0.495)	***(17.594)	***(3.861)	(0.699)	***(4.041)						
	h-Stat	(0.477)	***(3.368)	(0.592)	(0.114)	(0.494)						
1993	Coeff	-3,153,372.0	0.659	0.014	0.135	0.544					0.682	998
	t-Stat	(-1.465)	***(30.492)	***(8.186)	***(7.064)	***(11.145)						
	h-Stat	(-1.199)	***(5.308)	(1.093)	(1.319)	***(2.987)						
1994	Coeff	557,311.433	0.837	-0.001	0.165	0.140					0.768	1,061
	t-Stat	(0.294)	***(41.022)	(-0.805)	***(14.726)	**(2.529)						
	h-Stat	(0.303)	***(7.276)	(-0.156)	***(3.262)	(0.514)						
1995	Coeff	-5,377,241.2	0.851	0.012	0.032	0.227					0.704	1,114
	t-Stat	**(-2.134)	***(33.254)	***(4.923)	***(3.192)	***(4.279)						
	h-Stat	(-1.511)	***(8.349)	(0.629)	(0.563)	(1.095)						
1996	Coeff	-531,836.4	0.859	-0.007	0.055	0.407					0.725	1,157
	t-Stat	(-0.200)	***(36.407)	**(-2.291)	***(4.023)	***(8.328)						
	h-Stat	(-0.208)	***(6.753)	(-0.609)	(0.879)	*(1.703)						
1997	Coeff	-2,282,620.9	0.389	0.023	0.031	0.545					0.594	1,124
	t-Stat	(-0.824)	***(18.997)	***(8.534)	**(2.525)	***(10.789)						
	h-Stat	(-0.612)	***(3.897)	(1.334)	(0.573)	***(3.004)						
1998	Coeff	816,878.1	0.667	0.014	-0.001	0.190					0.522	1,025
	t-Stat	(0.215)	***(17.812)	***(4.630)	(-0.034)	***(2.868)						
	h-Stat	(0.168)	**(2.455)	(0.594)	(-0.009)	(0.484)						
1999	Coeff	2,566,213.7	0.825	0.038	-0.433	0.894					0.795	921
	t-Stat	(0.315)	***(13.985)	***(6.987)	***(-23.497)	***(8.608)						
	h-Stat	(0.246)	***(3.390)	(0.692)	**(-2.439)	*(1.851)						
1991	Coeff	5,719,132.7	1.240	-0.017	0.025	-0.238	-0.095				0.567	962
	t-Stat	**(2.322)	***(29.714)	***(-6.714)	(1.029)	***(-3.990)	***(-6.404)					
	h-Stat	*(1.775)	***(6.531)	(-1.199)	(0.227)	(-0.756)	(-1.529)					
1992	Coeff	-2,002,662.9	0.472	0.008	-0.041	0.004	0.089				0.317	940
	t-Stat	(-0.659)	***(15.957)	**(2.511)	(-1.501)	(0.043)	***(5.404)					
	h-Stat	(-0.701)	***(2.679)	(0.350)	(-0.314)	(0.005)	(1.013)					
1993	Coeff	-3,614,831.1	0.655	0.013	0.122	0.513	0.013				0.683	998
	t-Stat	*(-1.649)	***(29.866)	***(7.446)	***(5.499)	***(9.072)	(1.117)					
	h-Stat	(-1.301)	***(5.319)	(1.001)	(1.141)	***(2.639)	(0.259)					
1994	Coeff	-474,949.8	0.817	-0.003	0.153	0.105	0.025				0.769	1,061
	t-Stat	(-0.246)	***(37.704)	*(-1.726)	***(12.772)	*(1.845)	***(2.604)					
	h-Stat	(-0.272)	***(6.661)	(-0.328)	***(2.787)	(0.387)	(0.598)					
1995	Coeff	-526,133.2	0.941	0.022	0.030	0.388	-0.112				0.724	1,114
	t-Stat	(-0.211)	***(35.284)	***(8.492)	***(3.128)	***(7.156)	***(-8.999)					
	h-Stat	(-0.177)	***(9.856)	(1.099)	(0.654)	*(1.667)	**(-2.568)					
1996	Coeff	-5,322,058.5	0.853	-0.016	-0.004	0.144	0.129				0.746	1,157
	t-Stat	**(-2.051)	***(37.657)	***(-5.557)	(-0.261)	***(2.674)	***(9.920)					
	h-Stat	(-1.132)	***(6.100)	(-0.911)	(-0.076)	(0.676)	(1.369)					

Appendix 5.1 - Coefficients and associated statistics from C/s & Pool Estimations of Undeflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	Obs
1997	Coeff	-6,560,236.0	0.351	0.017	0.027	0.415	0.085				0.607	1,124
	t-Stat	**(-2.337)	***(16.705)	***(5.816)	**(2.242)	***(7.740)	***(6.325)					
	h-Stat	(-1.317)	***(2.867)	(0.962)	(0.530)	**(2.423)	(1.054)					
1998	Coeff	4,644,025.8	0.711	0.019	0.002	0.311	-0.076				0.53	1,025
	t-Stat	(1.202)	***(18.460)	***(5.939)	(0.113)	***(4.352)	***(-4.298)					
	h-Stat	(1.024)	***(2.838)	(0.714)	(0.033)	(0.734)	(-0.890)					
1999	Coeff	5,389,168.5	0.834	0.042	-0.443	0.974	-0.043				0.795	921
	t-Stat	(0.638)	***(14.044)	***(6.842)	***(-22.101)	***(8.023)	(-1.275)					
	h-Stat	(0.319)	***(3.355)	(0.789)	***(-2.586)	*(1.837)	(-0.245)					
1991	Coeff	7,554,028.7	1.221	-0.027	0.136	-0.162	-0.154	0.132			0.61	962
	t-Stat	***(3.222)	***(30.782)	***(-10.548)	***(5.406)	***(-2.839)	***(-10.100)	***(10.293)				
	h-Stat	***(2.612)	***(7.797)	**(-2.565)	(1.494)	(-0.525)	**(-2.472)	***(2.645)				
1992	Coeff	-1,227,035.4	0.46	0.004	-0.049	-0.049	0.078	0.063				
	t-Stat	(-0.408)	***(15.658)	(1.219)	*(-1.781)	(-0.565)	***(4.724)	***(4.532)				
	h-Stat	(-0.413)	**(2.498)	(0.193)	(-0.369)	(-0.061)	(0.889)	(1.029)				
1993	Coeff	-2,680,669.3	0.613	0.010	0.128	0.454	-0.007	0.074			0.701	998
	t-Stat	(-1.258)	***(27.912)	***(5.868)	***(5.920)	***(8.210)	(-0.591)	***(7.890)				
	h-Stat	(-1.074)	***(5.125)	(0.862)	(1.241)	**(2.396)	(-0.143)	(1.499)				
1994	Coeff	-1,051,807.2	0.861	-0.001	0.151	0.122	0.039	-0.057			0.778	1,061
	t-Stat	(-0.555)	***(38.536)	(-0.917)	***(12.851)	**(2.173)	***(4.032)	***(-6.412)				
	h-Stat	(-0.722)	***(6.907)	(-0.184)	***(2.903)	(0.404)	(0.911)	**(-2.036)				
1995	Coeff	1,629,376.4	0.897	0.015	0.021	0.313	-0.149	0.153			0.774	1,114
	t-Stat	(0.721)	***(36.898)	***(6.420)	**(2.441)	***(6.350)	***(-13.033)	***(15.701)				
	h-Stat	(0.625)	***(9.613)	(0.995)	(0.573)	*(1.864)	***(-3.281)	**(2.448)				
1996	Coeff	-2,645,325.4	0.694	-0.018	0.011	0.134	0.059	0.202			0.816	1,157
	t-Stat	(-1.195)	***(33.435)	***(-7.252)	(0.863)	***(2.927)	***(5.087)	***(20.878)				
	h-Stat	*(-1.697)	***(4.395)	*(-1.770)	(0.184)	(0.620)	(1.244)	***(3.796)				
1997	Coeff	-6,795,680.5	0.474	0.022	-0.012	0.386	0.105	-0.125			0.629	1,124
	t-Stat	**(-2.491)	***(18.686)	***(7.777)	(-0.972)	***(7.378)	***(7.915)	***(-8.174)				
	h-Stat	(-1.541)	***(3.928)	(1.330)	(-0.273)	**(1.980)	(1.322)	*(-1.933)				
1998	Coeff	6,025,500.9	0.670	0.020	-0.003	0.194	-0.134	0.183			0.587	1,025
	t-Stat	*(1.662)	***(18.475)	***(6.642)	(-0.145)	***(2.858)	***(-7.769)	***(11.867)				
	h-Stat	(1.345)	***(2.651)	(0.887)	(-0.043)	(0.531)	*(-1.795)	**(2.263)				
1999	Coeff	7,318,347.1	0.711	0.042	-0.443	0.911	-0.104	0.198			0.802	921
	t-Stat	(0.880)	***(11.423)	***(7.017)	***(-22.501)	***(7.596)	***(-2.989)	***(5.680)				
	h-Stat	(0.476)	***(2.761)	(0.820)	***(-2.677)	**(2.058)	(-0.573)	(0.791)				
1991	Coeff	7,520,797.6	1.212	-0.029	0.141	-0.148	-0.161	0.133	0.008		0.61	962
	t-Stat	***(3.207)	***(29.796)	***(-9.318)	***(5.495)	**(-2.503)	***(-9.684)	***(10.327)	(1.006)			
	h-Stat	***(2.636)	***(7.169)	**(-2.527)	(1.530)	(-0.466)	**(-2.403)	***(2.609)	(0.291)			
1992	Coeff	-1,297,034.8	0.457	0.001	-0.063	-0.037	0.069	0.062	0.016		0.333	940
	t-Stat	(-0.432)	***(15.600)	(0.232)	**(-2.240)	(-0.419)	***(4.044)	***(4.472)	**(2.120)			
	h-Stat	(-0.427)	**(2.477)	(0.038)	(-0.464)	(-0.045)	(0.795)	(1.019)	(0.603)			

