

**THE INFORMATION CONTENT OF ACCOUNTING EARNINGS,
FUNDS FLOWS AND CASH FLOWS**

by

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To my wife, Kamini, my daughter, Rhea, my mother, Jo,
and to the memory of my father, Eric Clubb.

ABSTRACT

The information content of accounting earnings, funds flows and cash flows to investors is examined from a number of different perspectives. Firstly, arguments and proposals for an increased emphasis on cash and funds flow in financial reporting are reviewed and major themes from this literature are identified. Empirical studies indicating the use of earnings, funds flow and cash flow data by investors and the predictive ability of this data in relation to future cash flows are also reviewed. Two studies related to the above areas (Clubb 1988, Arnold et al 1991) are enclosed in published form.

Secondly, capital market based accounting research concerned with the information content of accounting earnings, funds flows and cash flows is reviewed. The review of this work indicates increasing use of concepts from valuation theory in the evaluation of the information content of accounting earnings data but less emphasis on this approach in studies concerned with the information content of cash and funds flow data. Alternative approaches to the latter area based on recent advances in the development of linear information valuation models of security valuation are considered.

Thirdly, an empirical study of the information content of accounting earnings, funds flows and cash flows in the UK, drawing on insights from the dividend capitalisation model of share valuation, is presented. The main aim of the study is to examine the relative information content of accounting earnings data and cash and funds flow data. Using a time series approach applied to each of 48 companies over the period 1955-1984, the study confirms previous

findings that accounting earnings data has incremental information content beyond cash and funds flow data and provides further findings that cash and funds flow data has incremental information content beyond accounting earnings data.

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ADDITIONAL PUBLICATIONS ENCLOSED:

Clubb, C D B (1988), "The Potential Role of the Funds Statement in Financial Reporting", Omega, Winter, pp 405-19.

Arnold, A, C D B Clubb, S Manson and R T Wearing (1991), "The Relationship between Earnings, Funds Flows and Cash Flows: Evidence for the UK", Accounting and Business Research, Winter, pp 13-19.

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**CHAPTER 1 -
INTRODUCTION**

1. Motivation for the Study

The primary motivation for the study is the belief that a focus on the information needs of investors, based on analysis of normative proposals for the development of financial reporting which are perceived to satisfy these needs and on capital market analysis of share price responses to various types of accounting data, may have beneficial social and economic consequences if it leads to a greater consensus and understanding of the nature of these needs. Thus, it is felt that the nature of these needs is only imperfectly understood and that the methodological perspectives considered in this study may lead to improved understanding of these needs. As discussed further in section 3 below, this study focusses in particular on (i) a review and analysis of normative arguments for a greater emphasis on cash or funds flow accounting in financial reporting to investors, including a brief discussion of a system of financial reporting centred around the funds statement (see Clubb 1988, enclosed at the end of this thesis) (ii) a review and analysis of capital market research focussing on the information content of accounting earnings, funds flow and cash flow data in relation to share prices and (iii) an empirical study of the information content of accounting earnings, funds flow and cash flow data in the UK. The focus on these particular areas is based on the belief that the relative merits of earnings and cash or funds flow accounting is a topic of central importance in the design of financial reporting systems which aim to satisfy the information needs of investors.

In the light of the argument presented in the previous paragraph, the motivation for reviewing the normative literature on cash and

funds flow reporting is simply to summarise the arguments presented in this literature and to indicate areas of agreement and disagreement in relation to the perceived utility of this data for investors. Such an analysis 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 practice towards an increased emphasis on this data. It is argued that there is currently considerable consensus in relation to the proposals generated by this research and that further work, particularly in relation to the development of financial reporting systems combining cash and funds flow data with current value accounting data, may represent a significant influence on the direction of financial reporting practice in the future.

The motivation for reviewing and analyzing capital market research concerned with the relationship between share prices and accounting earnings is to provide an indication of the extent to which this research can be viewed as providing support for the continued focus on historic cost income in financial reporting practice. Clearly, to the extent that this research is able to establish a relationship between share prices and accounting earnings data, it can be viewed as providing a degree of support for the argument that such data, at least in part, provides information that is useful to investors. However, given the normative arguments presented in favour of the relevance of cash and funds flow data to investors, it also seems desirable to consider the extent to which share prices have reflected data of this type in the past. This therefore provides the primary motivation for reviewing and analyzing the capital market literature concerned with the relationship between share prices and earnings,

funds flow and cash flow data and with attempting to carry out an empirical study of this type using UK data. A limitation, however, of this research methodology is that it is restricted to the study of accounting data provided by past financial reporting systems and is therefore unable to provide evidence on the extent to which alternative reporting systems providing more detailed (or more closely regulated) disclosure of cash and funds flow data could be relevant to investor information needs in the future. In addition, the possibility of informational inefficiency or the use of misspecified asset pricing models in empirical research raises problems for the interpretation of findings.

In summary, the aim of this study is to contribute to the debate over the relative merits of an emphasis on historic cost income data or cash and funds flow data in financial reporting to investors. As discussed briefly in section 2 below, the methodological approaches adopted to the analysis of investor information needs in this study are by no means unproblematic and the emphasis on the needs of investors is itself open to possible criticism. Nevertheless, it is hoped that the analysis contained in this study provides some indication of possible directions for the development of improved systems of financial reporting.

2. Methodological Issues

The previous section provided an outline of the motivation for the study. This section provides a brief discussion of some of the methodological issues raised by the study. Such a discussion is

useful for the purpose of clarifying the scope and the limitations of the perspectives on accounting implicit both in the literature surveyed and in the theoretical and empirical analysis developed from this literature in the study.

As already indicated, the principle concern of the study is the analysis of the usefulness of alternative types of accounting data to investors in business enterprises. The review and analysis of the literature concerned with arguments for the relevance of cash and funds flow data to investors attempts to identify the underlying rationale for the cash and funds flow accounting proposals contained in this literature. The analysis therefore attempts to elucidate the assumptions and arguments concerning the information needs of investors contained in these studies. The research methodology employed in this literature is best characterised as normative and principally oriented to the provision of data to facilitate improved wealth maximising (or perhaps satisficing) financial decisions by investors. Such a perspective clearly limits the scope of such research as it is reasonable to argue that there are other actual or potential uses for, and users of, accounting information (see for example the Corporate Report (ASSC 1975)). Furthermore, to the extent that the nature of accounting practice is related to its broader social context (for example, see Burchell et al 1980), it is likely that the practical relevance of such normative approaches to accounting theorising will be dependent on its relationship to this broader social setting. While it is accepted that the normative discourse on cash and funds flow reporting may be usefully analysed within a broader historical and social framework, the analysis presented in the first part of this study is restricted to the

identification of themes and arguments contained within this literature. Clearly, it must be accepted that the perceived relevance of such an approach depends on the perceived relevance of the investor interests with which it is primarily concerned.

The other parts of the study focus principally on (i) previous research concerned with issues of capital market informational efficiency and the association between share prices and accounting data and (ii) on an empirical study of the association between accounting data and share prices using UK data. While the analysis in these parts of the study has a less overtly normative orientation than that discussed above, it can be argued that such research has its origins in normative conceptions of the role of accounting in society (Tinker et al 1982). Furthermore, it can be criticised for a focus on the private value of accounting information as opposed to its broader social value (Cooper and Sherer 1984). These criticisms may well be accepted as genuine limitations of the focus of these parts of this study, although it is a matter of opinion as to whether they negate the relevance or legitimacy of such work. It seems reasonable to conclude, however, in the light of criticisms of capital market based research, that any conclusions drawn from this research be regarded as providing only partial insights into the social utility of alternative forms of accounting data.

The two main approaches to accounting research considered in this study, the normative approach underlying the proposals considered in Chapter 2 and the empirical approach adopted in the analyses considered in Chapter 3 and in the empirical study described in Chapter 4, can be viewed as reflecting the distinction between

research concerned with accounting methodology and research concerned with propositions about the providers and users of accounting data suggested by Christenson (1983 p5). This basic dichotomy in accounting research identified by Christensen draws on a distinction between proposals and propositions in science attributable to Popper (Christensen 1983 p4), although both Christensen (1983) and Hines (1988) argue that most empirical research in accounting, in particular that which has been termed 'positive' accounting research (Watts and Zimmerman 1986), does not satisfy the Popperian criterion of falsifiability. Consistent with Hines's view that "no hypothesis or theory is conclusively falsifiable" (Hines 1988 p660), a more limited view of capital market research as only one methodological perspective among many which may be used to gain insights into the role of accounting in society underlies the present study. Nevertheless, while Christensen's use of the criterion of falsifiability as a basis for evaluating accounting research is viewed to be of limited relevance to accounting research, his broad dichotomy identified above does provide a useful basis for justifying the normative and empirical perspectives adopted in this study. Furthermore, the attempt to view the issue of the relative usefulness of earnings, funds flow and cash flow data to investors from these two perspectives reflects a belief that both empirical research and *a priori* reasoning represent useful avenues for accounting research (Whittington 1988).

The above discussion is intended to provide some indication of potential problems raised by the methodological perspectives contained within this study. Given the lack of a single generally accepted perspective on accounting research, the analysis of

accounting practices from a number of alternative perspectives can perhaps be justified simply in terms of the different insights offered. The practical significance of alternative approaches to accounting analysis, including those adopted here, are likely to depend on many factors beyond the academic realm. It is now useful to consider in greater detail the contents of the main chapters of the study.

3. Outline of the Study

The remainder of the study is divided into three main parts. Chapter 2 provides a review and analysis of arguments for a greater emphasis on cash or funds flow accounting, as opposed to historic cost income measurement, in financial reporting and considers empirical evidence both on the use of funds statement data by investors and on the relative ability of earnings, funds and cash flow data to predict future enterprise cash flows. This part of the study therefore focusses on proposals which suggest that cash or funds flow data may have greater information content in relation to the needs of investors than historic cost income data and reviews empirical research indicative of the extent to which such arguments are consistent with investor behaviour and with the statistical relationship between earnings, funds flow and cash flow measures over time. The main conclusion from this part is that, while there is a considerable consensus in the normative literature regarding the need for continued development of financial reporting systems combining *ex post* cash or funds flow data and current value asset data, there is only limited direct empirical evidence that investors actually use

cash or funds flow data for share valuation purposes or that such data is important for prediction of future enterprise cash flows. It is therefore suggested that further development of *a priori* arguments for the proposed approaches to financial reporting, together with further empirical analysis of the utility of cash flow data to investors, particularly in the light of recent changes to financial reporting requirements in the area, are required. Two papers, Clubb (1988) and Arnold, Clubb, Manson and Wearing (1991), providing analysis and empirical findings relevant to the themes of this chapter, are enclosed in published form at the end of the thesis.

Chapter 3 is concerned with the role of capital market research as a basis for the study of the information content of earnings, funds flow and cash flow data. The main aims of this part are to provide a review and analysis of recent research on the informational efficiency of capital markets and its possible implications for the evaluation of accounting data, to provide a review and analysis of theoretical and empirical analyses of the relationship between share prices and earnings, and to consider recent empirical evidence on the information content of cash and funds flow data. The analysis notes the recent advances in theoretical and empirical analysis of the relationship between share price movements and accounting earnings data but argues that these developments fail to provide clear support for the superiority of historic cost income data over cash or funds flow data as explanatory variables for share prices. This part of the study concludes by suggesting ways in which theoretical developments in capital market research may be extended to address the issue of the relative explanatory power of earnings data and cash and funds flow data for share prices. In particular, it is suggested

that linear information models concerned with the relationship between accounting earnings and share prices can be readily adapted to the analysis of cash and funds flow data, an issue developed in Appendix A in relation to a particular linear information model developed by Feltham and Ohlson (1992) and in Chapter 4 and Appendix B in relation to a model attributable to Lipe (1986).

Chapter 4 focusses on an empirical analysis of the relationship between share returns and earnings, funds flow and cash flow data based on a sample of 48 UK companies over the period 1955-1984. As noted above, this part develops aspects of the analysis in Chapter 3 concerned with the design of empirical studies to address the issue of the relative information content of earnings data and cash and funds flow data. In particular, it is shown that previous research demonstrating the link between earnings forecast model parameters and earnings forecast error share response coefficients under the assumption of an earnings capitalisation share valuation model can be extended to derive a link between earnings, funds flow and cash flow forecast model parameters and corresponding forecast error share response coefficients under the more general assumption of a dividend capitalisation share valuation model. Findings from estimation of returns equations for individual sample companies using a multivariate time series approach provide evidence that unexpected earnings data and unexpected cash flow data each have incremental information content beyond the other. Some limited evidence that estimated share response coefficients are related to estimated parameters of the assumed forecast models for earnings and cash flow data is also presented.

Chapter 5 concludes the study by summarising the principal 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 the accounting needs of investors (i) by providing insights into the direction of research concerned with the development of cash and funds flow reporting systems and by contributing directly to this debate (Clubb 1988) (ii) by analyzing recent developments in capital market research relevant to an understanding of the scope and limitations of information content studies in accounting and by providing insights into how capital market analysis of the information content of cash and funds flow data may be carried out and (iii) by providing an empirical study of the information content of accounting earnings, funds flows and cash flows in the UK which extends previous empirical findings in the area and which utilises insights from a linear information valuation perspective. Perhaps unsurprisingly, the study concludes by suggesting that there is continued scope for future research in a number of areas concerned with the relative importance of earnings and cash and funds flow accounting data to investors.

CHAPTER 2 -
CASH AND FUNDS FLOW ACCOUNTING AND
THE INFORMATION NEEDS OF INVESTORS

1. Introduction

Recent professional pronouncements in the USA and the UK have led to marked changes both in the terminology of funds flow accounting and in the way funds flow data is disclosed. Thus, the term 'funds' has been replaced by the narrower concept of 'cash and cash equivalents' in the latest US standard, Statement of Financial Standards No.95 (FASB 1989), and the formal title of the funds flow statement changed from Statement of Changes in Financial Position under the previous standard to Statement of Cash Flows. Similar changes have occurred in the UK with the replacement of Standard Statement of Accounting Practice No.10 (ASC 1975) which prescribed a Statement of Sources and Application of Funds based on a working capital definition of funds with Financial Reporting Statement No.1 (ASB 1991) which requires the preparation of a Cash Flow Statement based again on the concept of 'cash and cash equivalents'. One of the goals of this chapter will be to provide a conceptual basis for evaluating the desirability of these changes.

Underlying the changes in professional pronouncements on funds flow reporting, there has been considerable debate in the academic literature on the possible benefits of an increased emphasis on cash or funds flows in financial reporting practice. This debate has included suggestions for radical shifts in financial reporting which would require the presentation of multi-period forecast cash flow information, cash flow and exit price data, and project-based cash flow reports. There have also been serious doubts raised over these cash flow prescriptions, perhaps not least because of the diversity of the proposals to emerge. Thus, while some of the recent changes

in funds flow reporting are likely to meet with a degree of approval from advocates of cash and funds flow accounting (and also from advocates of a more conventional approach to financial reporting to the extent that they are not perceived as undermining historic cost accounting), it is also reasonable to expect, as for the case of income reporting, considerable disagreement on more detailed issues of implementation. Indeed, the question arises as to whether a single accounting standard can provide sufficient scope to deal fully with reporting issues for a potentially large and complex area.

The remainder of this chapter is organised as follows. Section 2 reviews the debate on cash and funds flow accounting (CFFA hereafter) in recent years with particular reference to the issue of the relationship between proposed CFFA reporting systems and the wider financial reporting system incorporating income statement and balance sheet financial data. Section 3 reviews the empirical evidence on the way in which investors use financial information and on the contemporaneous and predictive relationships between alternative income and funds flow measures in order to provide some empirical perspective on the arguments presented in favour of and against the need for a greater emphasis on CFFA in financial reporting. Section 4 concludes the chapter and includes brief discussions of (a) the relationship between the previously reviewed research and professional pronouncements in the area and (b) the possible usefulness and limitations of a capital market/security price research perspective on CFFA, an issue developed further in Chapters 3 and 4 of the thesis. Finally, a paper presenting an integrated financial reporting system based around a working capital based funds flow statement which provides the user with historic cost and

current value (income and asset value) data (Clubb 1988) is enclosed at the end of this thesis.

2. A Review of the Debate on Cash and Funds Flow Accounting

As demonstrated by Rosen and DeCoster (1969), the funds statement has a long history in the USA, and mandatory disclosure has been required under standard accounting practice in the USA and the UK for several years. However, as indicated by Rosen and DeCoster (1969) for the USA and Lee (1974) in the UK, diverse approaches to reporting funds flow information existed prior to mandatory reporting requirements and this continued after the promulgation of the first accounting standards due to the generality of the reporting requirements. Furthermore, this diversity of practice was associated with academic criticism that the objectives of funds flow accounting in both the USA and the UK were unclear (Heath 1978, Lawson 1982). Given the controversy and confusion surrounding the role of funds flow accounting among academic writers (Rosen and DeCoster 1969), it is perhaps not surprising that accounting standards promulgated in the 1960s and early 1970s lacked focus. The main concern of the following review is to consider the CFFA debate, particularly since the late 1960s, in order to attempt to ascertain whether or not greater clarity with respect to the objectives of cash and funds flow accounting has been achieved and to identify important developments with a view to predicting and suggesting future directions for the development of this aspect of financial reporting.

a. An Organising Framework for Reviewing the Debate

Before proceeding with a review of proposals and arguments put forward in the context of the debate over the relative merits of CFFA and more conventional profit based approaches to financial reporting, it is useful to outline a broad perspective used to organise the subsequent review. Following ideas developed by Sorter (1969) concerning the distinction between an 'events' approach and a 'value' approach to financial accounting theory, it is felt that a useful distinction can be made between an 'events' perspective and a 'value/income' perspective on CFFA. In this important contribution to our understanding of the nature of financial reporting, Sorter argues that the 'events' approach suggests that "instead of producing input values for unknown and perhaps unknowable decision models directly, accounting provides information about relevant economic events that allow individual users to generate their own input values for their own individual decision models" (Sorter 1969 pl3). It will be argued that such a perspective is implicit in many proposals for CFFA and that this may be one of the single most important justifications for the development of funds flow reporting systems. The 'value' perspective identified by Sorter, on the other hand, was viewed as less supportive of the case for funds flow accounting, with advocates of this approach to accounting theory having 'the most difficulty in justifying this statement'(pl6). As noted in the Introduction to this chapter, a major concern of the review of the debate on CFFA is the relationship between cash and funds flow proposals and the wider financial reporting system incorporating income and balance sheet data. It will be argued that, while the 'value' perspective may, in part, be a source of resistance to the

promotion of funds flow accounting in financial reporting, there is also increasing evidence of attempts to reconcile CFFA with value and income measurement perspectives on financial reporting.

While the distinction between 'events' and 'value/income' perspectives on CFFA provides a useful, if simplified, dichotomisation of approaches to the area, a second distinction between an emphasis on the cash flow potential of the firm and the liquidity of the firm (Staubus 1966 1989) provides a further basis for distinguishing perspectives on CFFA. Staubus argues that "users rely on historical cash flow reporting for information relevant to projecting enterprise liquidity in the short-run, and on financial statements based on accrual-deferral accounting for information relevant to their interest in wealth and income" (Staubus 1989 p161) but he notes that "a curious feature of the widely accepted notion that reporting flows of cash or a similar pool of liquid funds is worthwhile is that those advocating or requiring such reporting give little attention to the concept of liquidity" (p164). It is suggested that this perceived omission, or perhaps more accurately lack of emphasis, is at least partially explained by the focus of these studies on the role of CFFA in relation to the longer-term cash flow potential of the firm as opposed to its liquidity position. Despite this apparent disagreement between Staubus's view of the scope of CFFA and the views of its scope by many of those arguing for increased emphasis on CFFA, his distinction between an emphasis on cash flow potential and liquidity provides a useful further basis for reviewing research in the area.

To summarise, previous research by Sorter (1969) and Staibus (1989) jointly provide an interesting basis for reviewing research concerned with the role of CFFA in financial reporting practice. Figure 1 combines the two dimensions identified by Sorter and Staibus in the

Figure 1

Perspectives on Cash and Funds
Flow Accounting

		Perspectives on Investor Information Needs		
		Not Clearly Specified	Cash Flow Potential	Liquidity Perspective
Perspectives on Financial Reporting	Events Perspective	A	B	D
	Current Value Perspective	Not Relevant	C	E

form of a simple matrix where research may be characterised as falling into one or more of five broad categories. It should be emphasised that this framework is only intended as an organising basis for purposes of the review which follows and that, while it is

hopefully possible to classify particular research proposals or arguments as principally related to one of the five 'zones' identified in Figure 1, most studies are likely, to some degree, to consider issues related to two or more zones.