Appendix 5.1 - Coefficients and associated statistics from C/s & Pool Estimations of Undeflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{it})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	Obs
1993	Coeff	-2,595,919.5	0.592	0.003	0.129	0.497	-0.033	0.080	0.032		0.715	998
	t-Stat	(-1.248)	***(27.369)	(1.343)	***(6.119)	***(9.142)	***(-2.831)	***(8.734)	***(7.089)			
	h-Stat	(-1.167)	***(5.241)	(0.266)	(1.356)	***(2.643)	(-0.720)	*(1.856)	(1.335)			
1994	Coeff	-1,055,473.4	0.860	-0.002	0.151	0.123	0.038	-0.057	0.001		0.777	1,061
	t-Stat	(-0.556)	***(37.908)	(-0.893)	***(12.846)	**(2.180)	***(3.683)	***(-6.318)	(0.192)			
	h-Stat	(-0.731)	***(6.186)	(-0.242)	**(2.894)	(0.397)	(0.743)	*(-1.888)	(0.030)			
1995	Coeff	1,955,808.7	0.892	-0.001	0.013	0.362	-0.188	0.169	0.055		0.792	1,114
	t-Stat	(0.903)	***(38.283)	(-0.248)	(1.532)	***(7.620)	***(-16.150)	***(17.826)	***(9.966)			
	h-Stat	(0.662)	***(11.184)	(-0.047)	(0.381)	**(2.511)	***(-3.768)	***(2.644)	**(2.276)			
1996	Coeff	-2,395,879.1	0.710	-0.010	0.016	0.111	0.076	0.192	-0.033		0.819	1,157
	t-Stat	(-1.093)	***(34.107)	***(-3.257)	(1.289)	**(2.425)	***(6.324)	***(19.718)	***(-4.862)			
	h-Stat	(-1.506)	***(4.716)	(-0.942)	(0.264)	(0.546)	*(1.762)	***(3.642)	(-1.271)			
1997	Coeff	-7,056,179.1	0.466	0.014	-0.017	0.412	0.078	-0.116	0.035		0.636	1,124
	t-Stat	***(-2.611)	***(18.530)	***(4.137)	(-1.353)	***(7.915)	***(5.444)	***(-7.541)	***(4.782)			
	h-Stat	(-1.541)	***(3.962)	(0.758)	(-0.374)	**(2.160)	(0.932)	*(-1.696)	(1.608)			
1998	Coeff	4,077,233.9	0.645	-0.004	0.015	0.235	-0.169	0.181	0.078		0.612	1,025
	t-Stat	(1.158)	***(18.265)	(-1.004)	(0.800)	***(3.576)	***(-9.781)	***(12.094)	***(8.149)			
	h-Stat	(1.236)	***(2.791)	(-0.128)	(0.214)	(0.686)	**(-2.309)	**(2.220)	(1.600)			
1999	Coeff	6,952,688.0	0.687	0.037	-0.430	0.926	-0.135	0.213	0.023		0.802	921
	t-Stat	(0.836)	***(10.525)	***(5.039)	***(-18.992)	***(7.681)	***(-3.098)	***(5.735)	(1.187)			
	h-Stat	(0.444)	***(2.904)	(0.619)	**(-2.293)	**(2.145)	(-0.880)	(0.886)	(0.342)			
1991	Coeff	7,516,117.6	1.183	-0.029	0.087	-0.270	-0.159	0.099	-0.032	0.548	0.628	962
	t-Stat	***(3.279)	***(29.579)	***(-9.643)	***(3.305)	***(-4.474)	***(-9.821)	***(7.294)	***(-3.351)	***(6.754)		
	h-Stat	**(2.426)	***(8.595)	***(-3.790)	(0.883)	(-0.828)	**(-2.574)	**(2.049)	(-0.802)	(1.603)		
1992	Coeff	-556,001.0	0.259	-0.014	-0.147	-0.354	0.005	0.064	0.001	1.194	0.443	940
	t-Stat	(-0.202)	***(8.473)	***(-4.122)	***(-5.580)	***(-4.254)	(0.316)	***(5.007)	(0.079)	***(13.554)		
	h-Stat	(-0.260)	(1.252)	(-1.561)	(-1.162)	(-0.450)	(0.075)	(1.225)	(0.041)	***(3.528)		
1993	Coeff	-1,624,781.9	0.440	-0.002	0.054	0.220	-0.085	0.106	0.014	0.773	0.76	998
	t-Stat	(-0.850)	***(19.303)	(-1.269)	***(2.702)	***(4.073)	***(-7.418)	***(12.300)	***(3.258)	***(13.577)		
	h-Stat	(-0.702)	***(4.553)	(-0.510)	(0.774)	(1.154)	**(-2.111)	***(2.850)	(0.650)	***(3.337)		
1994	Coeff	-1,101,435.2	0.732	-0.003	0.137	0.057	0.012	-0.037	-0.007	0.335	0.785	1,061
	t-Stat	(-0.591)	***(24.122)	*(-1.671)	***(11.629)	(1.016)	(1.092)	***(-3.898)	(-1.480)	***(6.215)		
	h-Stat	(-0.715)	***(4.796)	(-0.601)	**(2.496)	(0.183)	(0.235)	(-1.074)	(-0.228)	(1.581)		
1995	Coeff	1,831,740.1	0.817	-0.002	0.010	0.351	-0.186	0.171	0.045	0.166	0.796	1,114
	t-Stat	(0.853)	***(28.731)	(-0.819)	(1.149)	***(7.445)	***(-16.103)	***(18.190)	***(7.568)	***(4.539)		
	h-Stat	(0.656)	***(6.790)	(-0.164)	(0.285)	**(2.368)	***(-3.962)	***(2.760)	*(1.844)	(0.859)		
1996	Coeff	-3,123,676.8	0.754	-0.007	0.019	0.108	0.094	0.180	-0.034	-0.102	0.822	1,157
	t-Stat	(-1.433)	***(33.036)	**(-2.183)	(1.581)	**(2.387)	***(7.513)	***(17.947)	***(-5.118)	***(-4.553)		
	h-Stat	*(-1.683)	***(4.194)	(-0.649)	(0.350)	(0.554)	*(1.731)	***(3.053)	(-1.296)	(-1.068)		
1997	Coeff	-7,169,186.1	0.397	0.006	-0.019	0.324	0.072	-0.120	0.024	0.351	0.652	1,124
	t-Stat	***(-2.710)	***(14.933)	(1.603)	(-1.571)	***(6.172)	***(5.117)	***(-7.968)	***(3.187)	***(7.044)		
	h-Stat	*(-1.786)	***(2.807)	(0.304)	(-0.438)	*(1.688)	(0.863)	*(-1.743)	(0.777)	(1.176)		

Appendix 5.1 - Coefficients and associated statistics from C/s & Pool Estimations of Undeflated Equations for Sample where $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	ω_{11} (RI_{it})	ω_{12} (OA_{1T})	ω_{13} (CI_{it})	ω_{14} (RD_{it})	ω_{15} (HR_{it})	ω_{16} (DC_{it})	ω_{17} (TD_{it})	ω_{18} (DIV_{it})	$A\text{-}R^2$	Obs
1998	Coeff	3,866,552.7	0.653	-0.004	0.013	0.232	-0.166	0.195	0.078	-0.025	0.611	1,025
	t-Stat	(1.093)	***(17.544)	(-0.984)	(0.708)	***(3.503)	***(-9.290)	***(7.246)	***(8.163)	(-0.648)		
	h-Stat	(1.154)	***(2.610)	(-0.125)	(0.193)	(0.657)	**(-2.294)	**(2.117)	(1.596)	(-0.258)		
1999	Coeff	13,483,438.9	0.557	-0.041	-0.195	0.179	-0.273	0.041	0.002	2.127	0.849	921
	t-Stat	*(1.853)	***(9.675)	***(-5.142)	***(-8.040)	(1.563)	***(-7.013)	(1.211)	(0.114)	***(16.841)		
	h-Stat	(0.888)	**(2.223)	(-0.990)	(-1.549)	(0.413)	*(-1.876)	(0.195)	(0.035)	**(2.362)		
Pool	Coeff	2,921,925	0.774								0.231	9,302
	t-Stat	(1.496)	***(52.832)									
	h-Stat	***(2.675)	***(8.516)									
	Coeff	17,060,057	1.041	-0.049							0.437	9,302
	t-Stat	***(10.101)	***(78.037)	***(-58.356)								
	h-Stat	**(2.172)	***(7.459)	*(-1.757)								
	Coeff	10,613,699	0.946	0.003	-0.255						0.572	9,302
	t-Stat	***(7.182)	***(80.382)	**(2.564)	***(-54.095)							
	h-Stat	***(3.238)	***(10.556)	(0.229)	***(-3.581)							
	Coeff	8,769,737	0.838	0.001	-0.254	0.607					0.595	9,302
	t-Stat	***(6.093)	***(67.714)	(1.129)	***(-55.531)	***(23.165)						
	h-Stat	***(2.997)	***(10.534)	(0.101)	***(-3.920)	***(3.252)						
	Coeff	2,071,876	0.775	-0.006	-0.239	0.358	0.113				0.608	9,302
	t-Stat	(1.415)	***(61.260)	***(-4.862)	***(-52.290)	***(12.206)	***(17.876)					
	h-Stat	(0.668)	***(9.521)	(-0.457)	***(-4.081)	*(1.819)	***(2.970)					
	Coeff	2970048.531	0.731	-0.009	-0.231	0.317	0.089	0.087			0.616	9,302
	t-Stat	**(2.047)	***(56.475)	***(-6.921)	***(-50.487)	***(10.855)	***(13.638)	***(13.579)				
	h-Stat	(0.990)	***(9.309)	(-0.673)	***(-4.009)	*(1.718)	**(2.212)	*(1.877)				
	Coeff	2,089,552	0.691	-0.025	-0.196	0.379	0.016	0.104	0.076		0.635	9,302
	t-Stat	(1.477)	***(54.271)	***(-17.662)	***(-41.498)	***(13.258)	**(2.168)	***(16.465)	***(22.237)			
	h-Stat	(0.693)	***(9.047)	*(-1.768)	***(-3.769)	**(2.171)	(0.390)	**(2.330)	***(3.628)			
	Coeff	2,776,586	0.608	-0.027	-0.191	0.312	-0.011	0.085	0.064	0.329	0.65	9,302
	t-Stat	**(2.001)	***(46.094)	***(-19.759)	***(-41.053)	***(11.067)	(-1.522)	***(13.662)	***(18.900)	***(19.411)		
	h-Stat	(0.991)	***(6.296)	**(-2.041)	***(-3.847)	*(1.794)	(-0.269)	*(1.877)	***(3.101)	*(1.689)		

Annual samples range from 920 to 1,157 observations and the pooled samples consist of 9,277 to 9,302 observations. Regressions are run from Prop-LID

(1) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + e_{it}$, (2) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + e_{it}$, (3) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + e_{it}$ (4) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + e_{it}$ (5) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + e_{it}$

(6) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + e_{it}$ (7) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + e_{it}$

(8) $RI_{it+1} = \omega_0 + \omega_{11} RI_{it} + \omega_{12} OA_{it} + \omega_{13} CI_{it} + \omega_{14} RD_{it} + \omega_{15} HR_{it} + \varepsilon_{it} + \omega_{16} DC_{it} + \omega_{17} TD_{it} + \omega_{18} DIV_{it} + e_{it}$

*, **, *** = 90%, 95%, 99% confidence level respectively. Results on deflated Equations in **Table 5.12.**

Appendix 5.2 – Relations between R^2, $\bar{R}^2$ and *t*- and *F*-statistic

When new variables are added to a regression equation, R^2 always increase while $\bar{R}^2$ may rise or fall, depending on its *t*-statistic. This appendix provides the mathematical relation between R^2, $\bar{R}^2$ and its associated *t*-statistics. Firstly, R^2 can be expressed as the explained variation (ESS) over total variation (TSS), and then in terms of residual variation (RSS):

$$R^2 = \frac{ESS}{TSS} = \frac{TSS - RSS}{TSS} = 1 - \frac{RSS}{TSS} = 1 - \frac{\sum \varepsilon_i^2}{\sum y_i^2} \qquad \text{(B.1)}$$