We start with an analysis of some early studies which emphasised the potential usefulness of an events perspective for a variety of undefined user decision models (Fig.1 Zone A). Next, we consider studies which emphasised an events perspective within an approach primarily concerned with the cash flow potential of the firm (Zone B). Thirdly, we consider studies which have taken a current value accounting based perspective on CFFA within the context of discussions of both the long-term cash flow potential and the short-term liquidity of the firm (Zones C and E). Studies concerned purely with developing a rationale for CFFA based on an events perspective on financial reporting in the context of investor information needs regarding the short-term liquidity position of the firm (Zone D) are very limited (as noted by Staubus (1989), this is probably due to the limited relevance of the liquidity perspective to investors) and therefore are not a major focus of interest in this section, although, as noted in section 4 of this chapter, the liquidity perspective on the utility of CFFA is raised in professional pronouncements (for example, ASB 1991) on cash flow reporting. Finally, we conclude with a brief summary of the current position in relation to academic advocacy of CFFA in financial reporting.

b. The Events Perspective

As has already been noted, the analysis of Sorter (1969) provides an important explication of the events perspective on financial

accounting, placing some emphasis on the consistency between the events perspective and a more prominent role for the funds statement in company financial reporting. Although his analysis is concerned more generally with interpretation of the role of all the major financial statements, Sorter (1969) acknowledges Vatter, a prominent funds statement theorist, as the main source of inspiration for his analysis (footnote 2). Indeed, the seeds of the 'events' perspective can be seen, for example, in Vatter (1963) where it was argued that "accountants should cease using the misleading notion that accounting reports deal with 'funds that flow'" and that they should report "transactions or financial events, not funds or funds flow....[in an operating report which].....does not depend for its validity on anything but the desire to report essential transactions without unwieldy duplication" (Vatter 1963 p298). Although, as indicated above, Vatter was somewhat hostile to the simplification of describing a statement which reported major operating events as a funds or funds flow statement, he essentially recommended an operating statement which may be described as an "all financial resources" funds statement reconciled to changes in working capital. Furthermore, given that his primary operating statement excluded any measure of income, and that this was perceived by Vatter as "a desirable rather than undesirable feature" (p298) of the report given the multitude of possible income concepts, his analysis provides an early example of the importance of an 'events approach' in challenging the central role of historic cost income measurement in financial reporting practice in favour of greater emphasis on information contained in a variant of the funds statement.

While Vatter's proposals preceded and influenced the formalisation of the events approach to financial accounting by Sorter, the work of Rayman (1969 1970) provides an example of an events rationale for increased emphasis on the funds statement in financial reporting which appeared in the literature at approximately the same time as Sorter's analysis and which has theoretical similarities to the latter. Hence, Rayman argued for the need for a 'segregated system of funds accounting' to replace the focus on the profit and loss account and the balance sheet which prevailed in the UK at the end of the 1960s suggesting that: "The fault of the conventional system of accounting lies in the failure to differentiate between records of fact and assessments of value.....Consequently, it is impossible to distinguish between the results of actual events and the effects of accounting procedures" (Rayman 1970 p423). In order to remove issues of historic cost asset valuation from his funds flow statement, Rayman defined funds in terms of 'current non-specific claims', the latter representing for a particular business entity the difference between "current non-specific claims in its favour (eg:cash, current debtors, accrued income etc) and current non-specific claims against it (eg: current creditors, accrued expenses etc)" (p424). Thus, although Rayman, unlike Vatter, was concerned with incorporating the notion of 'funds that flow' into his analysis, his concern with placing an events oriented operating statement at the centre of the financial reporting system and clearly differentiating the events basis of this statement from the conventional accounting system based on the historic cost income statement and balance sheet is in a similar spirit to the approach of Vatter and Sorter.

Finally, it is useful to consider the work of Thomas (1969 1974) on the allocation problem in financial accounting within the context of this discussion of the development of an events perspective on CFFA. Thus, while the focus of Thomas's work is a demonstration of both the arbitrary nature of the apportionment of revenues between inputs into the production process and the arbitrary nature of allocation-based approaches to asset valuation, one important corollary of his analysis is the implicit support it provides to the events perspective on financial accounting. In particular, Thomas's concern to encourage the development of financial reporting methods that avoid arbitrary allocation leads him to support the preparation of funds statements on a 'net-quick-asset' basis, thus excluding all non-monetary assets and liabilities from the definition of funds (Thomas 1974). This prescription has clear similarities to that of Rayman considered above and his view of this statement as "a statement of current activities...[which]...would begin with a detailed calculation of funds from operationsfollowed by a report of purchases of non-monetary assets, less proceeds from nonoperating sales of such assets, leading to a figure for funds from operations less funds consequences of transactions in nonmonetary assets" (Thomas 1974 pp119-120) indicates the consistency between this allocation-free perspective on financial reporting and the more explicit concern with reporting financial events in the work of Rayman, Sorter and Vatter.

The studies considered above represent important developments towards a conceptual rationale for elevating the status of the funds statement in financial reporting practice. However, a notable omission of these studies is an explicit analysis of the usefulness

to investors, or other users, of the information provided by the proposed statements, the authors primary concern being to differentiate perceived records of 'objective fact' provided by the funds statement from the subjective valuations and allocations of accountants contained in conventional accounts. While the events perspective has continued to underlie subsequent developments in research in the CFFA area, a more explicit concern with the usefulness to investors of the data provided in funds flow or, more particularly, cash flow statements has pervaded more recent developments in the area. An important theme to emerge in the 1970s was the possible link between cash flow accounting and what may be termed 'the cash flow valuation model' of the firm and it is to these developments that we now turn.

c. The Cash Flow Potential Perspective

A more explicit concern with investor information needs emerged in the cash flow accounting (CFA) proposals of Lawson (1971) and Lee (1971 1972), although ,as highlighted by Ashton (1976), there were important differences between the CFA proposals of these two researchers. The Lawson model was most explicitly based on the Miller-Modigliani (1958 1961) (MM hereafter) share valuation model, recommending the preparation of multi-period cash flow statements which disclosed disaggregated operating cash flows, corporation tax payments, capital expenditure, and debt and equity financing cash flows, with shareholder cash flows (defined as the difference between total dividends paid and new equity finance contributed) as the 'bottom line'. The main rationale for the focus of the model on the latter item is that the value of the company's equity in an efficient

capital market should correspond to the discounted value of future expected shareholder cash flows and hence it was recommended that not only should multi-period cash flow disclosures cover 5 to 6 years prior to the current period but should also include forecasts for up to 10 years. However, while the Lawson (1971) model represented a major attempt to implement concepts from valuation theory in a financial reporting framework, Ashton (1976) argued that the model could be too easily accepted on the simple grounds that it provides more information to users.

The Lee (1972) proposals were less closely tied to the MM equity valuation model but nevertheless were preceded by a discussion of the importance of providing information which is "relevant and useful for purposes of helping the investor to predict (a) future dividends and other benefits receivable by him from the company: (b) its future survival, maintenance and expansion: and (c) the degree of risk and uncertainty and connected with his existing or potential investment in it." (Lee 1972 p28). Furthermore, Lee's (1971) analysis of the problems of accounting for goodwill, which provides much of the conceptual background to his (1972) CFA proposal, includes a discussion of the relationship between cash flow accounting and discounted cash flow valuation methods, with a tentative recommendation that 'share price / discounted cash flow' ratios be prepared, along with Hicksian measures of income for the current period. The cash flow reporting system suggested by Lee (1972), incorporating both actual and forecast cash flow information, however, articulates less clearly with DCF valuation models of the firm than the Lawson model, with an emphasis on a measure described as 'net distributable flow' (equal to opening cash balance plus

measures of operational, exceptional, financial, capital and taxation transaction cash flows) and on movements in the firm's cash balance over the accounting period. Nevertheless, there is clearly much in common between Lee's and Lawson's early concern for the provision of disaggregated data on actual and expected future cash flow events within an overall reporting framework designed to facilitate investor evaluations of the cash flow potential of business organisations.

Perhaps the most radical aspect of both Lawson's and Lee's early proposals relate to the provision of forecast cash flow information, a feature also contained in a number of other cash flow reporting proposals in the 1970s (for example, Climo 1976). However, as argued by Ashton (1976), despite considerable efforts by the authors (particularly, Lee 1971) to provide guidelines for the preparation of such information, the reliability of forecast data beyond the immediate short-term is likely to be low, with resulting problems for the formal inclusion of such data in company financial reports. This clearly represents a potential limitation of these early cash flow proposals as a basis for improving investor assessments of company cash flow potential and renders the determination of cash flow based measures of periodic performance, for example based on a Hicksian definition of income as tentatively suggested by Lee (1971), highly problematic. It is therefore perhaps unsurprising that both these authors have moved in their more recent work from the earlier emphasis on the potential role of cash flow reporting systems in providing *ex ante* accounting information to a focus on either long-term *ex post* cash flow performance (Lawson 1981, Lawson and Stark 1981) or periodic performance measurement employing share price (Lawson 1982 1983 1985) or asset net realisable value (Lee 1981 1985)

data. Before moving to a review of these and other more recent developments which have addressed more fully the relationship between CFFA and value or income measurement in external financial reporting, it is necessary to conclude this section with a brief review of the contribution of Ijiri (1978 1979 1980) to the cash flow potential perspective on CFFA.

Ijiri's analysis provides an important extension of the early work of Lawson and Lee on the cash flow potential approach to CFFA which argues that if "an objective of financial statements is to provide information useful to investors and creditors for predicting, comparing and evaluating potential cash flows to them in terms of amount, timing, and uncertainty then well-classified data on the past cash flows of the firm seems to be more directly relevant to this objective than data on assets and liabilities of the firm" (Ijiri 1978 p332). Ijiri's approach is therefore consistent with the perspective of Sorter (1969) to the extent that it questions the dominance of valuation approaches to financial accounting theory but is also clearly concerned with the cash flow potential of the firm. Furthermore, the focus on past cash flow data as opposed to forecast data means that it is not afflicted by the forecasting problem confronted by the early Lawson and Lee proposals. However, as accepted by Ijiri (1978 1979), the implementation and theoretical underpinnings of this approach to CFFA is by no means unproblematic, as discussed below.

A central feature of Ijiri's system is the identity of investment cash flows and financing cash flows where the former is split into the difference of two components, investment minus recovery, and the

latter is also split into the difference of two components, financing less repayment. While his proposed system is referred to as a cash flow accounting system, Ijiri (1978) uses the notion of 'constructive cash flows' so that his cash flow (investment) recovery measure amounts to working capital from operations plus proceeds from fixed asset sales plus the net decrease in current assets (in periods when this occurs). Unlike most other approaches to CFFA, he suggests that ideally his system would be based on disaggregating total investment cash flows in terms of individual projects undertaken by the firm and disaggregating total financing flows as they relate to the individual loans and the equity of the firm. Cash recovery rates could then be calculated for individual projects by dividing the cash flow recovery for a particular project in a given accounting period by the average gross (excluding depreciation) investment for the period. Ijiri argues that such a project oriented cash flow statement, providing *ex post* cash recovery rates over a five-year period "to aid performance evaluation and projection of cash flows to the future" (Ijiri 1978 p338), would have the further advantage of "bridging the gap between investment decisions and performance evaluation" (Ijiri 1978 p340) as the reciprocal of the (average) cash recovery rate would provide information to investors on project payback periods from which project rates of return may also be estimated (given an estimate of project life).

In summary, Ijiri's cash flow accounting system represents an important attempt to move towards a system of *ex post* financial reporting which is consistent with investor information needs concerning the cash flow potential of a business enterprise and which is consistent with internal capital budgeting procedures based on

evaluation of expected future project cash flows. At a practical level, he recognises the difficulty in developing principles and procedures for project cash flow reporting but suggests that efforts in this direction would be worthwhile. In relation to the utility of the system as a basis for improving investor estimates of future cash flows, he notes that "of course, cash-flow patterns in the future may be different from those indicated by the past cash-flow data" but argues that "the purpose of the cash-flow statement is not to present such projections, but to provide information useful for predicting, comparing and evaluating potential cash flows." (Ijiri 1978 p341). The failure of his approach to gain acceptance in the new US standard on cash flow reporting, SFAS95 (FASB 1989), however, suggests that it may be regarded as equally difficult and/or costly to implement as the cash flow systems incorporating ex ante data suggested in the early work of Lawson, Lee and others. It has also come under some recent criticism for promoting 'cash recoveries' as cash flows when this is not strictly the case due to the treatment of credit expenses as (constructive) cash flows (Lee and Stark 1987).

d. The Current Value Perspective.

The review of CFFA proposals so far has considered the emergence of the events perspective, particularly in relation to funds statement reporting, and the focus on investor information needs concerning the prediction of future cash flows in early approaches to cash flow accounting. These two perspectives remain important themes in contemporary arguments for CFFA but have become increasingly intertwined with a growing concern for the relationship between CFFA and value and income-based approaches to financial reporting. Thus,

while the proposals considered in 3(b) and 3(c) above were uniformly sceptical of the scope of the traditional historic cost income measurement paradigm in financial reporting and, with the notable exception of Thomas, gave brief consideration to the ability of methods of current value accounting to rectify the perceived deficiencies in historic cost accounting, more recent studies have viewed compatibility with current value approaches to financial reporting as an increasingly important aspect of CFFA. Indeed, some recent work suggests that cash or funds flow data be regarded as providing an objective core of information for the purpose of current value income measurement (Clubb 1988) or treated as an input within an overall financial reporting framework primarily concerned with current value (allocation-free exit price) accounting (Arnold and Wearing, 1988). We focus initially, however, on how issues of income and value measurement have influenced the more recent work of the early cash flow advocates, Lawson and Lee.

It was suggested in section 3(c) that problems in relation to the provision of reliable forecast data in CFFA served to undermine aspects of the early CFA systems developed by Lee and Lawson and hence most probably affected the directions taken by these writers in more recent research. In defence of this view, it is useful to focus on a critical review by Egginton (1984) of the CFA proposals of Lawson and Lee and the replies of each to this critique. The intention is not to take particular 'sides' in this exchange but rather to use it to gain a fuller understanding of the main issues confronting the further development of CFFA as an area for advance in financial reporting theory and practice.

Egginton (1984) provides a critical analysis of Lee's proposals from the early studies considered above through to some more recent studies concerned with the potential role of net realisable values in a cash flow reporting framework (Lee 1981) and the significance of the allocation problem for CFA (Lee 1982), the latter paper itself arising as a response to a critical analysis of the role of allocations in CFA by Rutherford (1982). In relation to the allocation issue, as noted earlier, the work of Thomas (1969 1974 1979) suggests that implementation of an allocation-free approach to financial reporting may be possible within the context of funds flow statements based on either a cash or net monetary current asset basis. Rutherford (1982) raises the further issue of what he terms 'distributional allocations', questioning the ability of cash flow reports to provide unambiguous classifications of cash flows, for example, between different business segments or between capital and revenue when there is economic interaction between such accounting categories. These criticisms can be interpreted as suggesting important reasons for not overstating the scope of the events orientation of CFFA and were to some extent accepted by Lee (1982). Given that the exchange between Rutherford (1982) and Lee (1982) deals with the main issues in relation to allocation, the main contribution of Egginton (1984) was to question the movement in Lee (1981) towards reporting cash flow data and net realisable values within an overall cash flow framework. It is this aspect of Egginton's critique which is of particular interest here.

The cash flow reporting framework of Lee (1981), following previous suggestions by Lee (1978) himself and a number of earlier researchers (notably Edwards (1962) and Edey (1963)), attempts to link CFA and

net realisable value accounting (NRVA) "in the hope of revealing...that CFA and NRVA are parts of a single system of reporting which concentrates on the importance and accessibility of cash in business enterprise activity" (Lee 1981 p163). Lee (1981) argues that there is a special relationship between CFA and NRVA such that changes in the NRV of (non-cash) assets may be regarded as 'unrealised cash flows' of varying degrees of realisability, his illustration distinguishing simply between 'readily-realisable cash flows' such as the change in the NRV of trade debtors and 'not-readily-realisable cash flows' such as the change in the NRV of work-in-progress or plant and machinery. Egginton (1984 1985) objects to the idea of 'unrealised cash flows' arguing that Lee's 'Statement of Total Cash Flow', incorporating the above-mentioned NVR changes, is inappropriately titled and that "NRV is neither cash nor flow, so it is dangerous to call realisable profit a measure of total cash flow, or the statement containing it 'one of cash flow'" (Egginton 1985 p110).

Egginton's criticism in relation to the labelling of non-flow items in Lee (1981) as cash flows appears to be appropriate, although it can be argued (Staubus 1989) that Lee (1981) contributes usefully to the debate on the role of CFA in financial accounting by indicating how CFA can be combined with NRV data to provide a set of interlocking statements designed to provide a detailed picture of the liquidity position of the enterprise. While it may therefore be argued that further refinements to the CFA/NRVA system suggested by Lee, for example in a manner such as that suggested by Arnold and Wearing (1988) discussed below, may be required, perhaps the most interesting issue raised in Lee (1981) and the subsequent exchange

with Egginton is the change in the role of CFA in financial reporting envisaged by Lee. Thus, in his reply to Egginton, Lee clearly confirms the move from the provision of ex ante cash flow data in his approach to CFA, arguing that "it ought to be noted that the recent proposals of Lee to combine his earlier proposals with net realisable value accounting in a total cash flow system evidence his primary concern to develop a relevant and feasible system of ex post reporting" (Lee 1985 p96). The implication is that CFA is now conceived by Lee as being more concerned with the short-term liquidity of the firm than its longer-term cash flow potential, although, of course, the incorporation of NRV data will, at least under relatively competitive asset markets, provide information in relation to the latter objective.

Although Egginton (1984) primarily provided a critique of Lee's work on CFA, his analysis also elicited a defence of the relevance of CFA for performance evaluation from Lawson (1985). Once again, it is confirmed that "in the present Lawson scheme of things, CFA is essentially a system for measuring multiperiod (ex post) performance" (Lawson 1985 p99), and a detailed application of this approach, drawing on earlier studies (Lawson 1982 1983a 1983b), to the cash flow performance of the Royal Dutch/Shell company over the period 1975-81, considered by Egginton to illustrate the shortcomings of CFA in relation to periodic performance measurement, is provided. The main feature of the Lawson (1985) system is the combined use of periodic measures of shareholder and lender cash flows (defined as dividend or interest payments less capital contributions) with equity and debt market values over a number a number of years to obtain 'half-matrices' of real equity and lender rates of return for a

variety of holding periods. Egginton (1984) argued that the large overall cash deficit for the Royal Dutch Shell company over this period financed by large-scale borrowing might be interpreted erroneously as indicative of poor performance due to the failure of the cash flow statement to incorporate asset value changes. Lawson's analysis indicated that over much of the period both shareholder's and lender's experienced negative real rates of return and this, he argued, rather than Egginton's analysis, represented an appropriate form of cash flow analysis.

The exchange between Lawson and Egginton therefore reveals a similar movement in the Lawson CFA model to that of Lee towards an ex post system incorporating market value data. The main difference in the evolution of the two approaches is the use of equity and debt market values in Lawson's system as opposed to NRV asset values in Lee's system, which suggests the retention of a strong cash flow potential perspective in Lawson's work in contrast to the liquidity perspective developed by Lee. It should be noted, however, that the use of stock market values as a means of building ex ante data into cash flow analysis is strongly criticised by Egginton (1985) for its failure to demonstrate how cash flow data is relevant to an understanding the process of stock price determination. Thus Egginton argues that the returns data generated by Lawson have "little bearing on the information content of CFA" and that "the rates of return calculations can be made without the help of cash flow statements" (Egginton 1985 p110).

According to Lee (1981), the combined use of cash flow data and NRV asset data results in a reporting system which, at least in the

theoretical terms conceived by Thomas (1974), is allocation-free. This theme is developed by Arnold and Wearing (1988) in their application of a cash flow/exit price (CaFE) accounting system to the multi-period performance of British Airways over the period 1975-1985. The Arnold and Wearing system, however, differs in emphasis from that of Lee (1981) to the extent that it is conceived of as primarily a system of exit price accounting "in which exit price changes are analyzed into their realised (ie:cash flow) and non-realised components" (Arnold and Wearing 1988, p.317) as opposed to an elaborated cash flow reporting system. This difference of emphasis follows from their support for the notion that exit prices be viewed as opportunity costs rather than measures of liquidity and that, following Chambers (1970, 1976), firm performance is appropriately evaluated against such a yardstick. Thus, while there are considerable similarities in terms of the information provided by the Lee (1981) and Arnold and Wearing systems, the interpretative framework, and hence detailed structure of financial statements, associated with each differ. In terms of the organising framework represented by Figure 1, it can be argued that the primary concern of the Arnold and Wearing system is to promote a system of financial reporting which is useful in relation to the assessment of the future cash flow potential of the firm by providing *ex post* data on whether or not the existence of the firm has been justified by its past financial performance.

The more recent studies concerned with the role of CFA in financial reporting reviewed above therefore argue for the combined use of CFA with market value asset data to provide allocation-free information on the cash flow potential and liquidity of the firm. While the

revised Lawson system is best viewed as a method of financial analysis (as opposed to a financial reporting) due to the problems of using share market values in financial statements identified by Egginton, the suggested use of CFA and NRVA data by Lee (1981) and Arnold and Wearing (1988) can be viewed as legitimate possible approaches to allocation-free financial reporting. However, as noted by Thomas (1974), allocation-free financial reports incorporating current-entry-value statements based on "specific assets of the same kinds, ages, and conditions as its present holdings" (p.116) are also possible in principle. To the extent that entry values provide potentially useful data in relation to the future cash flow potential of the firm, it would seem desirable that a combined CFFA and current value based reporting system also provide entry value data.

The integrated financial reporting system based on the funds statement presented in Clubb (1988) seeks to provide a system of financial reporting which (a) emphasises the importance of financial events reported in the funds statement, (b) indicates as clearly as possible the relationship between the data reported in this statement and the traditional allocation-based historic cost income statement and balance sheet, and (c) demonstrates the relative simplicity of deriving current (entry and / or exit) value income statements making use of the funds statement. The reporting system is divided into two main parts, the first part demonstrating how conventional historic cost balance sheet and income statement data are related to the data contained in a funds statement prepared in terms of a direct method format distinguishing between operating, investment and financing funds flows and the second part demonstrating how current value income statements can be obtained by simply applying opening and

closing asset values to the data provided in the funds statement. As a point of detail, it should be noted that operating funds flow in the first part of the Clubb system is based on a working capital definition, including changes in stocks, and hence to be strictly consistent with the Thomas (1974) allocation-free perspective (and the Sorter (1982) 'cash impact' concept which influenced the proposed system) should be replaced with the net quick flow definition. This can be achieved quite simply by moving stocks from the first column to the second column of Tables 1a, 1b, and 1c in Clubb (1988).