In equation (B.1), R^2 can be improved by adding additional explanatory variables to a multiple regression as it does not account for the number of degrees of freedom (df). To account for df, the goodness-of-fit is expressed in variances in which the sample variances of $\hat{\varepsilon}$ and $\hat{Y}$ are calculated as follows:

$$S^2 = \frac{\sum \hat{\varepsilon}_i^2}{n-k-1} \qquad \widehat{Var}(Y) = \frac{\sum \left(Y_i - \bar{Y}\right)^2}{n-1} = \frac{\sum y_i^2}{n-1} \qquad \text{(B.2)}$$

where:

- n = Number of observations (sample size)
- k = Number of independent variables

Substitute (B.2) into (B.1) produces:

$$R^2 = 1 - \frac{S^2\left(n-k-1\right)}{\widehat{Var}(Y)\left(n-1\right)} \qquad \text{(B.3)}$$

$$\text{Let} \quad \frac{S^2}{\widehat{Var}(Y)} = 1 - \bar{R}^2 \qquad \text{(B.4)}$$

Substitute (B.4) into (B.3) and rearranging:

$$1 - R^2 = \left(1 - \bar{R}^2\right)\left(\frac{n-k-1}{n-1}\right) \qquad \text{(B.5)}$$

Rearranging (B.5) in terms of $\bar{R}^2$ produces:

$$\bar{R}^2 = 1 - \left(1 - R^2\right)\left(\frac{n-1}{n-k-1}\right) \qquad \text{(B.6)}$$

Note:

- If $k = 1$, then $R^2 = \bar{R}^2$ (simple regression)
- If $k > 1$, then $R^2 \geq \bar{R}^2$ (multiple regression)
- $\bar{R}^2$ can be negative

Rearranging (B.6):

$$\frac{1-\bar{R}^2}{n-1} = \frac{(1-R^2)}{n-k-1} \tag{B.7}$$

- X both sides by TSS:

$$\frac{(1-\bar{R}^2)TSS}{n-1} = \frac{(1-R^2)TSS}{n-k-1}$$

$$= \frac{RSS}{n-k-1} \quad \text{[since } RSS = TSS(1-R^2) \text{ from (B.1)]} \tag{B.8}$$

Since the estimator of the residual variance, $\hat{\sigma}^2 = \frac{RSS}{n-k-1}$, where $n-k-1 = df$, therefore (B.8) becomes:

$$\frac{(1-\bar{R}^2)TSS}{n-1} = \hat{\sigma}^2$$

Since TSS and n are constants, closer examination of the behavior of $\hat{\sigma}^2, \bar{R}^2$ and $1-\bar{R}^2$ review:

$$\uparrow \hat{\sigma}^2 \quad \uparrow 1-\bar{R}^2 \quad \downarrow \bar{R}^2$$

From the above, it can be interpreted that when the estimator of the residual variance increases, $1-\bar{R}^2$ increase too but the adjusted explanatory power decreases, ie $\hat{\sigma}^2$ and $1-\bar{R}^2$ move in the same direction while $\bar{R}^2$ moves in the opposite direction. This shows that minimization of $\hat{\sigma}^2$ results in the maximization of $\bar{R}^2$. Thus, there is a relationship between t-tests, R^2, $\bar{R}^2$, and F-tests. Generally:

- If *t-ratio* < 1, and dropping the variable will increase $\bar{R}^2$
- If *F-ratio* < 1, and dropping this set of variables will increase $\bar{R}^2$

The indication is that, the addition of a new variable to a regression will cause $\bar{R}^2$ to rise if and only if its t-statistic is > 1 or < –1. Hence, a rise in $\bar{R}^2$ when a new variable is added does not necessarily mean that its coefficient is significantly different from 0. From this, any increase in $\bar{R}^2$ does NOT mean that the specification of an equation has improved. Due to this, $\bar{R}^2$ has lost its creditability as a prominent interpretive value for multiple regression over the years. Since even a poorly specified regression model may yield a high R^2 (Dougherty, 1992, p. 166), hence, when analyzing multiple regression it is necessary to analyze a whole range of statistical measure such as t-ratio, p-value, standard error, etc.

Appendix 6.1 - Coefficients and associated tests from Cross-sectional & Pool Estimations of Undeflated Equations for $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	A-R^2	Obs
1991	Coeff	59,949,355	1.091	8.131	0.352	-0.739						0.633	962
	t-Stat	*(1.658)	***(10.186)	***(13.560)	***(9.070)	**(-2.075)							
	h-Stat	**(2.129)	(1.498)	(1.511)	(0.999)	(-0.601)							
1992	Coeff	104,750,329	0.326	5.758	0.639	3.212						0.652	940
	t-Stat	**(2.563)	***(6.434)	***(13.944)	***(15.467)	***(9.272)							
	h-Stat	**(2.156)	(1.009)	**(2.573)	*(1.748)	(1.622)							
1993	Coeff	56,114,889	1.316	6.646	0.441	0.200						0.734	998
	t-Stat	(1.642)	***(17.629)	***(19.223)	***(15.440)	(0.595)							
	h-Stat	(1.621)	***(3.093)	**(2.480)	**(2.107)	(0.115)							
1994	Coeff	44,782,758	1.239	9.500	0.256	0.635						0.838	1,061
	t-Stat	*(1.660)	***(20.875)	***(34.538)	***(10.349)	***(4.106)							
	h-Stat	**(2.069)	***(5.396)	***(6.026)	**(2.034)	(0.964)							
1995	Coeff	72,624,535	0.293	8.033	0.752	0.992						0.796	1,114
	t-Stat	**(2.228)	***(4.112)	***(23.876)	***(20.626)	***(9.122)							
	h-Stat	***(3.216)	(0.760)	***(4.755)	***(2.646)	**(2.013)							
1996	Coeff	96,608,724	0.414	12.546	0.744	0.155						0.844	1,157
	t-Stat	***(2.691)	***(5.290)	***(43.273)	***(16.602)	(0.812)							
	h-Stat	***(3.013)	(1.275)	***(7.079)	***(4.288)	(0.246)							
1997	Coeff	-24,853,643	1.056	9.476	1.172	0.761						0.709	1,124
	t-Stat	(-0.376)	***(6.974)	***(20.673)	***(15.946)	***(2.641)							
	h-Stat	(-0.303)	(1.084)	***(2.583)	***(2.652)	(0.498)							
1998	Coeff	-127,368,596	1.443	13.447	1.153	-0.949						0.774	1,025
	t-Stat	(-1.545)	***(8.053)	***(18.212)	***(11.534)	**(-2.083)							
	h-Stat	(-1.458)	(1.362)	**(2.480)	*(1.872)	(-0.692)							
1999	Coeff	-30,810,582	3.586	8.410	0.097	-2.311						0.754	921
	t-Stat	(-0.292)	***(20.421)	***(11.750)	(0.855)	***(-8.684)							
	h-Stat	(-0.284)	***(3.511)	(1.406)	(0.186)	*(-1.956)							
1991	Coeff	103,409,774	1.514	7.890	0.238	0.613	7.247	-2.091	1.215			0.666	962
	t-Stat	***(2.962)	**(10.594)	***(13.127)	***(5.519)	(1.614)	***(8.510)	***(-7.070)	***(5.964)				
	h-Stat	**(2.380)	*(1.877)	(1.553)	(0.644)	(0.487)	(1.446)	*(-1.665)	(0.912)				
1992	Coeff	63,857,657	-0.097	7.139	0.641	2.169	11.676	1.271	-1.121			0.727	940
	t-Stat	*(1.727)	*(-1.863)	***(18.394)	***(16.198)	***(6.463)	***(10.462)	***(6.111)	***(-6.277)				
	h-Stat	(1.511)	(-0.367)	***(4.447)	*(1.672)	(1.517)	**(2.150)	(1.178)	(-0.983)				
1993	Coeff	65,810,396	1.286	6.496	0.413	-0.065	9.825	-0.365	-0.246			0.769	998
	t-Stat	**(2.049)	***(13.702)	***(19.059)	***(14.526)	(-0.196)	***(11.546)	(-1.604)	(-1.621)				
	h-Stat	*(1.672)	***(2.993)	***(3.836)	*(1.933)	(-0.038)	***(2.709)	(-0.557)	(-0.242)				