As presented in Clubb (1988), the system is clearly tolerant of allocation-based accounting both in terms of incorporating conventional historic cost financial statements and in terms of the possible use of price-level indexed depreciated historic cost values as estimates of current values. The system can be adapted by replacing the historic cost balance sheets in Table 1 with entry or exit value balance sheets based on actual entry or exit values for equivalent assets, so that the last column in Table 1b would give a current value income statement and the overall system represented by Table 1 would be allocation-free. Given the dominance of allocation based accounting in financial reporting, the Clubb system was proposed as a simple and understandable basis for facilitating investor utilisation of important allocation-free, event-based data provided by the historic cost reporting system for the purpose of evaluating corporate economic performance. In situations devoid of the need for accounting allocation where reliable second-hand asset prices are available, the above discussion suggests the proposed reporting system can readily be adapted to provide allocation-free current value income measures.

e. Some Concluding Comments on the Debate

The preceding review of the debate on the role of CFFA in financial reporting indicates how early proposals based on the provision of past and forecast CFFA data have given way to an emphasis in recent work on the provision of ex post data within a broader financial reporting framework incorporating current market value data. In terms of the organising framework presented in Figure 1, proposals for CFFA appear to have moved from an early concern for emphasising the events or allocation-free basis of ex post cash or funds flow reports (Zone A), first, to a stronger emphasis on the potential usefulness of such statements and their forecast equivalents in relation to the objective of providing information on the cash flow potential of the firm (Zone B) and, second, towards a greater emphasis on the joint provision of CFFA and current value data as a basis for satisfying the information needs of investors in relation to both the future cash flow potential and the liquidity position of the firm (Zones C and E). To a large degree, these developments may be regarded as cumulative, although certain specific proposals, for example the provision of extensive forecast data and project-based cash flow data, are not, at least at present, regarded as entirely feasible aspects of CFFA reporting systems. While there are clearly conceptual and technical differences in the various systems considered, it would seem that a financial reporting system centred around a direct method funds statement identifying operating, financing and investment flows on a cash or net quick asset basis and providing current market value data on both an exit price and entry price basis (and avoiding the application of asset price indices to depreciated historic cost values for estimation purposes) would

satisfy many of the major arguments for change in financial reporting to have emerged in the CFFA literature. The difficulty and cost of providing the desired current value asset data, however, is probably the main obstacle to the development of such a financial reporting system.

3. Empirical Evidence on the Usefulness of CFFA Data to Investors

Section 2 provided a review of developments in the academic literature concerned with the potential scope of cash and funds flow accounting in financial reporting. The review noted important changes in emphasis in this literature in recent years, in particular the move towards linking CFFA with financial reporting systems incorporating current value accounting data. Despite this trend away from the advocacy of CFFA alone as a panacea for the inadequacies of traditional financial reporting based on the historic cost income statement and balance sheet, it may be argued that an important belief implicit in all the CFFA proposals considered above is the usefulness of disaggregated CFFA data (with or without further additional value-based accounting data) for investor decision-making. Furthermore, in the recent accounting standards on cash flow reporting promulgated by US and UK standard-setting authorities, FASB (1989) and ASB (1991) respectively, there is also a clear belief that such data should facilitate prediction of the amount, timing and uncertainty of future cash flows of a business enterprise. The aim of part (a) of this section is therefore to briefly consider the consistency between this viewpoint and empirical evidence regarding the way investors (or experimental surrogates for investors) utilise

accounting information. The aim of part (b) is to consider the limited statistical evidence available on the contemporaneous and predictive relationships between earnings, funds flow and cash flow variables as an alternative approach to evaluating the usefulness of CFFA data in relation to the prediction of future enterprise cash flows. Discussion of the findings from capital market approaches to the evaluation of the information content of CFFA data in relation to share prices is, as indicated in Chapter 1, reserved for Chapters 3 and 4.

a. Investor Use of CFFA Data

A number of approaches have been used to analyse the use of accounting information by investors or their surrogates. First, studies by Tweedie (1977) and Lee (1984) used students to gain insights into the way inexperienced users of accounting information interpret financial accounting data, in particular testing the hypothesis that inexperienced users perceive income statement and balance sheet data in terms of cash flows and net realisable values respectively. Second, the usefulness of funds statement data in helping accounting students, accounting practitioners and financial analysts interpret conventional historic cost accounting data in a laboratory experiment setting has been carried out by Walker (1984) and a similar approach, focussing entirely on financial analysts, has been carried out by Bradbury and Newby (1989). Third, questionnaire and interview surveys of financial analysts' use of published annual reports have been carried by Lee and Tweedie (1981), Arnold and Moizer (1984) and Moizer and Arnold (1984) providing some insights into the relative use of funds statement data by these 'sophisticated

users' of accounting information. Finally, protocol and content analysis has been used by Day (1986) to analyze the use of annual reports by investment analysts and content analysis has been used by Govindarajan (1980) to assess the relative importance of earnings and cash flow data to security analysts' reports published in the financial press. Aspects of these studies relevant to an understanding of the usefulness of CFFA data to investors will now be considered. The following review of work in this area is by no means exhaustive and is limited to an indication of the variety of approaches to, and the difficult issues raised by, research concerned with gaining insights into the use of CFFA data by investors.

The studies by Tweedie (1977) and Lee (1984) were based on the results of experiments in which students at the beginning of a first course in accounting at university were asked to prepare income statements and balance sheets from hypothetical data, the Lee study extending the earlier Tweedie study by providing subjects with a single problem for which a profit and loss account and closing balance sheet was required as opposed to two separate problems in relation to each of these financial statements. The Tweedie study found that a cash basis, rather than an accrual basis, was preferred by most students for income measurement and that realisable value was preferred to historic cost or replacement cost as the basis for asset valuation in the balance sheet by the majority of students. The Lee study confirmed these findings for students with no prior experience of accounting and provided additional evidence that there was a significant change to the use of accrual and historic cost based approaches in a follow-up test at the end of their introductory accounting course. To the extent that students may be regarded as

surrogates for 'naive investors' (Tweedie and Lee 1977), both Tweedie and Lee argued that this research indicates a likely communication gap between such investors and the accounting profession and the need for accounting policy-makers to 'take note of' the intuition associated with cash flow and realisable value accounting.

The studies by Walker (1984) and Bradbury and Newby (1989) differ from those of Lee and Tweedie above not only in terms of their focus on more sophisticated users of accounting information but also in terms of their more practical emphasis on the use of published funds flow data. Walker's study was particularly concerned with extent to which funds statement data facilitated user understanding of the broader information set provided in the annual report. Thus, in response to a set of five 'calculation questions' and five 'judgemental questions' based on actual annual reports, Walker analyzed the differences in the replies between those subjects who were provided with funds statement data and those who were not. His findings suggested that the provision of funds flow data failed to improve the accuracy, confidence or consensus in the replies given by subjects and that this conclusion applied equally to students, accounting practitioners and academics and financial analysts. Similar conclusions followed from the study by Bradbury and Newby which focussed solely on financial analysts and which gauged the usefulness of funds statement data by correlating the proportion of total time spent by analysts using funds statement data (in their study, unlike Walker's, all subjects were provided with funds statement data) to answer three calculative questions and two judgemental questions against the accuracy (or consensus) and confidence of the replies ie: these correlations were not

significantly positive as would be expected if funds statement data enhanced user interpretation of annual report data.

The questionnaire and interview surveys by Lee and Tweedie (1981), Arnold and Moizer (1984) and Moizer and Arnold (1984) provide further evidence on analyst understanding and use of funds statement data. Lee and Tweedie's analysis was particularly concerned with the extent to which arguments in favour of the efficient capital markets hypothesis could be supported by empirical evidence confirming a high degree of understanding of financial reporting data among financial analyst users of accounting information. Perhaps somewhat surprisingly, Lee and Tweedie found that the level of understanding was not as high as might be expected from such 'sophisticated' users and, in particular, found understanding of funds statement data to be extremely poor (their findings suggested that 64% of the sample of 229 analysts had no or only poor understanding of the funds statement). In addition, their results indicated that the profit and loss account and balance sheet were read thoroughly by over 90% of analysts in their sample but that only 67% read the funds statement thoroughly. This lower level of use and understanding of funds statement data was combined with little evidence to suggest that analysts attempted to forecast either cash flow or funds flow variables and a belief among analysts that profit and loss account and balance sheet data was considerably more influential in determining the investment decisions of their organisations than funds statement data.

The studies by Arnold and Moizer (1984) and Moizer and Arnold (1984) were based on an interview and questionnaire approach where

interviews conducted with analysts in six firms were used as a basis for developing a questionnaire which was then mailed to over 500 members of the UK analyst community. The two studies provide evidence on the appraisal methods and information sources used by the sample of analysts as a whole (202 in total) and by two sub-samples represented by 'information intermediaries' (ie: investor advisers) and portfolio managers. The findings of these studies indicated a widespread use of fundamental analysis by the sample as a whole based on earnings, price-earnings ratio and dividend forecasts, with profit and loss account and balance sheet rated as the most important sources of data for such analysis. Funds statement data was considered to be of considerable importance as a source of data after profit and balance sheet data, although the authors argue that 'the popularity of forecasts of conventional accounting earnings numbers relative to cash flow forecasts does suggest that analysts' appraisal procedures and valuation models are more dependent on accrual-based earnings than on cash flows' (Arnold and Moizer 1984 p202). Nevertheless, the findings suggest some tendency for analysts to predict future cash flows (their findings suggest that in about 60% of the appraisals carried out by the 'average' analyst, cash flow forecasts are made) and that there is a slightly higher use of cash flow forecasts by information intermediaries as opposed portfolio managers. In general, the findings of Arnold and Moizer can therefore be interpreted as providing more positive news regarding the utility of CFFA to investors (or their advisers) than the Lee and Tweedie (1981) study, although conventional accrual data nevertheless appears to be of prime importance to these users of accounting data.

Studies by Day (1986) and Govindarajan (1980) have used the technique of content analysis to consider the use of published financial report data by invest analysts. Day (1986) used protocol analysis to obtain data on the use of accounting information by a small sample of 15 UK analysts who were given a single company annual report. The transcripts from the protocols (based on tapes from participants 'thinking aloud') were then analyzed using content analysis, combined with further data obtained from questions put to the participants after they had completed their analysis of the company. The findings from the content analysis indicated that the terms 'sources and uses of funds' and 'cash flow/generation' were referred to quite frequently by a majority of the analysts, although not as frequently as 'profit' and 'balance sheet'. However, the most frequently cited item, 'long-term debt/loans/borrowing', is clearly a funds statement category, suggesting a potentially important role for the funds statement in this connection (capital expenditure was also quite frequently referred to). Given the nature of the task requested of the participant analysts ie: 'to examine the accounts as they normally would on first receiving them', it was not expected that analysts would produce forecasts, although, contrary to this expectation, seven analysts did produce forecasts. From this data, together with the comments from analysts at the questioning stage following the analysis of the company accounts, Day found that cash flow forecasting is considered to be an important activity by analysts, together with profit, price/earnings ratio and dividend forecasting. The interest in cash flow forecasting, however, was not related directly to the issue of share valuation but was directed towards forecasting future borrowing requirements and interest

charges, with a view to using the latter in the estimation of future earnings.

Finally, the study by Govindarajan (1980) uses content analysis in a somewhat different context than Day to analyze the use of cash flow and earnings data by US security analysts. Content analysis was applied to the reports of security analysts in the Wall Street Journal over two six-month periods in the mid-1970s and it was found that in a large majority of reports, earnings analysis rather than cash flow analysis best characterised the approach adopted.

It is probably reasonable to conclude from this brief review that more detailed use of accounting information is restricted to professional investors and that funds flow data appears to be used as supplementary data to profit and balance sheet data, perhaps to facilitate predictions of future profitability. The methodologies adopted and the questions addressed by these studies, however, are quite heterogeneous, and the findings by no means appear to be entirely consistent. The finding that cash flow and exit prices are the intuitive concepts to inexperienced users of accounting data is of interest but begs the question of the relevance of naive intuition as a criteria for adopting accounting practices. The various approaches to the analysis of the use of accounting data by investment analysts provide evidence both of use and non-use of funds flow data. Whilst recent research into the appraisal methods of investment analysts indicate a significant use of funds flow data, this research also suggests that analysts are most interested in prediction of short-term accounting earnings and price earnings ratios for the purpose of estimating the 'true' value of a company's

shares. In general, therefore, the empirical evidence appears to indicate the primary importance of accounting earnings both as an input into the financial analysis process and as the object of prediction, with funds flow data playing a significant but secondary role in relation to the prediction of future earnings. The apparent inconsistency of this finding with standard valuation models based on discounted cash flows and with professional pronouncements on the role of accounting in relation to the prediction of future enterprise cash flows will be considered further in the concluding section of this chapter.

b. Statistical Relationships between Earnings and CFFA Data

Studies of the statistical association between accounting earnings data and various measures of cash and funds flow have been carried out by Bowen et al (1986) and Arnold et al (1991) in the US and the UK respectively. Both these studies will be reviewed in some detail here. In addition, findings from some other related studies will be briefly considered in order to emphasise the range of possible approaches applicable to this area.

Bowen et al (1986) analyzed the relationship between a set of earnings, funds and cash flow variables for a sample of 324 US firms over the period 1971-81 in order to obtain evidence on two main issues, firstly the extent to which these measures provide distinctive signals to the capital market and secondly the relative ability of each to predict future cash flows. Their analysis in relation to the former issue was based on the computation of contemporaneous correlations (R^2) between first differences and percentage changes in the following six accounting variables for each

company (ie: 10 observations per company) : NIBEI (net income before extraordinary items), NIDPR (NIBEI plus depreciation and amortization), WCFO (working capital from operations), CFO (cash flow from operations), CFAI (CFO less net investment in property, plant and equipment and other corporations) and CC (change in cash and short-term marketable securities). Their findings based on first differences revealed a mean R^2 of 0.940 for the NIBEI/NIDPR relationship and 0.754 for NIBEI/WCFO compared with 0.223 for NIBEI/CFO and 0.184 for NIBEI/CFAI, suggesting that while the relationship between earnings and funds flow measures was generally highly statistically significant for accrual based definitions of the latter, it was statistically insignificant in a large majority of companies for cash-based definitions. The correlations among the funds flow variables (ie: all variables excluding NIBEI) were statistically insignificant for the majority of companies with the notable exception of CFO/CFAI, where a mean R^2 of 0.722 was reported.

Their analysis in relation to the second issue above, the predictive ability of the various measures in relation to future cash flows, was carried out by means of a comparison of the forecast errors from naive predictions of CFO, CFAI and CC for one and two periods ahead. Thus, in relation to the prediction of CFO, they computed differences between CFO and four predictor variables represented by lagged (one or two year) values of NIBEI, NIDPR, WCFO and CFO for all company-years and computed median forecast errors for each predictor variable, where the latter was defined as the above difference scaled by the value of the predicted variable, CFO. Median forecast errors for CFAI (based on NIBEI, NIDPR, WCFO, CFO and CFAI lagged predictors) and for CC (based on NIBEI, NIDPR, WCFO, CFO,

CFAI and CC lagged predictors) were also computed using the same approach. The findings indicated that WCFO and NIDPR were approximately equally good predictors of CFO for both one and two year forecasts and that both variables were substantially better than NIBEI and CFO itself in relation to the prediction of CFO. Pairwise sign tests confirmed also that this superiority was statistically significant. In relation to the prediction of CFAI and CC, the findings suggested that lagged values of the forecasted variables were superior predictors for both one and two year forecasts ie: a random walk (for one period forecasts), although in relation to the prediction of CFAI, NIBEI appeared to have approximately the same predictive power as CFAI itself and there was no statistically significant difference between the predictive power of these two variables as revealed by the pairwise sign test.

The findings of Bowen et al (1986) therefore provide evidence that the signals provided by measures of enterprise cash flows differ from those of earnings and accrual funds flow measures and failed to support the argument of the FASB (1978) that "information about enterprise earnings based on accrual accounting generally provides a better indication of an enterprise's present and continuing ability to generate favourable cash flows than information limited to the financial aspects of cash receipts and payments" (p.ix). In the light of these findings, and given the expression of similar sentiments by the ASC (1986) and the IASC (1989) to those of the FASB (1978) above, Arnold et al (1991) carried out a similar analysis to Bowen et al (1986) using data on 171 UK companies for the period 1965-84. The main findings from this study will now be briefly considered.

The analysis of Arnold et al (1991) was based on the following set of seven variables: NI (Net Income), WO (working capital from operations), NQ (net quick assets from operations), CO (cash flow from operations), CI (cash flow from operations after investment), CC (change in liquid assets), and CIC (entity cash flows). The main difference from Bowen et al (1986) is the exclusion of their NIDPR variable and the inclusion of the NQ and CIC variables, the inclusion of NQ following from its advocacy by Thomas (1969, 1974), Sorter (1982) and others as an appropriate measure of operating funds flow and the inclusion of CIC following from the work of Lawson (1983, 1985) where it is identified as the cash flow input into the MM firm valuation model.

The findings of the study are in many respects similar to those of Bowen et al (1986) on US data both in relation to contemporaneous correlations and prediction of one and two period future cash flows. In relation to the former area, the mean R^2 (again only first difference findings discussed here) for NI/WO of 0.49 was therefore relatively high in comparison to 0.20 for NI/NQ, 0.15 for NI/CO, 0.14 for NI/CI and NI/CC, and 0.11 for NI/CIC, these findings suggesting more strongly than the US data that the NI signal differs significantly from the funds flow signals, particularly where the latter has a cash definition. As in Bowen et al (1986), the correlations among the funds flow variables (ie: all variables excluding NI) were statistically insignificant for the majority of companies, again with the notable exception of CO/CI, where a mean R^2 of 0.59 was reported, and also for the case of NQ/CO (not considered by Bowen et al) with a mean R^2 of 0.54. In relation to one and two year ahead naive forecasts, WO was again a superior predictor of CO

than lagged values of CO itself, although this finding was only statistically significant for the two year forecast. NQ also gave some indication that it was a superior predictor of CO than lagged values of CO itself (although W0 was superior to NQ for CO prediction). In relation to the prediction of CI, CC and CIC, the findings suggested that lagged values of the forecasted variables were superior predictors for both one and two year forecasts, as in Bowen et al (1986) for their CFAI and CC variables, this superiority over NI proving to be statistically significant in terms of the pairwise sign tests for one year predictions of CI and both one and two year predictions of CIC.

The above analyses provide some empirical basis for believing that cash and funds flow data can provide reasonable substitute predictors of short-run future cash flows to earnings data. An alternative approach to evaluating the predictive ability of earnings, funds and cash flows in relation to future cash flows is to attempt to estimate optimal cash flow forecast models from the time series of earnings, funds and cash flow data generated by companies. Kinnunen (1991) adopted this approach for a sample of Finnish companies over the period 1951-1984 and found that, while the random walk model was not easily outperformed in relation to the prediction of future accounting earnings, this was not the case in relation to the prediction of cash flows where a mean reverting process or exponentially weighted moving average process was superior. This therefore questions the appropriateness of the random walk model for cash flows assumed by Bowen et al (1986) and Arnold et al (1991) but his analysis offers no findings in relation to the predictive ability of earnings and accruals data in relation to future cash flows.

McLeay and Snizek (1992), on the other hand, in an analysis of the UK electronics sector over the period 1976-1990 combining a number of naive prediction models with a cross-sectional regression methodology based on the assumption of intra-industry homogeneity, provide evidence that cash flow from operations and cash flow after investment may better predicted by either "the sum of a moving average in earnings and a random walk in accruals ..(or)..a combination of the trend of cash flow plus the last change in accruals and add-backs" (p 14) than by a random walk. The latter therefore provides preliminary evidence that both cash flow and accrual data are relevant to optimal predictions of future cash flows.

In summary, the limited evidence to date on the predictive ability of earnings, funds flows and cash flows in relation to future cash flows suggests that aggregate earnings data alone may not provide superior information to past cash and funds flow data in relation to the prediction of future cash flows. Findings from the use of naive prediction models failed to support the argument that accounting earnings is a superior short-term predictor of a range of cash flow measures, although evidence from both the UK and the US suggests that the accrual based funds flow measure, working capital from operations, is a superior naive predictor of cash flow from operations. Limited evidence available in relation to estimation of cash flow forecast models suggests that the random walk is inappropriate for cash flow variables and that both accrual and cash flow data are possibly useful for the prediction of future cash flows.

4. Summary and Conclusions

a. Summary and Further Research

This chapter has considered a number of studies which provide arguments or evidence in relation to the scope of CFFA in financial reporting. Section 2 attempted to identify major trends in the generation of CFFA proposals, highlighting the increasing tendency for CFFA to be viewed as a core component of broader financial reporting systems incorporating current value asset valuation and income measurement. Thus, while the benefits of CFFA data indicated by early analyses based on what has broadly been termed the events perspective continue to provide an important rationale for CFFA, there is growing opinion in the CFFA literature that CFFA data alone does not provide a sufficient basis for satisfying the information needs of investors. Scepticism regarding the desirability of accrual based historic cost accounting remains an important motivating factor for this literature, although the preference for incorporation of current value data in these more recent proposals inevitably raises theoretical and practical problems posed by alternative approaches to current value accounting (see for example Whittington 1983 for a review of these issues). Although the studies by Lee (1981), Arnold and Wearing (1988) and Clubb (1988) provide possible approaches to the integration of CFFA and current value accounting, there is a need for further work on the theoretical justification for such an approach to financial reporting. In particular, more work is needed on the relationship between integrated CFFA and current value

reporting systems on the one hand and investor assessments of corporate financial performance and cash flow potential on the other.

Section 3(a) considered some empirical articles concerned with the use of accounting data by investors (or their 'experimental counterparts'), focussing in particular on evidence in relation to the use of funds statement data, while section 3(b) considered some statistical evidence on the prediction of future cash flows using cash flow, funds flow and earnings data. The evidence on the use of accounting data tends to confirm the dominance of accounting earnings as the basis for investor appraisals of fundamental share values and there was mixed evidence on the extent to which funds statement data contributed to this process. It would appear from this evidence that, at most, funds statement data may have been used by investors to facilitate prediction of future earnings and price-earnings ratios, and that the prediction of future cash flows, much emphasised in professional pronouncements as a major objective for financial reporting, is a secondary concern to investors. Although such evidence may appear to be inconsistent with the primacy of cash flow prediction in standard valuation theory, the studies reviewed in section 3(b) provide some support for the utility of cash flow and funds flow data in relation to the prediction of future cash flows, with current accruals providing the most relevant accrual accounting data. While professional pronouncements concerning the utility of accounting earnings in relation to the prediction of future cash flows is not clearly supported by statistical analysis, there is therefore some evidence in relation to the utility of accrual accounting in this respect. Further research both into the methods used by investors to value companies and the usefulness of accounting

data in relation to cash flow prediction is necessary to gain a better understanding of the actual and potential use of accounting data in investor decision-making.

b. Professional Pronouncements on Cash Flow Statements

As noted in the Introduction to this chapter, recent professional reporting standards in the US (FASB 1988) and the UK (ASB 1991) have replaced previous funds statement reporting requirements with a new requirement to produce cash flow statements. To some degree, these new reporting requirements may be regarded as generally moving towards the proposed systems of CFFA reviewed in section 2 of this chapter. In particular, the requirement that firms differentiate between operating, investing and financing flows is consistent with most of the proposals considered and the adoption of a cash definition of funds is consistent with the widely held view that arbitrary accounting allocations should be avoided in CFFA reporting systems. On the other hand, the failure of both standards to require firms to incorporate disaggregated operating cash flow data into the cash flow statement implies that financial statement users must extract disaggregated operating cash flow data from the income statement for those companies not using a direct method approach. It might also be noted that the US standard deviates significantly from the CFFA proposals reviewed in section 2 by classifying interest payments and investment returns as operating cash flows, while the UK standard, again inconsistent with any of the CFFA proposals reviewed above, groups these items, together with dividend payments, in a separate classification, 'returns on investments and the servicing of finance'.

The rationale offered for the new cash flow reporting requirements reflects some of the concerns in the CFFA proposals reviewed in section 2 above, in particular the role of cash flow data in relation to the prediction of future enterprise cash flows, although there is a continued argument that historic cost income data provides important data required for the prediction of future cash flows. This approach reflects the assumption that investors are concerned with the prediction of future cash flows and is, at least partially, consistent with the evidence in section 3(b) that both cash flow data and accrual data are useful for this purpose. Both standards also argue that the assessment of the liquidity position of the firm is facilitated by the preparation of a cash flow statement, a point not greatly emphasised in the CFFA literature reviewed in section 2 but consistent with widely-held views on the role of cash flow data.

In summary, the recent cash flow reporting requirements of the standard setting bodies in the UK and the US are broadly consistent with CFFA proposals in the academic literature, significant differences arising at a more detailed level in relation to the treatment of items such as interest payments. However, and perhaps unsurprisingly given its early stage of development, the recent cash flow standards do not attempt to deal with the link between current value accounting and CFFA which has begun to emerge in the academic literature. As noted above, any future developments in this direction will probably only arise after further refinements in and debate over the proposed systems and after the problematic issue of current value asset valuation has received further attention.

c. The Role of Market Based Accounting Research (MBAR)

The research reviewed above suggests the need for studies of the relationship between share prices and earnings, funds flow and cash flow data for a number of conceptual and practical reasons. This area of research is the main concern of the remainder of this study and it is therefore useful to conclude this chapter with a brief discussion of the extent to which the analyses and evidence considered above provide a justification for studies adopting a MBAR perspective.

A major role for MBAR to emerge from the studies reviewed in this chapter relates to the need for clarification concerning the usefulness of accrual and cash flow data to investors. First, the CFFA proposals considered above provide a conceptual basis for arguing that various types of CFFA data may be relevant for investor decisions, although the non-specific nature of the events perspective in relation to investor information needs and the reliance on forecast data and, more recently, current asset valuation in proposals focussing more explicitly on enterprise cash flow potential raises some doubt over the relevance to investors of the more limited data provided by past and present accounting standards in the CFFA area. Second, studies of the use of financial data by investors and their proxies suggest that the prediction of short-term accounting earnings rather than long-term cash flows is the primary concern of investors, possibly raising doubts concerning the efficiency of capital market responses to accounting information and questioning the extent to which the relative predictive ability of accrual and cash flow data in relation to future cash flows (rather than future

earnings) may be reflected in share prices. For both these reasons, analysis of the relationship between share prices and earnings, funds flow and cash flow data may provide useful additional insights into the relevance of this data to investors and the efficiency and rationality of capital market use of accounting data.

The perspective adopted in the following chapter attempts to locate MBAR within the broader setting of empirical research concerned capital market efficiency and rationality. Thus, Chapter 3 begins by briefly reviewing some well-known definitions of market efficiency and considers some recent empirical research concerned with market efficiency and rationality, mainly at an aggregate stock market level, which only uses past share price and dividend data as the basis for analysis. After considering the possible significance for MBAR of this research, the chapter considers the share price information content of accounting earnings, focussing on studies which have attempted to employ insights from valuation theory. The valuation aspect of these studies is important in the context of the issues considered above in the present chapter as it provides more formal specifications of the argument in professional pronouncements that historic cost income data is important in relation to the prediction of future cash flows. Chapter 3 also considers the findings to date in share price studies of the information content of cash and funds flow data and the information content of this data relative to accounting earnings data. This provides an indication of the extent to which proposals for an increased emphasis on CFFA in financial reporting are supported by evidence indicating a significant relationship between share prices and cash and funds flow data provided under past accounting standards.

An important conclusion of Chapter 3 is that empirical analysis of the share price information content of cash and funds flow data is not sufficiently complete either in the US or in the UK to provide entirely convincing evidence regarding the conventional wisdom that accounting earnings data is more relevant in relation to share valuation than cash or funds flow data. In particular, it is argued that there is a need for future MBAR studies of cash and funds flow data to utilise research designs more consistent with the academic and professional views considered in the present chapter which stress the relationship between CFFA data and the cash flow potential of the firm. Furthermore, given the findings of investor use of accounting data reviewed in the present chapter, there would also appear to be a case for attempting to examine capital market efficiency in relation to cash and funds flow data, an area which has received little attention either in the US or in the UK. It is now necessary to turn to the detailed consideration of the MBAR literature.

CHAPTER 3 -
ACCOUNTING EARNINGS, FUNDS FLOWS AND CASH FLOWS:
THE CAPITAL MARKET PERSPECTIVE

1. Introduction

In an authoritative and wide-ranging review and analysis of market-based research in accounting up to the beginning of the 1980s, Lev and Ohlson (1982) considered the achievements and disappointments of US research in the area and made a number of suggestions for the direction of future research. Among many other issues raised in their analysis, two are of particular significance to the concerns of this study. Firstly, they suggested that the information content of non-earnings financial data had, at the time of their review, been inadequately researched and, more specifically, that "an investigation of the incremental (over earnings) information content of properly defined cash flows ... is clearly called for" [p265]. Secondly, they argued more generally that there was a need for a more explicit use of valuation approaches in market-based accounting research (MBAR).

As already discussed, the first of these issues is of central importance to this chapter and the findings from recent research addressing this issue will therefore be considered in some detail. The second issue concerning the need for valuation approaches in MBAR has only been addressed to a limited degree in the MBAR literature, at least in the direct form of empirical studies focussing on the relationship between share price levels (as opposed to returns) and earnings or cash flow data emphasised by Lev and Ohlson (1982). On the other hand, a more explicit concern with valuation issues has begun to influence the design of MBAR studies utilising the conventional share return approach. Earnings and cash flow oriented MBAR studies, in particular those attempting to utilise insights from

share valuation theory either in a share returns or price framework, are therefore the main focus of this chapter.

The remainder of this chapter is organised as follows. Section 2 provides a brief discussion of recent work by researchers in economics and finance concerned with the informational efficiency of capital markets and the descriptive validity of the dividend capitalisation model. Given that the efficient markets hypothesis (EMH) can be viewed as a maintained hypothesis in much of the MBAR literature and that the dividend capitalisation model of share valuation underlies most studies in the area, this literature has potentially important implications for the interpretation of research findings in MBAR. Section 3 reviews the literature concerned with the information content of accounting earnings, focussing primarily on studies which have developed and implemented valuation-based approaches to the analysis of the relationship between share returns or prices and accounting earnings. Some recent anomalous evidence concerning the efficiency of capital markets in relation to accounting earnings data is also briefly considered. Section 4 reviews the predominantly empirical research concerned with the information content of cash and funds flow data and the relative information content of cash flow and accrual accounting data and considers the potential scope for valuation-based approaches in this area. Section 5 concludes the chapter.

Before proceeding, it is perhaps useful to make a definitional clarification relating to the use of the term 'share prices'. This term is used in a general sense in this chapter (particularly in sections 3 and 4) in relation to studies concerned with the

relationship between accounting data and either share returns or abnormal returns or share price levels etc. In general, therefore, the use of this term is not restricted to discussions of studies based on share price levels, although, as indicated above, such studies are obviously part of this broad research area and are considered at times.

2. Capital Market Efficiency: Theory, Evidence and Implications for Accounting Research

The aim of this section is to review some recent empirical research concerned with the informational efficiency of capital markets and to consider its possible implications for MBAR. First, some basic concepts of informational efficiency concept are discussed. Second, recent empirical evidence on capital market efficiency, primarily based on US stock market data, is discussed and the possible implications of such findings for the descriptive validity of the dividend valuation model are considered. Finally, the possible implications of this research for interpretation of information content studies in accounting are considered.

a. Concepts of Informational Efficiency

It is widely recognized that Fama (1970 1976) and Beaver (1981) have provided important contributions to the development of the concept of informational efficiency in capital markets (Dyckman and Morse 1986, Strong and Walker 1987). It is therefore useful to briefly outline the view of informational efficiency presented in this work. An attempt is then made to compare these views, thereby

more clearly delineating their separate contributions to the notion of capital market efficiency and providing a useful basis for subsequent discussion of empirical research into capital market efficiency and its implication for accounting research.

Fama (1970) provided the fair game definition of market efficiency which states that the expected abnormal return for a period on a given security, where expected returns are conditional on the information set reflected in prices at the beginning of the period, is zero if the market is efficient. In order to provide a more manageable basis for empirical testing, Fama also introduced the concepts of weak-form, semi-strong form and strong-form market efficiency in this paper, where weak-form efficiency assumes share prices to reflect the past history of share prices, semi-strong form efficiency assumes share prices to reflect both the past history of share prices and all publicly available information and strong-form efficiency assumes share prices to reflect all relevant information. As discussed below, Fama's notion of market efficiency is subject to a number of important limitations. One particular problem identified by Leroy (1976) with the fair game definition which led Fama (1976) to re-cast his concept of market efficiency is its apparent tautological nature, ie: the expected value of the deviation from a mean is definitionally zero. The alternative formulation is expressed algebraically as follows:

$$\begin{aligned} f_m(P_{t+1} | \emptyset_t^m) &= f(P_{t+1} | \emptyset_t) \\ \emptyset_t^m &= \emptyset_t \end{aligned}$$

where P_{t+1} is the vector of security at time $t+1$, $\emptyset_t$ is the information available at time t , $\emptyset_t^m$ is the information actually used by the market at time t , $f(P_{t+1} | \emptyset_t)$ is the true joint probability

density function of the vector of security prices at time $t+1$ implied by θ_t , and $f_m(P_{t+1}|\theta_t^m)$ is the joint probability density function of the vector of security prices at time $t+1$ assessed by the market at time t . "In words, these two conditions state that the market is informationally efficient if it behaves as if the actual probability distribution used in setting prices at time t is the true conditional distribution implied by all the information available to the market at time t " (Strong and Walker 1987 pp125-26).

The Beaver (1981) concept of market efficiency was advanced in the context of a discussion of the limitations of the Fama concept. The Beaver definition, incorporating the two dimensions of information system efficiency (referred to as n -efficiency) and signal efficiency (referred to as y -efficiency), is given below:

" y -efficiency

A securities market is efficient with respect to a signal y_t if and only if the configuration of security prices $\{P_{j,t}\}$ is the same as it would be in an otherwise identical economy (ie: with an identical configuration of preferences and endowments) except that every individual receives y_t as well as $y_{1,t}$ [where $y_{1,t}$ refers to the individual's private signal].

n -efficiency

A securities market is efficient with respect to n_t if and only if y -efficiency holds for every signal (y_t) from n_t " (Beaver 1981 p28)

Perhaps the most obvious difference between the Fama and Beaver concepts of market efficiency is the exclusion of the reified concept of the market in the latter definition. The Beaver concept therefore does not require the assumption of 'a joint probability density function for prices as perceived by the market' and thus permits market efficiency to occur where market participants have heterogeneous beliefs and where no conception of the 'market's' joint

probability density function for prices exists. Similarly, within the Beaver analysis, while a 'true' probability density function for prices may exist, it plays no role in the definition of market efficiency which is based on the notion of the individual's future expectations, in particular whether or not a revelation of a particular signal to all individuals would lead to a revision of individual probability beliefs in such a way as to result in an immediate price change.

The previous paragraph highlights a radical shift in the conception of market efficiency. However, as noted in part by Beaver, this shift towards a view of market efficiency consistent with heterogeneous attributes among investors has its limitations. Thus, Beaver acknowledges that his definition of market efficiency would view the market as efficient with respect to an information signal which, if revealed to all, would alter some individuals' subjective probability distributions and portfolio holdings, but not the configuration of security prices. This undesirable property of his concept of information efficiency would also seem to be accompanied by empirical testing problems highlighted by Dyckman and Morse (1986). In particular, the identification of the precise point in time that an information signal becomes generally available to the market is problematic and there is the requirement of an asset pricing model to determine expected security price changes assuming continued private availability of information.

Given that neither concept of information efficiency outlined above is unproblematic at either a theoretical or an empirical level, it is

useful to conclude this discussion with a brief comparative analysis which highlights the advantages and limitations of each approach.

First, the assumption of the Fama concept of a reified market with given expectations concerning future security prices has the advantage of consistency with the theory of valuation of cash flow streams under uncertainty. Thus, Rubinstein (1976) shows that if financial markets are arbitrage free, then the valuation of any risky cash flow stream can be characterised by a risk-adjusted discounting process (see also Ohlson 1990). A potentially more tractable valuation theory consistent with the Fama definition of market efficiency therefore exists, although an apparent limitation associated with both valuation theory and market efficiency concept is that of homogeneity of investor beliefs.

The Beaver concept, while possessing the desirable property of greater realism in relation to the assumptions concerning the nature of investor beliefs, is related to a complex and less developed body of knowledge concerned with security valuation under heterogeneous expectations and information asymmetry. Thus Beaver's concept of market efficiency has been related (Strong and Walker 1987) to the notion of a fully revealing rational expectations equilibrium. To the extent, however, that fully revealing rational expectations equilibrium can be viewed as unstable "because prices are revealing so much information that incentives for the collection of information are removed" [Grossman 1976 p585], it is unclear that this is an appropriate basis for defining a concept of market efficiency. Furthermore, Ball (1992) has commented in relation to what he describes as the information economics approach to market efficiency

(which incorporates the Beaver (1981) analysis) that "one would expect the construct of 'efficiency' to be defined in such a manner as to allow private reward for private investments in information...but the proposed definition does not allow this. All 'real world' markets thus would be judged 'inefficient' with respect to all valuable private information - but only because the information is privately costly to produce, not because of properties of the markets themselves" (Ball 1992 p10). In addition, the Beaver concept focusses solely on strong-form efficiency if publicly available information is interpreted as costless information, Beaver (1981 p32) arguing that semi-strong market efficiency holds trivially in the absence of information costs. Such a view is not held by all EMH researchers, as will become apparent in the review of empirical research below.

The general implication to be drawn from the preceding discussion is that the Fama concept of informational efficiency suffers from a reliance on an approach to security valuation which does not adequately deal with either heterogeneous expectations among investors or the role of information in the valuation process, and that the Beaver concept suffers from the lack of an operational valuation theory to implement its more realistic assumptions concerning the nature of investor expectations. As will become apparent in the following section, empirical studies, based in general on the Fama concept of informational efficiency, make assumptions regarding the nature of the valuation process such that it is difficult to interpret some findings as rejecting the EMH or rejecting assumptions in relation to other aspects of the valuation process (ie: the so-called joint hypothesis problem). Empirical

findings based directly on the Beaver concept are few, probably reflecting the lack of correspondence between this concept of information efficiency and a readily operationalised, valuation model based on heterogeneous beliefs and private information. An important contribution of Beaver's analysis, however, is the question mark it raises over the simplified valuation models underlying empirical tests of the EMH and hence the problematic nature of interpreting the findings of these studies.

b. Empirical Studies of Market Efficiency

The aim of this sub-section is to review empirical analyses of the EMH which may be interpreted as providing evidence relevant to the interpretation of market-based accounting research. In general, as noted above, these studies are best characterised as in the Fama tradition of market efficiency and therefore, for reasons already considered, are subject to considerable ambiguity and methodological dispute. The research considered here is nevertheless of potential relevance to MBAR to the extent that it provides more general evidence of the process whereby information is impounded in share prices.

Two closely related and increasingly voluminous areas of empirical research in market efficiency are the main focus of attention. The first area is the share price volatility literature which began with early studies by Shiller (1981) and Leroy and Porter (1981) and which has generated considerable subsequent findings. This research has mainly been carried out on aggregate market indices, although the model has been adapted for cross-sectional regression analysis using individual firm data (Easton 1985). The second area has been

concerned with share price predictability and to the extent that it has quite consistently suggested negative serial correlation in returns over long time horizons, it may be regarded as providing evidence which might be viewed as related to findings of excess volatility. This second area of research can itself be sub-divided into two groups, one focussing on the ability of winner/loser portfolios to earn abnormal returns, as exemplified by De Bondt and Thaler (1985), and the other focussing on serial correlation tests using mainly aggregated market indices (Fama and French 1988, Poterba and Summers 1988).

The basic idea underlying the share price volatility literature is the variance bound test. Based on the assumption of the simple dividend capitalisation model with a constant discount rate, Shiller (1981a) and Leroy and Porter (1981) independently derived the result that:

$$\text{var}(p_t^*) = \text{var}(u_t) + \text{var}(p_t)$$

$$\text{var}(p_t) \leq \text{var}(p_t^*)$$

where p_t^* is the discounted value at time t of the *ex post* realised dividends, p_t is the actual price of the security at time t and u_t is the market's forecast error in relation to the 'perfect foresight' value of the security (ie: $u_t = p_t^* - p_t$). The logic of this variance bound result is that if the price at time t , p_t , is the best unbiased estimator of the 'perfect foresight' value, p_t^* , then the forecast error, u_t , is uncorrelated with the forecast, p_t , and therefore $\text{cov}(u_t, p_t) = 0$. Although, both studies derived further tests of stock market rationality - for example, Shiller (1981a) derives variance bounds tests for the variance of share price innovations (ie: the change in share price expectations) and changes

in share price changes – subsequent studies have focussed on share price volatility and this is therefore the focus of attention in this review.

Given acceptance of what has been termed the Fama concept of market efficiency above and the specific valuation and statistical assumptions of their models, there can be little theoretical dispute with the Shiller and Leroy and Porter variance bound result for stock market rationality as it follows directly from the properties of optimal forecasts. Potential problems arise, however, when the result is applied empirically as a test of market rationality or efficiency, as is illustrated by subsequent volatility and related studies. Thus, the findings of Shiller from estimation of the standard deviation of p_t and p_t^* , where p_t is defined empirically as the detrended actual share price at time t and p_t^* is the present value of detrended real dividends subsequent to time t (a terminal value equal to the average value of the detrended actual share price, p_t , over the sample period is used by Shiller and other research reviewed below), based on one sample of over 100 years of data from the Standard and Poor's Stock Price and Dividend series and a second sample of 50 years data for a modified (fixed portfolio) of 30 Dow Industrial companies, has been the subject of considerable debate in the research literature. In particular, Shiller's findings of gross violations of the variance bounds for both data sets when sample standard deviations were calculated from the detrended time series (for the first sample $\sigma(p) = 50.12$ and $\sigma(p^*) = 8.968$, for the second sample $\sigma(p) = 355.9$ and $\sigma(p^*) = 26.80$, where σ refers to the sample standard deviation) has been criticised for the underlying assumption of a stationary process generating detrended real dividends (Kleidon

1986, Marsh and Merton 1986) and for small sample bias (Flavin 1983, Mankiw et al 1985). Furthermore, Easton (1985), using a cross-sectional regression methodology based on individual firm data and assuming intertemporal variation in firm-specific discount rates, presents evidence which he argues "suggests that price is the present value of the future stream of dividends" (Easton 1985 p76). These criticisms of the empirical application of the variance bound test for share price volatility, together with alternative findings, will now be considered before moving to some tentative conclusions regarding the significance of the share price volatility literature for the issue of market efficiency.