Appendix 6.1 - Coefficients and associated tests from Cross-sectional & Pool Estimations of Undeflated Equations for $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	A-R^2	Obs
1994	Coeff	61,627,581	1.450	9.407	0.263	0.224	8.055	-0.688	-0.699			0.857	1,061
	t-Stat	**(2.418)	***(18.492)	***(30.507)	***(10.847)	(1.383)	***(10.164)	***(-3.783)	***(-5.482)				
	h-Stat	**(2.454)	***(5.633)	***(6.582)	*(1.806)	(0.731)	***(5.098)	(-1.140)	(-0.799)				
1995	Coeff	102,406,147	0.795	7.181	0.688	0.334	7.269	-1.480	0.763			0.816	1,114
	t-Stat	***(3.275)	***(8.251)	***(20.811)	***(18.639)	***(2.757)	***(10.202)	***(-6.657)	***(5.138)				
	h-Stat	***(3.268)	**(2.075)	***(4.188)	**(2.476)	(0.720)	***(3.287)	**(-2.480)	(0.695)				
1996	Coeff	95,420,214	0.284	10.891	0.781	0.529	12.531	-0.381	-0.640			0.887	1,157
	t-Stat	***(3.097)	**(2.575)	***(36.125)	***(19.462)	***(3.064)	***(18.503)	(-1.466)	***(-4.014)				
	h-Stat	***(3.157)	(0.630)	***(6.117)	***(3.192)	(1.077)	***(3.609)	(-0.588)	(-0.686)				
1997	Coeff	-30,000,942	0.818	6.224	1.178	0.824	23.178	-0.476	-0.360			0.803	1,124
	t-Stat	(-0.547)	***(4.246)	***(12.031)	***(18.624)	***(3.224)	***(21.425)	(-1.168)	(-1.151)				
	h-Stat	(-0.363)	(0.799)	*(1.867)	**(2.458)	(0.656)	***(2.707)	(-0.402)	(-0.186)				
1998	Coeff	-93,778,872	1.662	7.023	1.252	-0.415	25.368	-2.704	2.160			0.846	1,025
	t-Stat	(-1.332)	***(10.536)	***(9.858)	***(15.155)	(-1.097)	***(19.248)	***(-7.651)	***(7.247)				
	h-Stat	(-1.629)	**(2.084)	**(2.020)	***(3.008)	(-0.420)	**(2.579)	**(-2.311)	(1.213)				
1999	Coeff	42,004,096	3.137	3.283	0.649	-3.636	30.504	-3.076	1.116			0.863	921
	t-Stat	(0.514)	***(20.263)	***(5.353)	***(7.358)	**(-17.683)	***(25.966)	***(-8.137)	***(3.261)				
	h-Stat	(0.549)	***(3.062)	(0.965)	(1.498)	***(-3.247)	***(4.203)	**(-2.071)	(0.443)				
1991	Coeff	115,802,974	0.333	6.333	0.148	-0.360	3.350	-1.368	-0.781	-0.656	23.970	0.804	962
	t-Stat	***(4.334)	***(2.796)	***(13.528)	***(4.014)	(-1.157)	***(4.737)	***(-5.850)	***(-4.456)	***(-5.976)	***(24.109)		
	h-Stat	***(3.232)	(0.662)	**(2.226)	(1.143)	(-0.364)	(1.188)	**(-2.256)	(-1.056)	(-1.339)	***(3.897)		
1992	Coeff	80,991,201	-0.210	2.931	0.250	-0.085	5.622	-0.312	-1.228	0.124	26.778	0.882	940
	t-Stat	***(3.338)	***(-6.082)	***(10.379)	***(8.451)	(-0.364)	***(7.408)	**(-2.143)	**(-10.466)	**(1.997)	***(34.319)		
	h-Stat	***(3.734)	**(-2.019)	**(2.534)	***(5.547)	(-0.132)	*(1.648)	(-0.911)	**(-2.507)	(1.201)	***(16.874)		
1993	Coeff	101,984,895	0.359	3.241	0.267	-1.260	2.048	-0.605	-0.059	0.090	18.937	0.851	998
	t-Stat	***(3.945)	***(4.209)	***(10.524)	***(10.246)	***(-4.620)	***(2.617)	***(-3.255)	(-0.483)	(1.541)	***(21.939)		
	h-Stat	***(3.233)	*(1.953)	***(2.982)	***(3.801)	(-1.286)	(0.807)	**(-2.075)	(-0.092)	(0.510)	***(7.162)		
1994	Coeff	68,293,082	0.698	4.880	0.259	0.019	3.452	-0.717	-0.254	-0.034	13.018	0.89	1,061
	t-Stat	***(3.045)	***(8.547)	***(13.051)	***(11.209)	(0.133)	***(4.619)	***(-4.445)	**(-2.208)	(-0.601)	***(17.396)		
	h-Stat	***(3.071)	***(3.074)	***(4.539)	***(3.139)	(0.075)	*(1.847)	*(-1.813)	(-0.402)	(-0.182)	***(5.428)		
1995	Coeff	102,835,508	0.729	5.779	0.553	0.222	7.291	-1.627	0.880	0.222	3.126	0.826	1,114
	t-Stat	***(3.380)	***(7.722)	***(14.252)	***(13.073)	*(1.866)	***(10.426)	***(-7.240)	***(6.020)	***(2.627)	***(5.991)		
	h-Stat	***(3.378)	**(2.148)	***(3.020)	*(1.861)	(0.525)	***(3.613)	**(-2.550)	(0.823)	(0.605)	(0.930)		
1996	Coeff	115,252,192	-0.003	9.830	0.746	0.397	12.019	-0.384	-0.512	0.037	2.945	0.895	1,157
	t-Stat	***(3.864)	(-0.028)	***(31.175)	***(16.896)	**(2.361)	***(18.286)	(-1.523)	***(-3.296)	(0.403)	***(9.236)		
	h-Stat	***(3.454)	(-0.007)	***(5.848)	**(2.450)	(0.897)	***(3.749)	(-0.642)	(-0.576)	(0.071)	*(1.878)		

Appendix 6.1 - Coefficients and associated tests from Cross-sectional & Pool Estimations of Undeflated Equations for $BV \geq$ £5 Millions and r = 10%