Marsh and Merton (1986) provide an interesting challenge to the variance bound test of stock market rationality. Specifically, they demonstrate that, by assuming a dividend process consistent with early behavioural analysis of corporate dividend policy (Lintner 1956), it is possible to reverse the variance bound inequality, when variance refers to the sample variance estimated over a given sample period T . The assumed dividend policy is based on a long-term target pay-out ratio from permanent earnings, where dividend payout is adjusted gradually for unexpected changes in permanent earnings in any given year over a subsequent N year period. This assumption generates a non-stationary dividend process where detrended dividends can be expressed as a moving average of current and past detrended share prices, as detrended price is equal to detrended permanent earnings multiplied by a constant scale factor (equal to the reciprocal of the cost of capital) under stock market rationality. It follows from this that the *ex post* price, p_t^* , at any time t is a weighted average of past and future share prices under the assumption

of stock market rationality and hence it follows quite intuitively that Marsh and Merton were able to prove that for this class of smoothed dividend policies, the sample variance of p_t is greater than or equal to the sample variance of p_t^* with almost complete certainty as $T/N \rightarrow \infty$ under rational stock market valuation.

Further support for the idea that an apparent violation of the variance bound test may be consistent with stock market rationality is provided in a detailed analysis by Kleidon (1986). In brief, Kleidon argues that the estimation of $\text{var}(p_t^*)$ should be conditional on information available at or before time t in order for the correct execution of the Shiller variance bound test and that apparent violations of the variance bound in Shiller (1981a 1981b) were the result of attempting to estimate an unconditional $\text{var}(p_t^*)$ for a non-stationary dividend process. Kleidon notes that the unconditional variances of both p_t^* and p_t do not exist for a random walk process in dividends and in a simulation based on the assumption that dividends follow a geometric random walk process in a rational stock market setting with 100 'years' of data, he shows that the mean (from 1,000 replications) of the ratio of the sample variance of p_t to the sample variance of p_t^* exceeds 1 for a range of reasonable parameter values. Furthermore, in addition to the above demonstration that the violation of the variance bound test is to be expected under a geometric random walk process when sample variances are used, he also shows that conditional variances of p_t and p_t^* based on 54 years of data from the Standard and Poor's series do not, in general, violate the variance bound test (Table 3 p987) and that these conditional variances were in general of a similar magnitude to mean and median conditional variances generated by a simulation analysis based on 54

years of data and a geometric random walk process for parameter values corresponding to the Standard and Poor's series.

Marsh and Merton (1986) and Kleidon (1986) together represent an impressive defence of stock market rationality in response to the serious challenge posed by early variance bounds tests. While these papers focussed on the implications on non-stationarity for the use of sample variances in the variance bound test, others (Flavin 1983, Mankiw et al 1985) have considered the impact of small sample bias in the use of sample variances as estimators for the (unconditional) population variances of p_t and p_t^* for stationary dividend processes. Mankiw et al illustrate this problem by plotting the ratio of the expected value of $\sigma^2(p^*) - \sigma^2(p)$ (where σ^2 refers to sample variances) to the expected value of $\sigma^2(p)$ for a stationary first order autoregressive dividend process and show that this ratio is negative for small sample sizes or at least downwardly biased for plausible sample sizes. Thus, even under the assumption of a stationary dividend process, it may be inappropriate to interpret apparent violations of the variance bound test based on the use of sample variances as evidence against the hypothesis of stock market rationality or efficiency.

Finally, the study by Easton (1985) referred to above provides evidence that the coefficient from a cross-sectional regression of the estimated 'perfect foresight price' on actual price for 349 firms in 1962 was not statistically significantly different from one, its theoretical value in the case of stock market rationality. Easton used dividend realisations over the period 1962-1980 and the terminal share price in 1980, together with intertemporally varying discount

rates based on firm-specific CAPM betas, the term structure of interest rates and the expected market risk premium as estimated from data available in 1962, to determine estimates of the 'perfect foresight price' for each firm in 1962. Although, as noted earlier, he interprets the failure to reject the hypothesis that the coefficient is equal to one as supportive of the joint hypothesis of stock market rationality and the assumed risk-adjusted dividend valuation model, his findings were not entirely consistent with this model. Thus, while the estimated regression coefficient of 0.95 and associated R^2 of 60% appears consistent with the above joint hypothesis, the finding of a statistically significant positive intercept term in this regression is not consistent with this hypothesis.

Although the brief review of some of the variance bound and related literature above suggests that the variance bounds test of Shiller and Leroy and Porter be interpreted with caution, it has been argued by Shiller (1988) that the magnitude of the violation exceeds that which might be expected under the non-stationary processes assumed by Marsh and Merton (1986) and Kleidon (1986). Thus Shiller states that "even in a random walk case for log dividends the possibility that $\sigma(p)/\sigma(p^*)$ is greater than 5 in a sample of 100 observations with a discount rate of .065 (or very nearly the .0636 used in the computation of p^* in my [Shiller's 1981a] paper) is only 0.148" [Shiller 1986 p502]. In addition, the paper by Mankiw et al (1985) referred to above provides an alternative test of stock market rationality which is unbiased in small sample and which does not depend on the assumption of stationarity. In effect, Mankiw et al replace the variance bound inequality with two inequalities whose

small sample counterparts are unbiased. One of these inequalities states that the expected value (conditional on information available at some finite time prior to period t) of the squared deviation of a naive forecast of share price, p_t^0 , from the 'perfect foresight' share price, p_t^* , must be greater than or equal to the expected value of the squared deviation of the actual share price at time t , p_t , from p_t^* under the assumption of stock market rationality. They show, for the same 100 years of Standard and Poor's data used by Shiller, that this inequality is clearly violated for a very naive forecast model that simply extrapolates current dividends indefinitely into the future, this result suggesting rather surprisingly that "the naive forecast price p^0 is a better forecast of the perfect forecast price p^* than is the market price p " [p684].

In general, interpretation of the findings from the share volatility studies is difficult due to the joint hypothesis problem associated with all analyses based on simplified share valuation models. While inappropriate assumptions, such as the stationarity of dividend processes or the use of a simple constant discount rate valuation model to estimate *ex post* share prices, may in part explain evidence which appears to question the hypothesis of stock market rationality or efficiency, the findings of apparent excess volatility should at least be acknowledged as a potential source of concern for MBAR. This theme, the relevance of which for the UK is emphasised in a study by Bulkley and Tonks (1989) which confirms the original Shiller (1981) finding of excess volatility for UK stock market data over the period 1918–1985 and which rejects the null hypothesis of non-stationarity for the log of real detrended stock prices over this period in favour of a first-order autoregressive process, is

developed after a consideration of the second branch of EMH research referred to earlier concerned directly with share price predictability and the so-called 'over-reaction effect'.

A concern with direct tests of the predictability of stock market returns was, as summarised in Fama (1970), the focus of early tests of the EMH. The findings of this research failed to uncover either significant serial correlation in the time series of stock returns or filter rules which provided abnormal returns beyond transaction costs. More recently, however, research has emerged which questions the power of the serial correlation tests and filter rule approaches employed in these earlier studies to reject the hypothesis of (weak-form) market efficiency and which has provided evidence consistent with weak-form inefficiency by means of alternative testing procedures.

Important papers to question the power of earlier serial correlation tests to reject weak-form inefficiency include Summers (1986), Fama and French (1988) and Poterba and Summers (1988). These papers are related as they employ the same simple stochastic process for monthly share prices to question the efficacy of earlier serial correlation tests. This model is represented mathematically as follows:

$$\ln(p_t) = q_t + z_t \quad (1)$$

$$q_t = q_{t-1} + \mu + n_t \quad (2)$$

$$z_t = \phi z_{t-1} + \epsilon_t \quad (3)$$

where the natural logarithm of a share price p_t at time t is made up of a random walk term, q_t , and a stationary AR1 component, z_t ($\phi < 1$), and where n_t and ϵ_t are disturbance terms and μ is a drift term.

Market inefficiency is introduced into this model through the stationary term, z_t , which permits some predictability of future share prices from past share prices.

Summers (1986), in the absence of such inefficiency, assumes a constant expected rate of return, r , and therefore that $x_t = R_t - r$ is a serially uncorrelated white noise term, where R_t represents the realised return for period t . For the case of the model incorporating market inefficiency given by equations 1, 2, and 3 above, he derives the following approximate ARMA (1,1) expression for $R_t - r$:

$$(R_t - r) = \phi(R_{t-1} - r) + x_t + \theta x_{t-1} + \epsilon_t - \epsilon_{t-1} \quad (4)$$

and shows that $\text{var}(R_t - r)$ is a weighted average of $\text{var}(z_t)$ and $\text{var}(x_t)$ and that the K -th order autocorrelation coefficient for $(R_t - r)$ is strictly negative (ie: negative serial correlation) and declines in absolute value as K increases. For illustrative purposes, he then selects a value of 0.08 for $\text{var}(z_t)$ and a value of 0.98 for ϕ , corresponding to a half-life of about 3 years for the elimination of any market error, z_t . On the assumption that $\text{var}(R_t - r)$ is equal to 0.004 on a monthly basis (Summers points out that this is consistent with an observed historical annual standard deviation of about 20%) and given $\text{var}(z_t)$ of 0.08, this implies $\text{var}(x_t)$ of 0.001. The first-order autocorrelation coefficient for this case is shown to be only -0.008 which is considerably less in absolute terms than the standard error of the coefficient for 600 months (50 years) of data. Hence, for this case where 75% of $\text{var}(R_t - r)$ is due to valuation error, z_t , rather than genuine information, x_t , there would be almost no chance of rejecting the null hypothesis of market efficiency. More

generally, Summers' analysis indicates that the power of conventional serial correlation tests to reject the hypothesis of market efficiency using monthly data is low for values of ρ between 0.9 and 1.0, even when up to 100% of $\text{var}(R_t - r)$ is due to valuation error, and for values of ρ below 0.9 when a greater percentage of $\text{var}(R_t - r)$ is explained by genuine information, x_t .

Fama and French (1988) develop the apparent implication of Summer's analysis that serial correlation in share returns may be better detected by means of tests based on longer returns horizons. From equations (1), (2) and (3) above, they derive an expression for the slope coefficient from regressing the continuously compounded rate of return over the period t to $t+T$, denoted $R_{t,t+T}$, on the corresponding lagged return $R_{t-T,t}$. They denote this coefficient $\beta(T)$ and show, with minor assumptions, that $\beta(T)$ may be expressed as minus (ie: negative serial correlation) the ratio of the variance of $E_t(z_{t+T}) - z_t$ to the variance of $R_{t,t+T}$, where E_t denotes expectation at time t . In words, therefore, this result highlights that " $\beta(T)$ measures the proportion of the variance of T -period return explained by (or predictable from) the mean version of a slowly decaying price component z_t " (p251). Fama and French show that $\beta(T)$ lies between -0.5 (for long horizons and where there is no random walk component to prices) and zero (where there is no stationary component to prices) and hypothesise that "if stock prices have both random-walk and slowly decaying stationary components, the slopes in regressions of $R_{t,t+T}$ on $R_{t-T,t}$ might form a U-shape pattern, starting around 0.0 for short horizons, becoming more negative as T increases, and then moving back towards 0.0 as the white noise variance begins to dominate at longer horizons" (p251).

The analysis of Summers (1986) and Fama and French (1988) summarized above demonstrates how short-term serial correlation tests may be unlikely to uncover autocorrelations significantly different from zero when there is mean reversion over longer return horizons. Fama and French's empirical analysis based on monthly data for all NYSE stocks over the period 1926-85 broadly supported the U-shaped pattern for $\beta(T)$ outlined above, thus providing evidence in support of negative serial correlation. However, when they applied their analysis to the 82 individual stocks who survived over the full sample period, the average for $\beta(T)$ over returns horizons of between 2 and 4 years showed only weak, statistically insignificant negative serial correlation. They thus concluded with some confidence that "the individual stock evidence ..[suggests].. that firm-specific components of long-horizon stock returns have no autocorrelation" (p265).

The final study concerned with statistical tests of the predictability of stock returns to be considered here is that of Poterba and Summers (1987). This study first considered the power of regression analyses (such as Fama and French 1988 discussed above) and related variance ratio tests (not to be confused with variance bounds tests, see Poterba and Summers 1987 pp29-31 for a brief description of variance ratio tests) to reject the null hypothesis of market efficiency given the model of market inefficiency represented by equations (1), (2) and (3). They concluded that even with monthly data for a 60-year period, the power of these tests to reject the null hypothesis of efficiency was generally low (for plausible parameter values, the probability of a Type II error was typically of the order of 90%, see Table 1 p33) and that in general the variance

ratio test had greater power than the Fama and French (1988) regression test. Their empirical analysis therefore employed variance ratio tests to test for serial correlation in long horizon returns on the same NYSE data set as Fama and French (1988) and on 17 stock markets outside the US, including the UK.

The empirical results from the NYSE data confirmed Fama and French's findings of significant long-horizon serial correlation, a result that was in general replicated over the other stock markets considered. They also compared these results with variance ratio tests on the 82 individual survivor stocks on the NYSE during the period 1926-85. Consistent with Fama and French, their findings for individual stocks were much weaker, though statistically significant, than for the aggregate market when returns were defined either as the excess over the risk-free rate or the value weighted NYSE return. However, when returns were defined as residuals from market-model equations estimated for each firm assuming a constant beta over the sample period, there was no statistically significant evidence of serial correlation.

The second type of empirical research to directly address the issue of predictability of stock returns has focussed on the ability of trading rules to generate statistically significant abnormal returns over various time horizons. De Bondt and Thaler (1985 1987) draw on findings from experimental psychology to argue that investors may 'over-react' to dramatic and unexpected news and hence that there may be a market over-reaction either to 'extremely good' or 'extremely bad' company news which will then subsequently be reversed. They therefore argue that "two hypotheses are suggested: (1) Extreme

movements in stock prices will be followed by subsequent price movements in the opposite direction (2) the more extreme the initial price movement, the greater will be the subsequent adjustment. Both hypotheses imply a violation of weak-form market efficiency" (De Bondt and Thaler 1985 p795). Using market-adjusted excess returns and monthly share returns data, they formed portfolios at three-yearly (36 month) intervals at 16 dates starting in December 1932 through to December 1977 based on cumulative excess returns in the previous 36 months with the aim of testing for a difference in cumulative excessive returns over the subsequent 36 month period between loser firms (those allocated to the bottom 35 or 50 stock or bottom decile portfolios) and winner firms (those allocated to the top 35 or 50 stock or top decile portfolios). Their findings were consistent with the overreaction hypothesis suggesting that "loser portfolios of 35 stocks outperform the market by, on average, 19.6%, thirty-six months after portfolio formation" (p799) and "winner stocks ... earn about 5.0% less than the market" (p799) over the period. The t-statistic for the difference in return of was statistically significant at more than the 2.5% level. An obvious feature of their findings is asymmetry in relation to the estimated size of winner and loser effects. In addition, they found that most of the excess returns were realised in the month of January and in the last two years of the test period. They argued that the former finding was consistent with the view that the 'January effect' is a 'losing firm' effect, although the apparently sizeable gains for loser portfolios several Januaries after portfolio formation ,and therefore after improved share return performance, could not easily be explained. Finally, further tests based on reducing the portfolio formation period to one and two years (rather than 3 years) reduced

the subsequent gains (losses) to loser (winner) portfolio consistent, they argue, with the prediction of the over-reaction hypothesis that for "stocks that go through more (or less) extreme return experiences during the formation period, the subsequent price reversals will be more (or less) pronounced" (p80).

The findings of De Bondt and Thaler (1985 1987) have been the subject of considerable debate in the literature. Chan (1988), using a similar sample to De Bondt and Thaler, argues that most of the apparent abnormal positive (negative) returns of loser (winner) stocks after the portfolio formation period in the De Bondt and Thaler studies can be explained by increases (decreases) in the systematic risk of loser (winner) stocks from the portfolio formation period. Chan's findings, based on an empirical estimation of the CAPM in the pre- and post- portfolio formation period, suggest that only small abnormal returns can be gained from the strategy of taking long positions in loser stocks and short positions in winner stocks and that "controlling for transaction costs, that is probably not economically significant" (p153). An interesting feature of Chan's findings is that, although the average risk (beta) of the loser portfolios over the sample period during post-formation periods is slightly higher than the average risk (beta) of the winner portfolios, it is not nearly sufficient alone to explain the difference in average returns. His finding of insignificant abnormal returns for the contrarian strategy is therefore based on a positive correlation between the beta of the arbitrage (ie: contrarian) portfolio and the excess return on the market portfolio, such that loser firm betas are high relative to winner firm betas when the expected market premium is high. De Bondt and Thaler (1987) note

that this aspect of Chan's findings suggests the need for cautious interpretation, arguing that "it seems odd to say that a portfolio with a beta of 1.602 in up markets and .591 in down markets (the up and down market betas of the loser portfolios in their sample) is riskier than the one with up and down betas of .854 and 1.439 (the up and down betas of the winner portfolio in their sample)" (p569). Thus, while the use of time-varying betas between pre- and post-formation periods may appear to eliminate the benefits of the contrarian strategy, De Bondt and Thaler (1987) raise an interesting question over the validity of this methodology as a means of controlling for risk if the systematic risk of the contrarian portfolio is positively related to the market risk premium.

Zarowin (1990), using the same data-set as De Bondt and Thaler but using quintiles (rather than deciles) to form winner and loser portfolios, finds that the use of Chan's procedure for controlling for risk does not eliminate the excess returns to the arbitrage portfolios. However, after matching winner and loser firms on the basis of size (market value at portfolio formation date), he is no longer able to detect a statistically significant positive return for arbitrage portfolios for four out of the five categories and only finds significant abnormal returns (as measured by the Jensen alpha estimate) for the firms in the smallest category. He concludes that his research shows "that losers' superior performance over winners during the three year test period is due, not to investor over-reaction, but to size discrepancies between winners and losers since losers tend to be smaller than winners" (p124).

In the UK, Power et al (1991) have presented empirical evidence consistent with an over-reaction effect for winner and loser stocks using a similar methodology to De Bondt and Thaler (1985 1987) and a sample of 30 winner and 30 loser stocks based on cumulative share returns generated in the 10 years up to 1982. The performance of the winner and loser portfolios in the subsequent 5 years to 1987 were then analyzed by computing average cumulative returns for both portfolios over the full 15 year period up to 1987 and by calculating cumulative abnormal returns for the post portfolio formation period, 1982-87. Their graphical analysis of the cumulative average returns clearly demonstrates a convergence of returns on the two portfolios by 1987, with most of this convergence arising from the improved performance of loser stocks as opposed to deteriorating performance from winner stocks. This picture is confirmed by the time series of cumulative abnormal returns over the period 1982-87 which shows increasingly positive abnormal returns for the loser portfolio and increasingly (but a lower rate) negative abnormal returns for the winner portfolio. While controlling for changes in systematic risk during the period 1982-87 reduced the cumulative abnormal returns over the period for the loser portfolio from a dramatic 86% to a more modest 20%, they nevertheless state that "a trading strategy based upon investing in the shares of the 'loser' portfolio and selling short the 'winner' shares would have generated a cumulative return of over 25% in excess of the market return for the five-year period" (p165).

The trading rule studies considered above focus on stocks which have experienced extreme share return results in comparison to the market as a whole. It is important to emphasise that whether these

findings indicate weak-form market inefficiency in relation to market pricing of these extreme performing stocks or some other effect such as the risk change or size effects considered above (see also Ball and Kothari (1989) for further evidence that non-stationary expected returns associated with risk changes explains the winner-loser overreaction effect), there is little evidence to suggest that these findings apply to less extreme 'winner' and 'loser' stocks. Thus, Beaver and Landsman (1981), in an analysis of monthly US share returns data covering the period 1926-1978 where all stocks with the required data in each year were classified as 'winner' or 'loser' stocks on the basis of the sign of their cumulative abnormal returns in a 20 month period prior to the formation month (August), concluded that cumulative abnormal returns for both 'winner' and 'loser' portfolios in the post-formation period were "essentially zero, when averaged over the 46 year period" (p238). Furthermore, while their findings suggested that in some years cumulative abnormal returns for 'winner' and 'loser' portfolios were significantly different from zero in the 20 months following portfolio formation, they offer no evidence that reversals in performance, of the type suggested by the studies of extreme performing stocks considered above, account for most of these cases.

c. Summary and Implications for Accounting Research

The previous review of a major empirical literature concerned with the efficiency of US capital markets and the descriptive validity of the dividend capitalisation model has a number of potential implications for market-based research in accounting in the US and possibly elsewhere. Given their equivocal nature, the interpretation

placed on the findings will inevitably influence the implications drawn for accounting research. The aim here is to attempt to outline a number of possible implications related to evidence and interpretations presented in the literature previously reviewed. It is obviously quite beyond the scope of this chapter to attempt an overall evaluation of this complex and evolving research area. Furthermore, the possible implications outlined below no doubt do not exhaust the range of arguments that might be presented.

The share price volatility literature is concerned with testing the joint hypothesis of market efficiency and the multiperiod, constant discount rate dividend capitalisation model. The main significance of this hypothesis for accounting research is possibly that affirmative evidence might be interpreted as supportive of attempts to model the contemporaneous relationship between accounting data and share prices making explicit use of the predictive power of accounting data in relation to future dividend flows. Negative evidence, on the other hand, as presented by Shiller (1981), Leroy and Porter (1981) and Mankiw et al (1986), might be interpreted either as casting doubt on the likely power of such approaches to the evaluation of accounting data due to the noise in contemporaneous share price data or as implying possible bias due to share price overreaction to accounting data followed by subsequent share price reversals. Although these studies relate to aggregate market movements as opposed to individual company share prices, both of the views on market efficiency summarised above would, however, appear to invite attempts to utilise insights from valuation theory in the analysis of the information content of accounting data, of course

with somewhat different expectations regarding the likely success of such an approach.

As outlined earlier, the evidence in relation to stock market volatility is mixed and has been subject to considerable methodological debate. If it is assumed that this literature indicates some degree of inefficiency at the level of aggregate market indices, there remains some question over the importance of such a finding to information content studies in accounting concerned with firm-level data. In particular, if excess volatility is due to a 'fads model' operating at the level of the market, such as represented by equations 1, 2 and 3 above (potential support for such an interpretation is provided by West (1988) who argues that analyses such as Kleidon (1986) which reject excess volatility have low power against this alternative model of market inefficiency), it is possible that the use of market model residuals based on *ex post* market returns might eliminate the effect of mis-pricing from individual share returns.

The issue of the relationship between findings consistent with market inefficiency in relation to aggregate indices and the behaviour of individual securities, as noted earlier, has been considered in the serial correlation studies undertaken by French and Fama (1988) and Poterba and Summers (1988). The findings of both studies that negative autocorrelation findings are much weaker at the individual security level, and are eliminated entirely in terms of statistical significance for market model residuals in the latter study, provides some support for the argument that information content studies in accounting focussing on the contemporaneous

relationship between accounting data and abnormal share returns may be insulated against the effects of this possible form of market inefficiency. As Poterba and Summers put it: "Arbitrageurs should be better at trading in individual securities to correct mispricing than at taking positions in the entire market to offset persistent misvaluation" (p43). Such an interpretation would also appear to be broadly consistent the findings of Easton (1985) reviewed above. On the other hand, as indicated in the first part of the Poterba and Summers study, the power of the variance ratio test for serial correlation employed in their study and the regression test in Fama and French (1988) are low against the alternative of long return horizon negative serial correlation. These findings therefore cannot rule out the possibility of significant firm-specific stationary components in share prices.

The issue of predictability of abnormal equity returns ie: share returns after some form of adjustment for general market movements, has been considered in a number of papers focussing on 'trading rule methodologies' involving the identification of 'winner' and 'loser' portfolios. The previous review of these studies demonstrated once again the difficulty of interpreting such research. If it is assumed that the work of De Bondt and Thaler (1985 1987) indicates some degree of firm-specific mean reversion in security prices, it also seems reasonable to conclude from the study by Beaver and Landsman (1981) that such an effect is not likely to be of great significance in explaining abnormal residuals for many companies. From an information content study perspective, this work can therefore at most be seen as indicating the likely impact of market induced noise on the abnormal returns of a limited number of companies at any

particular point in time. However, as pointed out by Summers (1986) in relation to studies of overall market valuation, while "the huge literature on market efficiency ... [indicates] ... the supreme difficulty of earning abnormal returns making use only of publicly available information .. [there is a need for] ... caution in treating stock prices or their changes as rational reflections of fundamental values. This point is important for both corporate financial policy and for event study research" (p600). The discovery of trading strategies which generate statistically significant abnormal returns therefore possibly represents a more challenging research objective than is required to question the role of share prices as a rational benchmark for assessing the usefulness of accounting data for investors.

The main conclusion in relation to MBAR to be drawn from the preceding review and analysis of some recent literature on capital market efficiency is the disputed nature of the empirical evidence and the low power of most tests in relation to the alternative hypothesis of long return horizon serial correlation resulting from market inefficiency. It would seem to follow from this that information content studies in accounting should utilise methodologies both which draw on the notion of capital market efficiency and which provide further evidence as to its descriptive validity. The increasing use of valuation perspectives in accounting information content studies examined in some detail in the following section of this chapter, together with tests of semi-strong market efficiency in relation to accounting data, would appear to be consistent with this argument. However, as will become apparent in the next section, the problem of distinguishing between empirical

findings affected by limitations in the assumed valuation models and/or statistical estimation error on the one hand or capital market inefficiency on the other hand is equally difficult for the case of MBAR as for the studies reviewed in this section. Indeed, as emphasised by Beaver's contribution to the concept of market efficiency, flaws in assumed valuation models may be such as to undermine the utility of the 'Fama concept' of market efficiency and therefore render any interpretation of empirical findings extremely difficult. Even if such fundamental issues regarding the nature of asset valuation under uncertainty are ignored, issues such as distinguishing between findings due to market inefficiency and other effects such as non-stationary expected returns resulting from risk changes raise difficult problems.

3. Accounting Earnings and Share Prices

This section is organised as follows. First, some theoretical developments concerned with the relationship between earnings and share prices based on the assumption of homogeneous expectations and capital market informational efficiency are reviewed. Second, empirical studies concerned with the contemporaneous relationship between share prices and accounting earnings, in particular those attempting to incorporate design insights from valuation theory, are reviewed. Finally, empirical studies concerned with the (possible) lagged relationship between accounting earnings and share prices in the context of a (possibly) informationally inefficient capital market are briefly considered within a broader discussion of the current state of market-based research into accounting earnings.

a. Accounting Earnings and Share Prices: Theoretical Developments

In recent years, theoretical analysis of the relationship between accounting earnings and share prices in an efficient market setting has followed two main directions. One of these directions represents a development or earlier work by Beaver and Demski (1979), Ohlson (1979) and Garman and Ohlson (1980) concerned with the identification of an endogenous concept of earnings within an informational perspective on security valuation. This ambitious line of inquiry has been most notably developed by Ohlson (1983 1989a 1989b 1990), and in particular Ohlson (1989b). The other direction for theoretical work on the relationship between accounting earnings and share prices has taken an exogenous view of the role of accounting earnings in security valuation (ie: it has assumed both that past accounting earnings are relevant to the prediction of future accounting earnings and that security valuation may be characterised in terms of earnings capitalisation) and has elaborated the relationship between accounting earnings and share prices within such a setting making use of results from the economic forecasting literature (Flavin 1981). Each of these directions will be considered before we turn to an analysis of the empirical findings concerning the information content of accounting earnings.

Ohlson (1990) provides a synthesis of results in studies by Ohlson (1979 1983 1989a), Garman and Ohlson (1980), Miller and Rock (1985) and Beaver, Lambert and Morse (1981) using the multi-period dividend capitalisation model of Rubinstein (1976) which states:

$$P(z_t) = \sum_{\tau=t+1}^{\infty} R_F(\tau; z_t)^{-1} \{e(d_{\tau}|z_t) + \text{cov}(d_{\tau}, Q_{\tau}|z_t)\} \quad (5)$$

where $P(z_t)$ denotes share price at time t based on information z_t , $R_f(\tau; z_t)$ denotes 1 plus the risk-free rate over the interval $\tau-t$, d_τ denotes dividends at time τ , $e(\cdot|z_t)$ and $\text{cov}(\cdot|z_t)$ are the expectation and covariance operators conditional on z_t respectively and Q_τ denotes a random variable at time τ which is always greater than zero with expected value of one (given the state preference framework underlying the above valuation expression, this may be interpreted as a state consumption price normalised by the uncertainty of the state and the discount factor, see Rubinstein 1976, Ohlson 1990). This synthesis summarises a number of important results, three of which are now outlined.

Firstly, if z_t is characterised as a $n \times 1$ vector, denoted $\underline{z}_t$, of random variables, one of which is the dividend at time t , and if the 'information dynamics' is characterised by $\underline{z}_{t+1} = [\underline{\theta} + \underline{\epsilon}_{t+1}] \underline{z}_t$, where $\underline{\theta}$ is a $n \times n$ matrix of non-stochastic intertemporal constants, where $e[\underline{\epsilon}_{t+1} | z_t] = \underline{0}$ and where the covariance between any component of the $n \times n$ matrix $\underline{\epsilon}_{t+\tau}$ and $-\underline{Q}_{t+\tau}$ conditional on $\underline{z}_t$ is an intertemporal constant σ_{1j} , $i, j = 1, 2 \dots n$, it can be shown that $P(z_t) = \underline{B} \underline{z}_t$ where $\underline{B}$ is a $1 \times n$ vector (ie: $P(z_t)$ is a linear function of the variables which forecast dividends). Secondly, while for the two special cases where the information dynamics is given by (i) $d_{t+1} = (\underline{\theta} + \underline{\epsilon}_{t+1}) d_t$ (ie: dividends are sufficient to predict future dividends at all future dates) and (ii) $x_{t+1} = (\underline{\theta}_1 + \underline{\epsilon}_{1,t+1}) x_t$ and $d_{t+1} = (\underline{\theta}_2 + \underline{\epsilon}_{2,t+1}) x_t$ (ie: the primitive information variable x_t alone predicts future dividends), it can be shown that $e(r_{t+1} | z_t) = \mu$, where r_t denotes the return between $t-1$ and t , is a constant independent of z_t for all t and hence that security valuation may be characterised in terms of dividend capitalisation at the risk-

adjusted rate of return μ , this is not the case for the more general information dynamics considered above ie: simple dividend capitalisation at a constant risk-adjusted discount rate only holds under very restricted conditions. Thirdly, an intertemporally constant price-earnings ratio will only exist for the special case (ii) above where x_t is interpreted as earnings and hence earnings alone is assumed to predict future dividends and future earnings. In the slightly more general case where dividends are permitted to play a predictive role in relation to future earnings (but x_t alone is again assumed to predict next period dividends), $P(z_t)$ can be expressed in terms of a relatively complex earnings capitalisation formula but the price-earnings ratio is no longer an intertemporal constant.

The main limitation of the above analysis, emphasised by Ohlson (1990), is its failure to identify a concept of accounting earnings in the valuation process. The main achievement is to indicate the potential role of an information variable, 'earnings', within the general no-arbitrage dividend valuation model developed by Rubinstein (1976). The linear valuation expression $P(z_t) = \underline{B} z_t$ therefore indicates formally how information variables other than dividends affect share price, while the imposition of restrictions on z_t indicate the theoretical possibility of current earnings as a valuation sufficient statistic (ie: an intertemporally constant price-earnings ratio) or discounted expected future earnings, adjusted for market risk and a stochastic pay-out ratio, as an alternative characterisation of the share valuation process. Both the latter possibilities, however, were rejected by Ohlson (1990) as ideal characterisations or criteria for a 'pure' earnings concept as

valuation sufficiency contravenes the notion of dividend irrelevance in perfect capital markets and the requirement for earnings capitalisation appeared to be unnecessarily restrictive in relation to admissible dividend policies. For this reason, Ohlson suggested that a more fruitful criterion for such an earnings concept is that of "earnings as a *sufficient information* variable that determines a security's payoff: $P_t + d_t = Bx_t$ " (p.669).

Consistent with the latter criterion, Ohlson (1989b) provides a major extension to the linear information dynamics perspective on accounting earnings and share prices considered above by incorporating two assumptions from the work of Modigliani and Miller (1958 1961):

"First, the valuation setting requires dividend payment (and policy) irrelevance, ie: an increase in current dividends is exactly offset by a decrease in the firm's current market value. Second, the expected future earnings depend on the current dividend payment: increases in the current dividends reduce the expected future earnings" [Ohlson 1989b p2].

His basic model assumes z_t to be a 3×1 vector of random variables consisting of earnings, x_t , and book value (owners equity), y_t , in addition to dividends (net of capital contributions), d_t . Given the assumption of risk neutrality (thereby avoiding technical problems arising from the application of the Rubinstein dividend capitalisation model required for the case of risk aversion), he shows (proposition 2) that for any linear information dynamics $z_t = (x_t \ y_t \ d_t)$ consistent both with the above MM precepts and with the clean surplus relation $x_t = d_t + y_t - y_{t-1}$, the following valuation formula holds:

$$P_t = KLx_t + (1-K)y_t - Kd_t \quad (6)$$

where $L = R_F/(R_F - 1)$ and K is a non-stochastic weight coefficient. He also shows (proposition 3) that given the MM precepts and the above equilibrium pricing relationship, the clean surplus relation must hold. In short, given standard MM perfect capital market results, Ohlson derives an earnings-based valuation model which holds exclusively for a clean-surplus concept of earnings.

It is useful to briefly consider the implications of the above result for the relationship between stock returns and earnings data. The realised return during period $t+1$, $R_{t+1} = (P_{t+1} + d_{t+1} - P_t)/P_t$, can be expressed using the clean surplus relation as follows:

$$R_{t+1} = \{KL(x_{t+1} - x_t) + (1 - K)x_{t+1} + Kd_t\}/P_t \quad (7)$$

Note that if $K = 0$, R_{t+1} is simply equal to the earnings yield for period $t+1$, while if $K = 1$, R_{t+1} is equal to the increase in earnings during period $t+1$ capitalised at the risk-free rate in perpetuity (ie: multiplied by $L = 1 + 1/r$, where r is the risk-free rate) plus the previous period's dividend, d_t , divided by opening price P_t . The intuition for the result follows from noting that the valuation model, equation (6), is a linear combination (with weights summing to one) of two extreme models where the firm's earnings process may be characterised as entirely permanent ($P_t = Lx_t - d_t$ if $K = 1$) or entirely transitory ($P_t = y_t$ if $K = 0$). The implication for empirical analysis is that studies which regress stock returns against first differences in earnings implicitly assume earnings to be entirely permanent and hence are likely to be mis-specified. This can be corrected by adding an earnings yield term or alternatively regressing unexpected returns on unexpected earnings (see Ohlson 1989b p44).

The second theoretical approach to the analysis of the relationship between accounting earnings and share prices has been termed the exogenous approach above. Early contributions to this approach are Lipe (1986) and Kormendi and Lipe (1987) who introduced the concept of 'earnings persistence' to the literature. As noted earlier, the reason for describing the approach as exogenous is that, unlike the approach of Ohlson, no attempt is made to derive a concept of accounting earnings in the context of an informational model of security valuation. Instead, given the assumption of accounting earnings capitalisation (or, more precisely, capitalisation of changes in earnings expectations), the following expression (Kormendi and Lipe 1987) is hypothesised to hold:

$$R(ux_t) = \sum_{s=0}^{\infty} [1/(1+r)]^s e(x_{t+s}|ux_t)/P_{t-1} \quad (8)$$

where x_t refers to accounting earnings at time t , $R(ux_t)$ is the percentage stock return for period t resulting from earnings surprise ux_t , r is an intertemporally constant discount rate, $e(x_{t+s}|ux_t)$ is the change in expectation of earnings in period $t+s$ resulting from knowledge of ux_t and P_{t-1} is the share price at the beginning of the period t . The rationale given for the relevance of this model is simply the classical cash flow valuation model (Modigliani and Miller 1958 1961, Fama and Miller 1972) combined with the additional assumption that "the present value of the revisions in expected future cash flows equals the present value of the revisions in expected future earnings" [Kormendi and Lipe 1987 p328]. Given this assumption, the main contribution of this approach is to demonstrate that the coefficient Γ in the expression:

$$R(ux_t) = (1 + \Gamma)ux_t/P_{t-1} \quad (9)$$

is dependent on the properties of the time series process generating earnings expectations.

Following results in Flavin (1981, Appendix 1), the general formula for Γ given an ARIMA (p d q) earnings process is given in Collins and Kothari (1989 p.148) and may be written as follows:

$$\Gamma = \frac{\left[1 + \sum_{s=1}^q \frac{1}{(1+r)^s} \theta_s \right]}{\left[\frac{r}{(1+r)} \right]^d \left[1 - \sum_{j=1}^p \frac{1}{(1+r)^j} \phi_j \right]} - 1 \quad (10)$$

where θ_s are the moving average coefficients and ϕ_j are the autoregressive coefficients. The logic of this formula is easily seen by first considering the ARMA (p q) process and noting that:

$$\begin{aligned} e_t(x_{t+1}) &= f\{\epsilon_t, \dots, \epsilon_{t+1-q}, e_t(x_{t+1-1}), \dots, e_t(x_{t+1-p})\} \text{ if } i \leq q \\ &= f\{e_t(x_{t+1-1}), \dots, e_t(x_{t+1-p})\} \text{ if } i > q \end{aligned}$$

where x denotes earnings, ϵ denotes moving average terms, $e_t(\cdot)$ is the expectation operator for time t , and $f\{\cdot\}$ denotes a linear function. Given the basic law linking total and partial derivatives for such functions and noting that $\epsilon_{t-1}, \epsilon_{t-2}, \dots$ may be regarded as constants at time t , we have the following expression for the change in future earnings expectations induced by the current surprise, ϵ_t (equivalent to ux_t in equation (9) above):

$$\begin{aligned} de_t(x_{t+1})/d\epsilon_t &= \delta e_t(x_{t+1})/\delta \epsilon_t + \\ &\quad \sum_{j=1}^i [\delta e_t(x_{t+1})/\delta e_t(x_{t+1-j})][de_t(x_{t+1-j})/d\epsilon_t] \\ &= \theta_1 + \sum_{j=1}^i \phi_j [de_t(x_{t+1-j})/d\epsilon_t] \end{aligned} \quad (11)$$

Dividing the expression by $(1 + r)^d$ to obtain the present value of the revision of expected earnings at time $t + i$ resulting from ϵ_t and summing over $i = 1, 2, \dots \infty$ gives equation (10) above for the case where $d = 0$ (see Flavin 1981 Appendix 1, for these steps). Finally, the need to incorporate the adjustment $((1 + r)/r)^d$ in equation (10) for differencing in the more general ARIMA $(p \ d \ q)$ earnings forecast model can be seen by first considering the ARIMA $(p \ 1 \ q)$ process. In this case, equation (11) above can be interpreted as the revision of the expected change in earnings between time $t+i$ and $t+i-1$ resulting from ϵ_t and hence, in order to evaluate the impact of ϵ_t on the present value of revisions in expected earnings levels, it is necessary to extrapolate each of these revisions in expected earnings changes indefinitely into the future and evaluate at the discount rate r . Hence, if x_t is interpreted as the first difference of earnings, $de_t(x_{t+1})/d\epsilon_t$ must first be multiplied by $1 + 1/r = (1 + r)/r$ and the resulting expression is then divided by $(1 + r)^d$ and summed over $i = 1, 2 \dots \infty$ to give equation (10) for the case when $d = 1$. Furthermore, by an iterative argument, it is clear that $((1 + r)/r)^d$ is the appropriate adjustment for cases where $d > 1$.

To conclude this discussion of theoretical perspectives on the association between accounting earnings and share prices, it is useful to briefly compare the implications of each approach for the empirical analysis of the information content of accounting earnings. Perhaps the main conclusion is that the endogenous perspective appears to provide a degree of rigorous support based on the dividend capitalisation model for the assertion in the exogenous approach that unexpected stock returns may be related to unexpected accounting earnings by means of univariate linear regression analysis

(if other non-accounting data relevant to the prediction of future dividends is ignored). Alternatively stated, Ohlson (1989b) demonstrates that given linear information dynamics and assumptions based on MM precepts, regressing unexpected stock returns against unexpected earnings is consistent with a clean-surplus concept of earnings, although it should be emphasised that Ohlson's analysis includes a predictive role for dividends in relation to future earnings in contrast to the earnings persistence approach. Difficulties in making further comparisons arise due to differences between the specification of the linear information dynamics employed by Ohlson and the ARIMA models employed in studies based on the assumption of capitalisation of earnings expectation changes. Nevertheless, it is reasonable to conclude that these two approaches to the analysis of the relationship between share returns and accounting earnings jointly represent an advance in the development of more formal approaches to analyzing the information content of accounting earnings. Empirical analyses drawing on both perspectives will now be considered in section 3(b) below and discussion of conceptual problems arising from an exclusive focus on accounting earnings in an efficient market setting will be reserved for section 4(b) when the relationship between share returns and cash and funds flow data is discussed.

b. Accounting Earnings and Share Price: Empirical Evidence

Given the vast number of empirical studies concerned with the contemporaneous relationship between share prices and accounting earnings, the following review is selective by necessity. The main focus is on studies which have appeared since the Lev and Ohlson

(1982) review and which have attempted to implement methodologies based on valuation theory. The review begins with the Beaver, Lambert and Morse (1980) study which might be viewed as an important precursor of empirical studies linking the time series properties of accounting earnings with the share price response to unexpected accounting earnings. This is followed by a review of several studies which explicitly address the issue of the relationship between time series properties of earnings expectations models and share response coefficients (ie: those based on the exogenous/assumed link between accounting earnings and share prices). Next, empirical research based on a more explicit recognition of the role of the dividend valuation model (or, to paraphrase [Ohlson 1990 pp673-674], papers which attempt to tackle the empirically complex issue of the link between accounting earnings information variables and dividends) are considered, including more recent papers which have attempted to estimate reduced form equations linking stock returns with earnings change and earnings yield variables as suggested by the clean surplus analysis of Ohlson (1989b). Finally, empirical studies concerned with the contemporaneous relationship between current cost measures of accounting earnings and share prices are briefly discussed.