Year	Estim	Intercept	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (OA_{it})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	Adj-R^2	Obs
1997	Coeff	-31,493,097	-0.691	1.958	0.688	0.609	15.502	1.081	-0.864	-0.236	24.306	0.892	1,124
	t-Stat	(-0.775)	***(-4.549)	***(4.797)	***(12.701)	***(3.204)	***(18.353)	***(3.472)	***(-3.699)	**(-2.066)	***(30.124)		
	h-Stat	(-0.647)	(-1.132)	(1.279)	***(2.830)	(0.845)	**(2.480)	(1.202)	(-0.874)	(-0.587)	***(3.766)		
1998	Coeff	-96,019,830	0.706	8.810	2.239	-0.397	23.144	-0.956	2.981	-1.995	-1.255	0.857	1,025
	t-Stat	(-1.412)	***(3.668)	***(12.053)	***(16.007)	(-1.075)	***(17.910)	**(-2.444)	***(5.720)	***(-8.646)	*(-1.655)		
	h-Stat	**(-2.076)	(0.730)	**(2.393)	***(3.564)	(-0.368)	**(2.390)	(-0.981)	(1.572)	***(-2.738)	(-0.463)		
1999	Coeff	87,433,448	1.732	1.159	0.226	-1.153	19.803	-3.136	-1.227	-0.572	29.688	0.917	921
	t-Stat	(1.372)	***(12.832)	**(2.283)	***(2.766)	***(-5.425)	***(19.394)	***(-8.489)	***(-4.091)	***(-3.761)	***(24.293)		
	h-Stat	(1.294)	***(2.890)	(0.930)	(0.810)	(-1.552)	***(4.542)	***(-2.977)	(-0.766)	(-1.222)	***(5.143)		
Pool	Coeff	70,320,672	1.996	11.008								0.648	9,302
	t-Stat	***(3.170)	***(74.756)	***(59.593)									
	h-Stat	(1.158)	***(5.406)	***(6.354)									
	Coeff	77,239,967	1.437	11.181	0.302							0.661	9,302
	t-Stat	***(3.544)	***(35.900)	***(61.548)	***(18.493)								
	h-Stat	(1.062)	***(2.771)	***(6.437)	(1.256)								
	Coeff	31,581,779	1.479	10.490	0.630	-1.671						0.682	9,302
	t-Stat	(1.492)	***(38.141)	***(58.933)	***(30.692)	**(-25.039)							
	h-Stat	(0.506)	***(3.030)	***(6.375)	***(4.475)	***(-2.588)							
	Coeff	1,322,351	1.258	8.003	0.648	-1.643	15.887					0.74	9,302
	t-Stat	(0.069)	***(35.532)	***(47.099)	***(34.941)	**(-27.223)	***(45.589)						
	h-Stat	(0.021)	**(2.407)	***(6.027)	***(4.640)	***(-2.951)	***(5.745)						
	Coeff	49,708,150	1.517	8.287	0.648	-1.814	18.084	-1.155				0.744	9,302
	t-Stat	**(2.553)	***(36.387)	***(48.605)	***(35.161)	**(-29.393)	***(45.819)	**(-11.572)					
	h-Stat	(1.340)	**(2.110)	***(6.664)	***(4.374)	***(-2.845)	***(5.609)	(-1.175)					
	Coeff	52,747,283	1.555	8.111	0.631	-1.795	18.000	-1.287	0.298			0.744	9,302
	t-Stat	***(2.707)	***(36.003)	***(45.483)	***(33.113)	**(-28.967)	***(45.541)	**(-11.994)	***(3.337)				
	h-Stat	(1.592)	**(2.015)	***(6.157)	***(4.044)	***(-2.935)	***(5.647)	(-1.114)	(0.399)				
	Coeff	46,442,139	1.560	7.822	0.513	-1.545	18.452	-1.820	0.419	0.544		0.748	9,302
	t-Stat	**(2.400)	***(36.364)	***(43.756)	***(23.932)	**(-23.730)	***(46.795)	**(-15.705)	***(4.697)	***(11.681)			
	h-Stat	(1.444)	**(2.020)	***(5.957)	***(3.241)	***(-2.602)	***(5.883)	(-1.584)	(0.575)	***(2.707)			
	Coeff	61,340,675	1.227	6.147	0.527	-1.350	16.447	-1.970	-0.201	0.263	7.869	0.776	9,302
	t-Stat	***(3.365)	***(29.548)	***(35.066)	***(26.095)	**(-21.915)	***(43.748)	**(-18.031)	**(-2.344)	***(5.888)	***(34.391)		
	h-Stat	**(2.158)	*(1.796)	***(4.418)	***(3.737)	**(-2.432)	***(5.299)	*(-1.960)	(-0.318)	(1.252)	**(2.034)		

Regressions are run from Prop-LID $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \varepsilon_{it}$ to $MV_{it} = \alpha_A + \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + \varepsilon_{it}$

*, **, *** = 90%, 95%, 99% confidence level respectively. Corresponding results for deflated equations in **Table 6.22.**

Appendix 6.2 - Coefficients and Associated tests from Cross-sectional & Pool Estimations (with lagged *OA*) for Sample where *BV* ≥ £5 Millions and *r* = 10%