Beaver et al (1980) provide an early formal analysis of the possible relationship between share prices and the stochastic process governing earnings and use empirical results from the contemporaneous regression of percentage changes in share prices on percentage changes in accounting earnings to make inferences about the nature of the earnings process. Given the assumption of a simple earnings capitalisation valuation model they argued that if earnings follow a

random walk process, then the above relationship should simply be one to one, while if earnings were to follow an IMA(1,1) process:

$$x_t = x_{t-1} + a_t - \theta a_{t-1}$$

where x represents earnings, θ is the moving average parameter and a_t is the period t earnings shock, then the above relationship would take the form:

$$\Delta P_t / P_{t-1} = (1 - \theta) \Delta x_t / x_{t-1}$$

for the case where a_{t-1} equals zero. Using a cross-sectional regression methodology which effectively assumes θ to be the same for all firms, Beaver et al (1981) found that the coefficient from regressing $\Delta P_t / P_{t-1}$ on $\Delta x_t / x_{t-1}$ on an individual security basis was (highly) significantly less than 1, thereby providing indirect evidence against the random walk hypothesis supported by direct time series tests (see Watts and Zimmerman 1986 Ch6). On the other hand, after employing a portfolio grouping technique designed to ensure a_{t-1} approximately equals zero at the portfolio level, the coefficient was (highly) significantly greater than 1. The latter regression suggested that the coefficient was around 2, giving a value of approximately -1 for θ . (If the IMA(1,1) process is the true earnings process, the individual security results suggesting that θ is close to +1, ie: a mean-reverting process, can be ignored as they are likely to result from an errors-in-variable problem due to the incorrect assumption that a_{t-1} is zero for each security. Also, Beaver et al argue that the market capitalises 'ungarbled earnings', as discussed further below. If true, this exacerbates the

errors-in-variable problem for analysis at the individual security level as accounting earnings contain a garbled component).

The Beaver et al (1980) analysis is important in providing a more formal link between share prices and earnings by making the joint assumption of earnings capitalisation and market efficiency and inferring from this an IMA(1,1) earnings process. Their argument that the earnings process is best characterised as IMA(1,1) with parameter θ equal to -1 also has the interesting consequence that:

$$e_t(x_{t+k}) = x_t + a_t$$

which suggests that "one-half of the cumulative impact of a_t on the level of the x series occurs in year t and the remaining one-half occurs in year $t+1$ (ie: with a lagged response)" [Beaver et al 1980 p16]. As they point out, a simple explanation of this is the temporal aggregation of earnings. The apparent inconsistency of their analysis and time series tests which suggest a random walk process for earnings is explained by the notion that the market capitalises an 'ungarbled' measure of earnings and that if ungarbled earnings follow an IMA(1,1) process with $\theta=-1$, negative serial correlation in the garbled component of earnings might counteract the positive serial correlation in the ungarbled component and hence give the impression of a random walk. An implication of the earnings process being represented by a garbled IMA(1,1) process is that share price changes in year t should (in an efficient market) be correlated with subsequent earnings change and that earnings prediction models incorporating prior earnings and price data might outperform random walk earnings predictions. Empirical evidence in support of both these hypotheses are also provided by Beaver et al (1980) and in a

further study (Beaver et al 1987) employing reverse regression in place of the portfolio grouping technique used in the 1980 study.

As noted earlier, studies by Kormendi and Lipe (1987) and Lipe (1986) introduced the concept of earnings persistence into the MBAR literature and generalised the link between earnings share response coefficients and the time series properties of the earnings process, given the joint assumptions of capital market efficiency and earnings capitalisation at a constant discount rate. The distinctive feature of the empirical parts of both these studies is the attempt by the researchers "to explore issues concerning the magnitude of the return reactions to earnings innovations ... [by comparing] ... a direct measure of the magnitude and ... an alternative measure of this magnitude based on the time-series properties of earnings and classical valuation theory" [Kormendi and Lipe 1987 p330]. Thus, unlike the empirical analysis of Beaver et al (1980, 1987) which assumes classical valuation in an efficient market, the analysis of Kormendi and Lipe (1987) and Lipe (1986) has the potential to test this characterisation of the security valuation process. Indeed, Kormendi and Lipe (1987) explicitly reference the excess volatility literature reviewed in section 3 above and argue that their empirical results "reveal no evidence of excessive sensitivity" [p325]. A more detailed analysis of the empirical findings of these papers now follows.

Kormendi and Lipe (1987) assume that the first difference in earnings is represented by a two period lag autoregressive process (ie: an ARIMA (2,1,0) earnings process) and examine the relationship between the two measures of returns reaction to earnings innovations

described in the previous paragraph for 147 US firms over the period 1947 to 1980. Their data was inflation adjusted, so that for each firm they obtain a direct measure and an indirect 'persistence' measure of the effect of a one-dollar innovation in real earnings on the dollar excess real return. The findings from separate time series analysis of returns reactions for each firm indicated a cross-firm mean direct response coefficient of 3.38 and a cross-firm mean persistence measure of 8.9, where the latter was based on an assumed 10% discount rate. They interpreted the former finding as consistent both with reported earnings conveying information to the stock market and with current earnings containing information about future expectations (as the coefficient exceeded one for 80% of firms). A cross-sectional regression of direct return response coefficient estimates on persistence estimates generated a slope coefficient of 0.35 which was significantly less than the theoretical value of one. Kormendi and Lipe suggest that due to measurement error in their persistence estimates the slope coefficient of 0.35 is likely to be downwardly biased and hence use reverse regression to estimate an upper limit on slope coefficient. This analysis generated a coefficient of 2.4 suggesting that "this (admittedly wide) interval contains the strong hypothesis" that the true slope coefficient is one. Finally, estimation of the cross-firm relationship between excess returns and unexpected earnings based on the restriction that the earnings response coefficient for each firm is a linear function of the earnings persistence measure estimated from the ARIMA (2,1,0) forecast model generated findings "broadly consistent with the stronger hypothesis that [the two measures of returns reactions] vary approximately one-for-one across firms" [p340].

Lipe (1986) uses the persistence concept to analyze the returns reaction to six components of accounting earnings. Using a multivariate ARIMA (1,1,0) forecast model for each component of earnings (where it is assumed that the expected change in each component is based on the previous period change in itself and the other five components) and a sample of 81 US firms for the period 1947-80, Lipe compared direct estimates of the excess returns reaction to a real dollar innovation in each of the six components of earnings with persistence estimates for each component on a firm by firm basis (see Chapter 4 for discussion of the derivation of persistence estimates for multivariate forecast models). Thus, for each firm, a multivariate time-series regression of excess returns on unexpected measures of the six components of earnings was carried out, where the latter dependent variables were obtained from joint estimation of the multivariate earnings component prediction models. F-tests computed for each firm and aggregated by means of a binomial test rejected the hypothesis of equality between the direct measures of returns reaction to each of the six components at less than the 0.1% level, although the additional explanatory power from decomposing earnings was typically small (an increase in unadjusted R^2 of the order of 5% is suggested by Lipe). Regressions of the direct measures of returns reaction on persistence estimates (based on a 10% real discount rate) across the six components for each firm ie: 81 firm regressions with 6 observations for regression, generated slope coefficients that were significantly positive at the 10% level for 43% of the regressions, thus rejecting the hypothesis that variation in the direct estimates of the returns reaction to each component is unrelated to the time series persistence estimates of

each component at less than the 0.1% level. On the other hand, the cross-firm average direct return reaction coefficient ranged between 3.19 and 4.12 across the six components, while the cross-firm average persistence estimates ranged between 7.6 and 18.4, thus easily rejecting the hypothesis of equality implied by the joint hypothesis of earnings capitalisation at a constant discount rate (across firms and earnings components), a multivariate ARIMA (1,1,0) prediction model and capital market efficiency.

The findings of Lipe (1986) and Kormendi and Lipe (1987) provide important evidence that share return reactions to earnings (and earnings components) innovations are related to the time series properties of the earnings forecast model. More recent research by Collins and Kothari (1989) in the US and O'Hanlon et al (1992) in the UK has considered the implications of the persistence concept for cross-sectional and pooled (cross-sectional and time-series) analyses of the relationship between stock returns and accounting earnings.

Collins and Kothari (1989), using a reverse regression methodology to mitigate potential measurement error in accounting earnings identified by Beaver et al (1980), analyzed the relationship between annual change in accounting earnings (scaled either by opening price or previous period's earnings) as the dependent variable and various combinations of explanatory variables consisting of contemporaneous (and prior period) raw returns, a growth proxy (market to book value of equity ratio), a systematic risk proxy (beta estimate), an expected earnings revision measure (based on an IMA (1,1) forecast model) and an interest rate measure, where the latter four variables are multiplied by raw returns (ie: they represent 'interactions

variables' with returns). The growth variable was included to overcome perceived problems in the use of the other (persistence related) variables as exclusive determinants of the return/earnings relationship (see Collins and Kothari 1989 p149 for a discussion of these likely limitations). The large number of tests carried out by Collins and Kothari on earnings data over the period 1968 to 1982 (yielding 9776 firm-year observations for their pooled regressions) broadly confirmed the hypotheses that share return responses to earnings changes are negatively related to the risk-free interest rate and systematic risk and positively related to the earnings expectation revision parameter and the growth parameter, particularly when earnings changes are scaled by opening share price. The most substantial increases in adjusted R^2 from pooled regressions of the change in earnings on various explanatory variables, however, resulted from the use of a 15 month return holding period covering several months prior to the annual report period (as opposed to the usual 12 month period ending three months after the annual report period) and the inclusion of dummy variables to identify different years in the pooled data, rather than from the inclusion of the persistence variables.

O'Hanlon et al (1992) used UK data "to examine the issue of whether adjustment of earnings surprises to reflect cross-sectional variation in earnings persistence increases the strength of the relationship between earnings surprise and abnormal return" (p626). Using the time series of real earnings per share for 188 UK companies over the period 1968-1988, they estimated the appropriate time series forecast model for each firm and computed persistence estimates from the time series parameters estimates and from estimates of each companies real

required rate of return at the time of the 1988 earnings announcement. Using analysts' forecasts immediately prior to the earnings announcement data, they computed the earnings forecast error, scaled by share price ten days before the earnings announcement, for each firm and multiplied this by 1 plus the firm's persistence estimate. They then computed abnormal daily returns for 5 days before and after the 1988 earnings announcement for each firm and obtained the cumulative average residuals for each day over this 10-day period. Cross-sectional correlations of cumulative abnormal returns against unadjusted and (persistence) adjusted earnings forecast errors were both statistically insignificant for dates before the earnings announcement and were statistically significant (at the 1% level) for persistence adjusted forecast errors alone at dates after the earnings announcement. Furthermore, a statistically significant correlation of 0.227 (R-squared of 5.2 %) for the adjusted forecast errors was computed for abnormal returns cumulated over the 3 days including and following the announcement date compared with a statistically insignificant correlation of 0.119 for the unadjusted forecast errors. Despite the relatively low R-squared for cross-sectional regressions based on the persistence adjusted forecast errors, there is clear evidence that such adjustment increases the strength of the cross-sectional relationship.

The empirical studies based on the joint assumption of capitalisation of earnings expectations revisions and capital market efficiency have provided evidence which may be interpreted as, at least, not inconsistent with the assumed valuation process, given in particular the probable impact of measurement error. Furthermore, theoretical refinements to the basic model to incorporate the impact

of alternative sources of information relevant to the prediction of future accounting earnings provide a basis for explaining at least part of the empirically observed deviation between direct measures of stock return reactions to unexpected earnings and persistence estimates based on the time series processes earnings (Lipe 1990). Nevertheless, given the assumption of capital market efficiency, this approach to the earnings/share return relationship suffers from the deficiency of failing to deal fully with the role of accounting earnings in a setting where equity valuation is based on capitalisation of expected dividends. We now consider some empirical studies which attempt to focus more explicitly on this issue.

Easton (1985), after providing evidence which he interprets as consistent with stock market rationality and the dividend capitalisation model (see section 2(b)), examines the cross-sectional relationship between capitalised ex post dividends (as measured in 1962) and accounting earnings for that year for his sample of 349 US firms. He found a highly significant positive association, thus providing empirical evidence of the role of accounting earnings as a predictor of future dividend realisations. In addition, he included the actual share price in 1962 as a further explanatory variable for capitalised ex post dividends and was 'somewhat surprised' to find that, while the coefficient for share price was statistically significant for the full range of assumed discount rates (see section 2 for a discussion of discount rates used) as expected, the coefficient for accounting earnings was also significant for higher assumed discount rates. While the latter finding could possibly suggest market inefficiency to the extent that accounting earnings have incremental explanatory power beyond share price in relation to

capitalised ex post future dividends, Easton argues that this is probably due to an artifact when high discount rates are used to capitalise dividends because "both accounting earnings and dividend realisations tend to lag in their adjustment for changes in the economic well-being of the firm" [p67]. He presents evidence for this argument by showing that while earnings has significant incremental explanatory power beyond share price in relation to individual annual dividend realisations for seven years into the future, share price has significant incremental explanatory power over accounting earnings for subsequent years' dividend realisations. Furthermore, he argues that because a large proportion of the explanation of the cross-sectional variation in annual dividend (for all 18 years) by price and accounting earnings is common to both price and accounting earnings, accounting earnings may be regarded as providing "a good summary of all future dividend realisations." In summary, Easton's findings suggest that a large proportion of the cross-sectional variation of capitalised ex post dividends can be explained by accounting earnings alone (R^2 ranging between 50 and 60% for various discount rate assumptions) and that share prices contain small but statistically significant explanatory power beyond earnings. The finding that earnings have incremental explanatory power beyond share prices is apparently due to an artifact of the discount rate underlying some regressions.

Easton and Zmijewski (1989) use the Garman and Ohlson (1980) theoretical framework to justify (i) an empirical time series analysis of the relationship between a variety of share return metrics and unexpected earnings and (ii) a cross-sectional analysis of the determinants of the resulting earnings response coefficients.

The main contribution of the Garman and Ohlson framework to their empirical analysis is twofold. First, there is an explicit attempt to take account of the role of other (non-earnings) data used to predict earnings by the use of analysts' (Value-Line) forecast errors rather than forecast errors from a univariate earnings time series model. Second, earnings forecast revision parameters, to be used as a possible explanatory variable for cross-sectional variation in earnings response coefficients, are estimated in the context of an analysts' earnings forecast revision model which models revisions of future earnings expectations as a function of both current period forecast error and the change in stock price since the previous forecast data, the latter serving as a proxy for other information. Given, however, that the theoretical framework suggests that unexpected returns are related linearly to the forecast errors of all information variables relevant to the prediction of future dividends, Easton and Zmijewski recognise the restrictive assumptions underlying the focus on earnings in their study.

The empirical findings reported are based on quarterly data for the period 1975 to 1980 (ie: 20 observations) for a sample of between 100 and 200 US firms depending on data availability for the various models estimated. Using a joint estimation procedure based on a methodology combining the SURM procedure for jointly estimating individual firm time-series equation parameters and the random coefficients procedure for adjusting individual firm parameter estimators for cross-firm differences in SURM parameter variances, they estimated (i) earnings response coefficients for each firm based on the time series relationship between market model residuals around the quarterly earnings announcement date and analysts' forecast

errors (ii) the forecast error coefficient and stock price coefficient in the time series relationship between future earnings forecast revisions and these two explanatory variables for each firm (iii) the beta coefficient for each firm from a 20 observation quarterly market model. The cross-firm mean earnings response coefficient varied between 1.65 and 2.53 according to the abnormal return cumulation period and for the latter case was significant at the 1% level. The mean forecast error coefficient in the earnings forecast revision model was 0.344 and the 99% confidence limit lay between 0 and 1, as required for stationarity if analysts use an autoregressive time series process. The mean stock price coefficient in the earnings forecast model was also significantly positive indicating the relevance of non-earnings data to the revision in analysts' earnings forecasts. In relation to the determinants of cross-sectional variation in earnings response coefficients, the partial correlation between ERC and earnings revision coefficient (conditional on beta) was consistently significantly positive, while the partial correlation between ERC and beta (conditional on the earnings revision coefficient) was consistently negative but not statistically significant from zero for all model specifications.

The Easton (1985) and Easton and Zmijewski (1989) studies represent important steps towards empirical analysis of the relationship between share valuation and accounting earnings in a manner consistent with a theoretical perspective which recognizes the ultimate importance of dividends expectations in the valuation process. More recent empirical studies (Easton and Harris 1991, Strong and Walker 1992) have exploited the recent theoretical advance of Ohlson (1989b) to estimate empirical models related to the

'reduced form' relationship between share returns and earnings change and earnings yield discussed earlier.

Easton and Harris (1991) use a cross-sectional (and pooled) regression approach based on US data over the period 1969-86 to analyze the relationship between share returns and the two earnings variables - earnings change scaled by opening share price and earnings yield - suggested by Ohlson (1989). They regress total unadjusted returns on each accounting variable in separate univariate regressions and in a single multivariate regression (for reasons not discussed by Easton and Harris, the lagged dividend yield variable in the full Ohlson model is omitted in their multivariate regression) and find that the coefficients for each earnings variable in univariate and multivariate regressions were statistically significant at the 1% level both in the pooled regressions and, on average, in the 19 annual cross-sectional regressions. In terms of both the size of aggregate t-statistics and the frequency with which annual cross-sectional regression coefficients were significant at the 1% level, their analysis suggested a stronger relationship between share returns and earnings yield rather than the earnings change variable, although the extent to which this might have resulted from the omitted lagged dividend variable is not discussed. An indication, however, that the latter factor may explain this finding is provided by a further test carried out by Easton and Harris where they regressed abnormal returns on the two earnings variables and where cross-sectional and pooled t-statistics suggested a stronger statistical relationship between abnormal returns and the earnings change variable than earnings yield. This argument follows from the obvious point that in an efficient market context, lagged

dividends (the omitted variable in their original tests) have no explanatory power in relation to current abnormal share returns. In summary, the findings of Easton and Harris that both earnings change and earnings yield variables have statistically significant explanatory power in relation to stock returns provides a measure of support for the theoretical argument of Ohlson (1989b) that earnings contain both transitory and permanent components and that share prices responses reflect this distinction.

Strong and Walker (1991) use UK data for 146 quoted companies over the period 1971 to 1986 to analyze the relationship between returns and abnormal returns and the two earnings variables identified by Ohlson (1989). Using a panel regression methodology where all firm-year observations of returns and accounting variables are pooled and where the number of explanatory variables are varied to incorporate time-varying and/or firm-varying response coefficients, they report results for a range of different models based on alternative specification of the set of explanatory variables. The use of this methodology enabled them to report adjusted R-squareds greatly in excess of those associated with conventional cross-sectional or time-series approaches. For example, while the mean adjusted R-squared from separate annual cross-sectional regressions of returns on the earnings change variable was 13%, the estimation of the panel regression of returns on earnings change allowing for time-varying and firm-varying response coefficients (an assumption of the technique is that the response coefficient for a particular firm in a given year is the sum of a cross-firm time-specific coefficient for that year and a cross-time firm-specific coefficient) increased dramatically to over 41%. They do not report corresponding panel

regression results for the earnings yield variable alone but when they estimated the full panel regression model incorporating time-varying and firm-varying coefficients for both earnings change and earnings yield variables, adjusted R-squared rose further to 48%. Strong and Walker's findings therefore provide evidence which supports the argument that addition of an earnings yield variable to the earnings change variable conventionally used in analyses of the share returns/earnings relationship increases the statistical strength of the association. Perhaps more importantly, however, following a previous advance in the estimation of the share returns/earnings relationship applied to US data (Board and Walker, 1990), their analysis suggests that the low R-squareds associated with previous share returns/earnings studies, bemoaned by Lev (1988), may be 'corrected' by using a more sophisticated regression methodology which allows for both time-varying and firm-varying earnings response coefficients. Such an approach is clearly consistent with the theoretical and empirical literature reviewed in this chapter which suggests the relevance of firm and time specific factors to an understanding of the contemporaneous relationship between share returns and accounting earnings.

The review of empirical studies concerned with the relationship between contemporaneous (or prior) share returns data and accounting earnings has thus far focussed on studies with an explicit link to share valuation theory. Another area of empirical research concerned with the earnings/returns relationship has considered the information content of current cost data mandatorily disclosed by firms in the UK and the USA at the end of the 1970s and in the early 1980s. Because much of this work was conducted in the early 1980s, it is perhaps

unsurprising that this research does not draw heavily on an informational perspective on the role of replacement cost data in security valuation. Indeed, a major study recognized that: "Adopting an information perspective with respect to replacement cost disclosures is difficult because a theory that links replacement cost disclosures to security returns is not well defined" (Beaver et al 1982 p17). Thus, while the Beaver et al study, based on a cross-sectional analysis of the relationship between unadjusted share returns and (i) the percentage change in historic cost income, (ii) the percentage change in pre-holding gain replacement cost income and (iii) post-holding gain replacement cost income scaled by opening replacement cost equity, failed to detect significant explanatory power for the pre-holding gain replacement cost earnings variable beyond the historic cost earnings variable and only weak evidence in relation to the incremental information content of the post holding gain variable beyond historic cost earnings, such findings may be due to inadequate consideration of the relationship between earnings variables and future dividend expectations in the research design. The same point may also apply to a cross-sectional study by Board and Walker (1985) based on UK data and employing a similar methodology to Beaver et al (1982) which also failed to detect incremental information content for the pre-holding gain current cost income measure required by Statement of Standard Accounting Practice 16 (ASC 1980).