Year	No	Type	Estim	1	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (Oa_{it-1})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	$A\text{-}R^2$	Obs
1991	2	Deflated by BV_{it}	Coeff	19,675,055.850	2.738	2.102	-0.748	-2.325	13.346	-0.746	0.383	1.413	1.172	-0.006	962
			t-Stat	(1.052)	(1.417)	(0.582)	(-0.884)	(-0.569)	(0.684)	(-0.659)	(0.135)	(0.989)	(0.071)		
			h-Stat	(1.202)	(1.487)	(0.963)	(-1.106)	(-1.182)	**(2.125)	(-1.274)	(0.650)	(1.141)	(0.092)		
	3	Deflated by MV_{it-1}	Coeff	3,133,638.313	-0.160	0.221	-0.072	0.042	6.354	0.045	-0.057	0.306	12.836	-0.695	922
			t-Stat	***(8.997)	***(-3.854)	(1.601)	**(-2.101)	(0.646)	***(6.748)	(1.128)	(-0.874)	***(6.027)	**(14.826)		
			h-Stat	***(3.225)	(-0.979)	(0.774)	(-0.919)	(0.199)	***(3.309)	(0.496)	(-0.502)	**(2.530)	**(10.065)		
1992	2	Deflated by BV_{it}	Coeff	5,592,421.919	1.599	1.381	0.033	1.334	8.198	-0.066	1.048	-0.050	7.926	-0.005	940
			t-Stat	(0.469)	(1.243)	(0.669)	(0.053)	(0.557)	(0.811)	(-0.067)	(0.636)	(-0.048)	(0.619)		
			h-Stat	(1.051)	(1.633)	(1.621)	(0.259)	(1.551)	***(2.604)	(-0.437)	(1.444)	(-0.307)	(0.572)		
	3	Deflated by MV_{it-1}	Coeff	-804,742.147	0.322	0.298	0.147	-0.005	-3.976	0.983	-0.533	-0.190	-6.211	0.349	902
			t-Stat	(-1.360)	***(5.221)	***(4.759)	***(4.053)	(-0.046)	***(-2.734)	**(18.086)	***(-3.564)	***(-3.767)	***(-5.973)		
			h-Stat	(-0.335)	*(1.751)	(1.114)	(1.483)	(-0.019)	(-0.637)	***(2.650)	*(-1.667)	*(-1.876)	(-1.126)		
1993	2	Deflated by BV_{it}	Coeff	15,447,667.152	-0.043	0.239	-0.041	-0.103	2.027	-0.019	0.147	0.136	31.099	0.074	998
			t-Stat	***(3.157)	(-0.089)	(0.387)	(-0.142)	(-0.137)	(0.870)	(-0.056)	(0.217)	(0.338)	***(6.961)		
			h-Stat	(1.045)	(-0.086)	(0.820)	(-0.247)	(-0.208)	**(2.406)	(-0.054)	(0.227)	(0.596)	***(5.223)		
	3	Deflated by MV_{it-1}	Coeff	-924,763.028	1.053	-0.680	-0.176	0.223	3.948	-0.212	0.880	-0.048	0.729	0.244	920
			t-Stat	(-1.488)	**(16.527)	***(-4.918)	***(-3.834)	***(4.298)	*(1.810)	**(-2.464)	***(5.702)	(-0.867)	(0.628)		
			h-Stat	(-0.622)	***(4.453)	**(-2.275)	(-1.323)	(1.505)	*(1.756)	(-1.160)	**(2.169)	(-0.558)	(0.167)		
1994	2	Deflated by BV_{it}	Coeff	11,535,622.336	0.453	0.767	0.126	0.142	6.370	-0.132	0.331	-0.032	19.926	0.079	1,061
			t-Stat	**(2.523)	(1.105)	(0.930)	(0.477)	(0.367)	*(1.933)	(-0.419)	(0.492)	(-0.090)	***(5.397)		
			h-Stat	(1.116)	*(1.804)	(1.350)	(1.294)	(0.565)	***(3.722)	(-0.548)	(0.822)	(-0.251)	***(5.627)		
	3	Deflated by MV_{it-1}	Coeff	2,622,737.580	0.358	-0.416	-0.225	0.067	8.093	0.172	0.736	0.042	4.427	-1.828	966
			t-Stat	***(4.499)	***(5.529)	***(-3.418)	***(-6.108)	(1.195)	***(5.625)	***(2.878)	***(5.470)	(0.922)	***(5.300)		
			h-Stat	**(2.316)	**(2.488)	**(-2.073)	***(-2.969)	(0.528)	***(3.367)	*(1.824)	***(3.107)	(0.450)	**(2.287)		
1995	2	Deflated by BV_{it}	Coeff	5,857,194.822	1.130	1.424	0.119	0.741	13.711	0.047	0.359	-0.202	10.782	0.327	1,114
			t-Stat	***(3.311)	***(6.669)	***(3.702)	(1.143)	***(3.525)	**(13.167)	(0.416)	(1.405)	(-1.385)	**(11.154)		
			h-Stat	*(1.875)	***(4.684)	*(1.909)	(0.598)	**(2.203)	***(5.669)	(0.417)	(1.206)	(-0.945)	***(3.201)		
	3	Deflated by MV_{it-1}	Coeff	-47,012.310	0.507	-0.415	-0.040	0.964	6.038	0.329	1.145	-0.101	-2.056	-0.385	1,025
			t-Stat	(-0.061)	***(5.625)	(-1.462)	(-0.835)	***(8.338)	***(5.586)	***(4.136)	***(6.665)	*(-1.843)	*(-1.759)		
			h-Stat	(-0.021)	**(2.122)	(-0.673)	(-0.312)	**(2.460)	*(1.764)	(1.629)	***(2.993)	(-0.772)	(-0.428)		
1996	2	Deflated by BV_{it}	Coeff	5,168,236.401	0.642	1.408	0.231	0.570	10.614	0.295	0.097	-0.222	16.796	0.433	1,157
			t-Stat	***(2.855)	***(4.078)	***(4.815)	***(2.692)	***(3.487)	**(10.509)	***(2.603)	(0.366)	(-1.588)	**(18.106)		
			h-Stat	**(2.381)	***(3.446)	***(2.641)	(1.258)	*(1.946)	***(4.573)	*(1.755)	(0.285)	(-0.942)	***(4.932)		
	3	Deflated by MV_{it-1}	Coeff	3,793,650.063	0.242	0.363	-0.086	-0.034	4.776	0.534	0.711	0.011	-0.843	-0.200	1,049
			t-Stat	***(4.468)	**(2.141)	***(3.774)	(-1.611)	(-0.501)	***(2.699)	***(7.038)	***(3.676)	(0.155)	(-0.800)		
			h-Stat	**(2.113)	(1.536)	(1.163)	(-1.002)	(-0.443)	*(1.677)	***(4.764)	(1.596)	(0.105)	(-0.333)		

Appendix 6.2 - Coefficients and Associated tests from Cross-sectional & Pool Estimations (with lagged *OA*) for Sample where *BV* ≥ £5 Millions and *r* = 10%

Year	No	Type	Estim	1	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (Oa_{it-1})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	$A\text{-}R^2$	Obs
1997	2	Deflated by BV_{it}	Coeff	-612,019.278	0.478	2.638	-0.160	2.418	8.574	0.839	0.192	0.522	14.142	0.524	1,124
			t-Stat	(-0.256)	**(2.183)	***(7.328)	(-1.265)	**(10.162)	***(9.463)	***(5.964)	(0.685)	***(3.707)	**(13.146)		
			h-Stat	(-0.264)	(1.375)	**(2.278)	(-0.607)	**(2.537)	***(4.698)	***(3.310)	(0.422)	**(1.975)	***(3.568)		
	3	Deflated by MV_{it-1}	Coeff	3,068,376.633	0.096	-0.561	0.050	0.165	6.113	0.188	0.367	-0.286	3.340	-2.168	1,040
			t-Stat	***(4.989)	(1.358)	***(-3.359)	(1.097)	*(1.761)	***(5.644)	***(2.646)	**(2.503)	***(-5.270)	***(4.178)		
			h-Stat	***(3.299)	(0.691)	*(-1.700)	(0.613)	(0.897)	***(3.583)	(1.534)	(1.249)	***(-2.683)	**(2.021)		
1998	2	Deflated by BV_{it}	Coeff	-3,352,089.215	1.404	1.344	-0.363	1.584	10.137	1.173	-0.809	0.935	5.314	0.453	1,025
			t-Stat	(-1.142)	***(5.918)	***(3.571)	***(-3.295)	**(10.801)	***(8.733)	***(7.639)	**(-2.400)	***(7.442)	***(5.060)		
			h-Stat	(-1.154)	***(3.672)	*(1.672)	(-1.159)	***(2.846)	***(3.823)	***(3.963)	*(-1.777)	**(2.426)	**(2.431)		
	3	Deflated by MV_{it-1}	Coeff	191,626.902	0.437	-0.611	-0.259	-0.339	5.356	0.412	0.559	0.211	1.360	-1.440	958
			t-Stat	(0.326)	***(7.418)	***(-3.961)	***(-6.903)	***(-6.713)	***(5.549)	***(5.216)	***(4.023)	***(4.085)	*(1.659)		
			h-Stat	(0.185)	***(3.174)	***(-2.781)	***(-3.009)	***(-2.685)	***(3.502)	***(4.862)	***(2.804)	*(1.805)	(1.070)		
1999	2	Deflated by BV_{it}	Coeff	16,457,315.957	1.794	-0.072	-1.177	1.928	25.300	-0.058	-0.480	1.602	15.877	0.299	921
			t-Stat	***(3.028)	***(4.043)	(-0.121)	***(-4.899)	***(6.647)	**(11.284)	(-0.235)	(-1.062)	***(5.082)	***(7.823)		
			h-Stat	***(3.043)	***(3.875)	(-0.094)	***(-3.534)	***(4.458)	***(6.763)	(-0.081)	(-0.273)	***(3.543)	***(3.464)		
	3	Deflated by MV_{it-1}	Coeff	6,965,452.006	0.087	0.654	-0.232	0.436	10.438	0.562	0.469	0.057	-0.036	-0.305	884
			t-Stat	***(5.966)	(0.658)	***(2.722)	**(-2.545)	***(2.825)	***(6.414)	***(4.416)	*(1.949)	(0.427)	(-0.038)		
			h-Stat	**(2.493)	(0.368)	(1.225)	*(-1.807)	(1.206)	***(3.850)	***(3.685)	**(2.217)	(0.303)	(-0.038)		
Pool	2	Deflated by BV_{it}	Coeff	6,412,416.995	2.876	1.638								0.003	9,302
			t-Stat	**(2.492)	**(15.684)	***(5.203)									
			h-Stat	**(2.171)	**(29.173)	***(2.913)									
	3	Deflated by MV_{it-1}	Coeff	3,529,738.331	0.304	0.103								-0.470	8,666
			t-Stat	***(19.248)	**(27.132)	***(3.873)									
			h-Stat	***(3.741)	***(3.345)	(0.861)									
	2	Deflated by BV_{it}	Coeff	7,029,844.021	2.154	2.268	0.452							0.010	9,302
			t-Stat	***(2.740)	**(10.553)	***(7.007)	***(7.943)								
			h-Stat	**(2.404)	**(13.542)	***(4.560)	***(4.563)								
	3	Deflated by MV_{it-1}	Coeff	3,479,196.230	0.415	0.066	-0.069							-0.459	8,666
			t-Stat	***(19.034)	**(23.673)	**(2.461)	***(-8.203)								
			h-Stat	***(3.858)	***(4.472)	(0.581)	*(-1.719)								
	2	Deflated by BV_{it}	Coeff	6,813,415.634	1.785	1.926	0.445	1.835						0.020	9,302
			t-Stat	***(2.669)	***(8.649)	***(5.949)	***(7.866)	**(10.026)							
			h-Stat	**(2.329)	***(9.727)	***(3.460)	***(4.535)	***(4.637)							
	3	Deflated by MV_{it-1}	Coeff	3,448,837.334	0.439	0.067	-0.074	-0.049						-0.458	8,666
			t-Stat	***(18.828)	**(21.826)	**(2.501)	***(-8.553)	**(-2.414)							
			h-Stat	***(3.745)	***(4.195)	(0.603)	*(-1.893)	(-0.470)							

Appendix 6.2 - Coefficients and Associated tests from Cross-sectional & Pool Estimations (with lagged OA) for Sample where $BV \geq$ £5 Millions and r = 10%

Year	No	Type	Estim	1	α_0 (BV_{it})	α_1 (RI_{it})	α_2 (Oa_{it-1})	α_3 (CI_{it})	α_4 (RD_{it})	α_5 (HR_{it})	α_6 (DC_{it})	α_7 (TD_{it})	α_8 (DIV_{it})	A-R^2	Obs
	2	Deflated by BV_{it}	Coeff	6,626,216.164	1.504	2.205	0.424	1.669	13.630					0.033	9,302
			t-Stat	***(2.613)	***(7.283)	***(6.834)	***(7.545)	***(9.153)	**(11.150)						
			h-Stat	**(2.274)	***(8.135)	***(4.276)	***(4.515)	***(4.028)	***(7.796)						
	3	Deflated by MV_{it-1}	Coeff	3,395,624.372	0.398	0.083	-0.069	-0.031	8.212					-0.412	8,666
			t-Stat	***(18.836)	**(19.962)	***(3.149)	***(-8.032)	(-1.530)	**(16.875)						
			h-Stat	***(3.765)	***(3.790)	(0.788)	*(-1.725)	(-0.292)	***(7.028)						
	2	Deflated by BV_{it}	Coeff	5,273,720.348	1.363	2.049	0.351	1.605	12.739	0.474				0.034	9,302
			t-Stat	**(2.059)	***(6.491)	***(6.299)	***(5.874)	***(8.765)	**(10.224)	***(3.628)					
			h-Stat	*(1.730)	***(5.696)	***(4.241)	***(4.255)	***(3.834)	***(7.001)	**(1.984)					
	3	Deflated by MV_{it-1}	Coeff	3,214,627.670	0.250	0.048	-0.076	0.017	6.417	0.405				-0.358	8,666
			t-Stat	***(18.154)	**(11.815)	*(1.835)	***(-9.006)	(0.880)	**(13.176)	**(18.529)					
			h-Stat	***(3.148)	**(2.426)	(0.491)	*(-1.904)	(0.171)	***(3.746)	**(2.022)					
	2	Deflated by BV_{it}	Coeff	5,231,204.605	1.368	2.030	0.339	1.598	12.565	0.402	0.381			0.034	9,302
			t-Stat	**(2.042)	***(6.512)	***(6.237)	***(5.608)	***(8.722)	**(10.026)	***(2.823)	(1.290)				
			h-Stat	*(1.715)	***(5.563)	***(4.321)	***(4.227)	***(3.766)	***(6.800)	*(1.824)	(0.756)				
	3	Deflated by MV_{it-1}	Coeff	3,166,929.968	0.242	0.054	-0.072	0.024	6.429	0.385	0.140			-0.357	8,666
			t-Stat	***(17.803)	**(11.376)	**(2.068)	***(-8.434)	(1.205)	**(13.205)	**(16.696)	***(2.717)				
			h-Stat	***(3.127)	**(2.418)	(0.552)	*(-1.883)	(0.234)	***(3.721)	*(1.741)	(0.614)				
	2	Deflated by BV_{it}	Coeff	5,542,435.606	1.582	2.049	0.026	1.379	12.317	0.343	0.321	0.471		0.035	9,302
			t-Stat	**(2.163)	***(7.171)	***(6.298)	(0.224)	***(7.049)	***(9.814)	**(2.394)	(1.084)	***(3.162)			
			h-Stat	*(1.791)	***(6.478)	***(4.405)	(0.170)	***(3.618)	***(6.575)	(1.485)	(0.635)	**(2.012)			
	3	Deflated by MV_{it-1}	Coeff	2,796,352.944	0.233	0.022	-0.007	0.089	6.308	0.409	0.112	-0.116		-0.351	8,666
			t-Stat	***(14.956)	**(10.962)	(0.849)	(-0.555)	***(3.966)	**(12.975)	**(17.535)	**(2.173)	***(-6.302)			
			h-Stat	***(3.203)	**(2.337)	(0.217)	(-0.117)	(0.767)	***(3.812)	*(1.943)	(0.488)	(-1.314)			
	2	Deflated by BV_{it}	Coeff	8,052,065.389	1.103	0.794	-0.254	1.170	10.430	0.130	0.006	0.575	14.060	0.047	9,302
			t-Stat	***(3.149)	***(4.934)	**(2.310)	**(-2.153)	***(5.988)	***(8.281)	(0.906)	(0.021)	***(3.871)	**(10.798)		
			h-Stat	***(2.657)	***(5.532)	**(1.981)	*(-1.879)	***(3.479)	***(6.238)	(0.830)	(0.015)	***(2.845)	***(6.778)		
	3	Deflated by MV_{it-1}	Coeff	2,587,238.864	0.258	0.056	0.003	0.089	6.397	0.412	0.120	-0.122	-0.819	-0.350	8,666
			t-Stat	***(12.803)	**(11.151)	*(1.931)	(0.185)	***(3.984)	**(13.133)	**(17.650)	**(2.323)	***(-6.572)	***(-2.722)		
			h-Stat	**(2.212)	**(2.186)	(0.426)	(0.045)	(0.773)	***(4.146)	*(1.921)	(0.546)	(-1.432)	(-0.380)		

Annual cross-sectional are first run from 1991-1999 and then pooled. Due to space constraint, only Model 8 (full equations) are reported for the cross-sectional regressions.
Regressions are run from Prop-MV $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \varepsilon_{it}$ to $MV_{it} = \alpha_0 BV_{it} + \alpha_1 RI_{it} + \alpha_2 OA_{it-1} + \alpha_3 CI_{it} + \alpha_4 RD_{it} + \alpha_5 HR_{it} + \alpha_6 DC_{it} + \alpha_7 TD_{it} + \alpha_8 DIV_{it} + \varepsilon_{it}$ in terms of (1) deflated by BV_{it} and (2) deflated by MV_{it-1}.
*, **, *** = 90%, 95%, 99% confidence level respectively. The medians and percentiles of the respective coefficients, adj. R^2, RSS are in **Table 6.19.**

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