In general, while it is the case that most empirical analysis in the US and the UK has either failed to detect significant explanatory power for current cost earnings beyond historic cost earnings (for example, Beaver et al 1982, Board and Walker 1985, Matolcsy 1984,

Schaffer 1984, Bernard and Ruland 1987) or has only provided weak evidence in this respect (for example, Bublitz et al 1985, Skerratt and Thompson 1984, Peasnell et al 1987), it is nevertheless possible that analysis based on more explicit links to informational theories of share valuation might generate alternative findings. Indeed, Darnell and Skerratt (1989), drawing on insights from the linear information valuation model of Ohlson (1983) which, as noted in section 3(a), suggests the possibility of a measure of earnings as valuation sufficient, provide evidence that the current cost adjustments required under SSAP 16 (ASC 1980) did have incremental information content beyond historic cost income in a pooled cross-sectional regression for 208 UK companies over the period 1980-1983 using share price levels as the dependent variable. Such an approach, using levels for both dependent and independent variables, has the advantage of avoiding measurement error in the estimation of unexpected earnings components, although, as noted by Darnell and Skerratt, there are likely to be statistical problems, such as heteroskedasticity in disturbance terms, arising from such cross-sectional regression analysis. Nevertheless, it would appear that their analysis at least suggests the possibility of more fruitful findings in relation to the relative information content of current value income measures from the adoption of a linear information valuation perspective.

c. Concluding Remarks

The papers reviewed in section 3(b) above have indicated the potential of insights from share valuation theory to provide improved empirical specifications of the relationship between share returns or

share prices and accounting earnings. While the theoretical valuation models which have influenced the design of these studies are based on the assumption of market efficiency, further research using designs which attempt to mitigate the possible effects of bias due to model misspecification may lead to a clearer understanding of the descriptive validity of this assumption. Factors such as firm size (Freeman 1987, Collins and Kothari 1989, Chaney and Jeter 1992) and bankruptcy risk (Dhaliwal et al 1991) are beginning to be incorporated into empirical analyses of the determinants of earnings response coefficients and models which identify a role for such factors in security valuation may be expected to influence the design of future empirical studies. It is useful to conclude this review of research concerned with the relationship between share prices and accounting earnings with a brief overview of some arguments regarding the extent to which model misspecification or market inefficiency explain existing 'anomalous' findings concerning the relationship between share prices and accounting earnings.

Ball (1978) provided a now well-known presentation of the argument that model misspecification, rather than semi-strong form market inefficiency, may explain research findings in the 1970s, such as Litzenberger et al (1971) and Basu (1977), which indicated positive (negative) abnormal risk-adjusted returns for portfolios with high (low) prior period earnings yields. In this paper, Ball argued that the use of an earnings yield variable, as opposed to earnings first differences as in Ball and Brown (1969) for example, increased the likelihood that anomalies might arise due to inadequacies in the two-parameter capital asset pricing model in fully characterising the risk attributes of securities, as earnings yield may be highly

correlated with such omitted risk. Subsequent work by Basu (1983) reinforced the finding of the earnings yield effect and also supported the Ball hypothesis that the anomaly may be the result of model misspecification rather than delayed response to the release of earnings data (as the yield effect persisted for many months after the earnings release). While there has been much debate in the literature as to whether the earnings yield effect is in fact a small firm effect (see for example, Reinganum 1981, Basu 1983, Banz and Breen 1986, Jaffe et al 1989), it is probably reasonable to conclude that the Ball (1978) hypothesis of asset pricing model misspecification is more widely accepted as the cause of this particular anomaly than the informational inefficiency hypothesis.

Although the earnings yield anomaly cannot readily be interpreted as providing evidence of market inefficiency in relation to the processing of earnings data for reasons outlined above, the so-called post-earnings-announcement drift anomaly appears more amenable to such an interpretation. Recent research (Bernard and Thomas 1989 1990, Foster et al 1984), together with several earlier papers reviewed by Lev and Ohlson (1982), provide strong support for the existence of this anomaly in relation to quarterly earnings releases in the US, the papers by Bernard and Thomas arguing persuasively that informational inefficiency is the most likely cause. On the other hand, Ball, Kothari and Watts (1992) have carried out research which suggests that much of the post-earnings- announcement drift anomaly in annual (as opposed to quarterly) data can be explained by changes in the systematic (beta) risk of securities between the post-announcement (and announcement) period and prior periods, and that

any remaining drift is probably due to misspecification of the two-parameter asset pricing model.

It would appear that further research will be required to clarify the above arguments regarding the nature of post-earnings-announcement drift. Nevertheless, some observations on the possible implications of each of these explanations for analysis of the information content of accounting earnings can be made. For example, if delayed market response to earnings data (Bernard and Thomas 1989) is the cause of the drift phenomenon, this would suggest that studies such as Kormendi and Lipe (1987), Lipe (1986), Collins and Kothari (1989), Easton and Zmijewski (1989), Easton and Harris (1991) and Strong and Walker (1991) which attempt to incorporate cross-sectional and/or intertemporal variation in share price responses to earnings data will only be partially successful due to their underlying assumption of capital market efficiency. On the other hand, if the Ball et al (1992) argument is accepted, a different, and perhaps more complex, set of issues are raised for valuation approaches to the analysis of the information content of accounting earnings. In particular, the systematic risk changes observed by Ball et al (1992) occurred between the prior period and the earnings announcement period, with little further change in the post announcement period. This suggests that the use of market model residuals based on prior period estimation of the market model may be a major source of estimation error in information content studies using this particular return metric and that valuation approaches which seek to explain earnings response coefficients on the basis of intertemporally constant systematic risk, or constant systematic risk between a prior

estimation period and the earnings announcement period, are likely to be at best only partially successful.

Finally, it is useful to consider the implications of the 'over-reaction hypothesis' of DeBondt and Thaler (1985 1987) in extreme performing stocks for the relationship between share prices and accounting earnings in these cases. Zarowin (1989) notes that DeBondt and Thaler (1987) suggest that the market's inefficient response to earnings information may be the cause of the over-reaction effect in these shares as extreme share price movements are followed by subsequent earnings change reversals. Although Zarowin (1989) agrees that these findings are consistent with an 'overreaction to earnings' effect, he argues that only subsequent share price responses to extreme prior period earnings performance provides a proper test of this hypothesis. Empirical evidence presented by Zarowin based on subsequent share price performance of arbitrage portfolios based on extreme prior period earnings performance suggest an overreaction to earnings data after adjusting for risk (beta) changes in the post portfolio formation period. However, further tests based on the formation of arbitrage portfolios using both size and earnings performance provide persuasive evidence that firm size, rather than the 'over-reaction to earnings' hypothesis, explains the findings as "when poor earners are matched with good earners of equal size, there is little difference in return behavior...[but]... when poor (or good) earners of disparate size are compared, small firms outperform large firms, and smaller winners outperform larger losers" (p1398). This particular earnings anomaly may therefore be best explained by model (CAPM) misspecification rather than capital market inefficiency.

In conclusion, this section has attempted to outline some of the theoretical and empirical advances in the analysis of the relationship between share prices and accounting earnings during the 1980s. It is clear that considerable progress has been made in moving towards an understanding of the factors which influence the nature of the relationship between share prices and accounting earnings, although it would appear that considerable theoretical and statistical refinements are still required in order to provide more convincing evidence of the factors affecting this relationship. Continued evidence of the post-earnings-announcement drift anomaly, described by Lev and Ohlson (1982) as "the evidence most damaging to the naive and unwavering belief in market efficiency" at the time of their review, suggests that future developments may need, for example, to deal with problems of controlling both for risk changes associated with earnings announcements and for inefficiency in the capital market response to earnings data. It might be hoped that future work in this direction will move closer to a more complete understanding of the scope of accounting earnings data as a basis for explaining share prices. Finally, although, as noted earlier, Easton (1985) argued that his evidence provided little evidence to support the case that earnings provide incremental information content beyond current share price in relation to the prediction of future dividends, a study based on aggregate US stock market data for the period 1871-1986 by Campbell and Shiller (1988) suggests that a moving average of past accounting earnings does contribute beyond current share price to the prediction of the present value of future dividends. Development of this approach to the assessment of the information content of accounting earnings would appear to be of

potential interest given the possibility of excess volatility of share prices at the individual firm level.

4. Cash Flows, Funds Flows and Share Prices

The previous section reviewed recent theory and evidence concerned with the association between accounting earnings and share returns and concluded that some measure of success has been achieved in applying concepts from valuation theory to the analysis of this relationship. The main aim of this section is to review empirical evidence concerning the relationship between cash flows and funds flows and share returns. Given the role of cash flow in standard valuation theory, it is perhaps surprising that little theoretical work on an informational model linking cash flow data to share prices has been carried out. This issue is considered further following the review of empirical work.

a. Review of Empirical Findings

A number of empirical studies have addressed the issue of the relative information content of cash and funds flows vis-a-vis accounting earnings since the publication of the Lev and Ohlson (1982) review of MBAR. These studies have collectively provided evidence on the incremental information content of accounting earnings beyond measures of cash flows and funds flow (where, in most cases, the latter refers to operating flows) and vice versa. In addition, some more recent work has considered the information content of a number of components of cash flow, including investment

and financing flows. We focus initially on US evidence before considering the evidence available for the UK and elsewhere.

Harmon (1984) carried out a comparative analysis of the relationship between share returns and three earnings measures and six funds flow variables. For a sample of US firms over the period 1971-1979, he computed the mean abnormal daily market model residuals for a ten-day period prior to the earnings announcement in the Wall Street Journal and classified each firm-year observation as good, bad or indifferent using the t-statistic for the mean abnormal return. Assuming a simple (and an inflation adjusted) random walk model for determining all forecast errors, he also classified forecast errors for all firm-year-variables as good, bad or indifferent using $\pm 5\%$ change as the 'indifferent range'. For each sample year, each of the nine accounting variables were ranked in terms of their strength of association with abnormal returns.

Harmon's findings indicated that one of the three earnings variables occupied the first place ranking for all tests carried out. From this he concluded that "Even though there are limitations in the results, the findings indicate that earnings are more associated with market reaction than are funds flows." (Harmon 1984 p34). In addition to the statistical limitations discussed by Harmon, there would appear to be further limitations not considered in his paper. Firstly, his range of funds flow measures are either operating flows (cash flow from operations and working capital from operations) or asset balance changes (net change in cash and net change in working capital), with only one of the variables appearing to represent a post-investment funds flow measure (total working capital provided).

Secondly, his use of mean abnormal returns prior to the earnings announcement date on the grounds that "annual report information is likely available to price-making investors by that date" (p27) would seem to potentially bias his findings in favour of the earnings variables and is inconsistent with Wilson's (1987) analysis which suggests a statistically significant share price response to cash flow from operations after the release of earnings data (see below for a discussion of Wilson (1987) and also Bernard and Stober (1989) who, in turn, question Wilson's findings).

Bowen et al (1987) use a cross-sectional regression methodology to analyze the relative information content of earnings, funds flow and cash flow measures for 98 US firms over the period 1972-81. They used standardized (variance adjusted) market model residuals cumulated over a 12 month period ending four months after the fiscal year-end as the share return metric and measures of unexpected earnings (UE), working capital from operations (UWCFO), cash flow from operations (UCFO) and cash flow after investment (UCFAI) as explanatory variables. UE, UWCFO and UCFAI were defined simply as percentage changes in the respective accounting variables, while UCFO was based on the difference between current period cash flow from operations and previous period working capital from operations (scaled by the latter) following previous findings (Bowen et al 1986) suggesting the superiority of working capital from operations as a predictor of cash flow from operations. Their findings based on pooled regressions over the whole sample period indicated statistically significant coefficient estimates (at the 1% level) for all unexpected accounting variables in regressions of unexpected returns on (i) UE alone (ii) UCFO and UCFAI (iii) UE, UCFO and UCFAI.

This supports the notion of individual and relative information content for both earnings and cash flow data. T-tests on the mean coefficient from the ten annual cross-sectional regressions, however, suggested relatively weaker findings for cash flows, with only UCFO mean coefficients achieving statistical significance at the 10% level in (ii) and (iii) above (UCFAI mean coefficients were statistically insignificant in (ii) and (iii) and UE mean coefficients significant at the 5% level in (i) and (iii)). In summary, Bowen et al (1987) provide evidence of the incremental information content of earnings beyond cash flows and vice versa, although the evidence in relation to the latter is weaker than for the former. In addition, their results on the information content of UCFAI beyond UCFO are not conclusive (the pooled regression showed the UCFAI coefficient to be significant at the 10% level but this was not confirmed by the t-test on the mean annual cross-sectional coefficient) and tests of the incremental information content of UWFCO beyond UE consistently failed to detect any statistically significant incremental explanatory power for UWFCO.

Rayburn (1986) also employed a cross-sectional regression methodology to focus on the issue of the incremental information content of accounting earnings data beyond cash flow data. For a sample of 175 US firms over a 20 year period from 1963 to 1982, she conducted annual cross-sectional regressions of market model residuals cumulated over the fiscal year on (i) measures of unexpected cash flow from operations (UCFO) and unexpected total accruals (UA) and (ii) UCFO and accruals decomposed into unexpected change in working capital (UWC), unexpected deferred tax (UDT) and unexpected depreciation (UDN). She used two forecast models to

generate unexpected measures of accounting variables, a random walk model and a multivariate ARI model where forecast errors for each accounting variable (UCFO, UWC, UDT and UDN) were based on regressions of each variable on lagged values of all four variables. Prior to estimation of these forecast errors, all accounting variables were scaled by opening market value of equity to control for heteroskedasticity related to growth and inflation over time. The findings in relation to (i) above for both forecast models generated statistically significant t-statistics (at the 5% level) for the mean annual regression coefficients for UCFO and UA, with annual regression coefficients for UCFO and UA significant at the 5% level in 10 and 8 years respectively (out of 28) for the random walk forecast model and 18 and 16 years respectively for the multivariate ARI forecast model. Findings based on regression equation (ii) above for both forecast models generated statistically significant t-statistics at the 5% level for the mean annual coefficients of all four forecast errors, UCFO, UWC, UDT and UDN, although this finding was only robust for UCFO and UWC across both forecast models before controlling for outliers. Rayburn concludes that her findings support the view that "operating cash flow, aggregate accruals and current accruals are consistent with the information set used to value equity securities" (Rayburn 1986 p132).

The findings of Bowen et al (1987) and Rayburn (1986) have been reconsidered in a paper by Jennings (1990) where it is argued that further implications for the relative information content of earnings and cash flows may be extracted from their studies. Making use of the published findings, Jennings shows that the findings of Bowen et al (1987) are equivalent to the findings of statistically significant

(at the 5% level) mean annual coefficients for unexpected cash flow from operations, unexpected current accruals and unexpected long-term accruals, but not unexpected investment, in annual cross-sectional multiple regressions of unexpected returns on these four accounting forecast errors. He therefore concludes that these results are consistent with Rayburn. More surprisingly, he carries out six pairwise tests of equality between the four accounting variables considered by Rayburn (1986) ie: UCFO, UWC, UDT and UDN as defined in the previous paragraph, again making use of the published findings and basing his tests on the mean of the annual cross-sectional estimates, and finds that the null hypothesis is not rejected for any of these six tests at the 5% level (2-tail test) and is only rejected for cash flow from operations against depreciation and depreciation against change in working capital at the 10% level for the random walk (but not the AR1) forecast model. He concludes that "there appears to be little evidence in Rayburn's data that the components of reported income are valued differently by investors" (Jennings 1990 p929). Alternatively stated, Rayburn's data provides little evidence that cash or funds flows have incremental information content beyond accounting earnings.

Two studies by Wilson (Wilson 1986 1987) have analyzed the relative information content of earnings, funds flow and cash flow data by examining the relationship between market model residuals and accounting forecast errors over narrow returns intervals around major information release dates. Wilson (1987) uses a cross-sectional regression methodology to examine the hypothesis of no incremental information for the funds from operations and accrual components of previously disclosed earnings numbers, where the funds from

operations component was defined either as cash flow from operations or working capital from operations and the corresponding accruals component was defined as the difference between funds from operations and accounting earnings. His analysis focussed on 322 firm-year observations for US companies over the test period 1981-82, where there was at least an 8-day interval between the fourth-quarter earnings announcements in the Wall Street Journal and the subsequent release of the annual report revealing the funds and accrual components of fourth quarter earnings. Both the regression and portfolio testing approaches used by Wilson involved the estimation of funds from operation forecast errors for each firm-year as the residuals from a cross-sectional regression of fourth-quarter funds from operations on fourth-quarter earnings and revenues and other lagged accruals and funds flow variables (including annual capital expenditure) for previous quarters in the current year and the last quarter of the previous year. The regression tests were then based on a cross-sectional regression of average daily market model residuals over a nine day period extending from 4 days before the annual report release date to 4 days after this date on unexpected funds from operations defined either as cash flow from operations or working capital from operations. His findings indicated a statistically significant positive reaction (at less than the 1% level) for the cash from operation definition of funds which was relatively robust to variations in the return interval and consistent over the two test years, 1981 and 1982. The coefficient for the working capital forecast error, on the other hand, was statistically insignificant over the same 9-day return interval, although there was some evidence of a lagged return response (probably due to random factors, according to Wilson). The portfolio tests involved the

division of firm-year observations into low, medium and high forecast error portfolios for cash and working capital definitions of funds from operations and the calculation of cumulative average residuals for the 9-day return interval described above. Statistical tests based on T^2 -statistics rejected the hypothesis that the mean portfolio returns were the same for low, medium and high forecast error portfolios at the 2.5% level when funds were defined as cash from operations but failed to reject this hypothesis for the working capital from operation definition of funds.

Wilson (1986) extended the above analysis to provide evidence on the null hypothesis that accruals have no incremental information beyond funds from operations. This study differs from Wilson (1987) by considering two narrow returns intervals, the first around the fourth-quarter earnings release date and the second (as in Wilson 1987) around the financial statement release date. The use of this 'two-return model' allowed him to consider the incremental information content of accruals beyond funds because at the earnings release date investors revise (from zero) their beliefs regarding funds and accruals forecast errors and hence a comparison of differential share response is possible. Wilson's model assumes that expectations of funds and accrual components of earnings are based on 13 funds and accrual items from the third-quarter and first-half of the current year and the fourth-quarter of the previous year. His findings, based on regression of the sum of average market model residuals over a 2-day interval around the earnings release date and a 9-day interval around the financial statement release date on unexpected funds from operations and unexpected accruals, suggested no incremental information content for non-current accruals beyond

working capital from operations but significant incremental information content for current accruals beyond cash flow operations. In addition, univariate regressions of this 2-interval measure of unexpected return on unexpected working capital from operation and unexpected earnings indicated a stronger relationship in the former case than in the latter case. These findings suggest that working capital from operations is revealed at the earnings release date and that abnormal returns are positively related to unexpected working capital from operations but unrelated to non-current accruals (this was confirmed by regressions using unexpected returns at the earnings release date only as the dependent variable). In addition to the finding of incremental information content for current accruals beyond cash flow from operations already indicated, further tests by Wilson confirmed his earlier findings (Wilson 1987) that the decomposition of earnings into cash flow from operations and total accruals has information content beyond earnings.

The two studies by Wilson considered above provide empirical support for the argument that both cash flow from operations and current accruals (and therefore working capital from operations) are statistically significant explanatory variables in relation to share returns. Although his study failed to detect any significant association between share returns and non-current accruals, the use of an announcement date methodology suggests that his findings "do not preclude the possibility that non-current accruals have information content at a date prior to the earnings announcement date" (Wilson 1986 p192).

A particular feature of Wilson's work considered further by Bernard and Stober (1989) is his finding in both studies that the cash flow from operations components of unexpected earnings is valued more highly than the accrual component. Using the cross-sectional regression test employed in Wilson (1987) but applying it to 170 firms for all four quarters over the 8 year period 1977-82, Bernard and Stober were unable to confirm Wilson's (1987) findings, based on the fourth-quarters of 1981 and 1982 alone, that the coefficient from regressing average market model residuals from the 9-day return interval around the financial statement release date on unexpected cash flow from operations is significantly positive. Indeed, the coefficient was negative and statistically insignificant, this finding casting doubt on the generality of Wilson's conclusion that the decomposition of earnings into cash flow and accruals components has incremental information content beyond earnings. Furthermore, while Wilson (1987) considered the possibility that his findings may have been due to macroeconomic conditions prevailing in 1981-82 such that firms which responded to the economic downturn at the time by reducing inventories and receivables and thus increasing cash flow may have received a premium from investors, Bernard and Stober were unable "to find evidence of any significant variation over time in the relative impacts of cash flows and accruals" (Bernard and Stober, 1989 p648).

Livnat and Zarowin (1990) provide the first detailed analysis of the information content of the components of operating, investing and financing cash flows for US companies, using a cross-sectional regression methodology with at least 345 firms in each of the years over the period 1974-86. Market model residuals were regressed

against forecast errors of accounting variables in each year, where the latter are measured as the change in the variable from the previous year scaled by the opening market value of equity. They disaggregated operating cash flows into five components (collection from customers, payments to suppliers and employers, tax, interest and other operating cash flows), financing flows into 4 components (debt issuance, common-stock issuance, preferred stock issuance and dividend payment) and investing flows into 5 components (investment in property, plant and equipment, retirement of the latter, acquisitions, purchase of minority interest, and investment in unconsolidated subsidiaries) and used forecast errors for these 13 variables and an accruals variable as the dependent variables in their main regression equation. Their findings, based on mean annual cross-sectional regression coefficients and associated t-statistics, indicated statistically significant coefficients of the appropriate sign for positive and negative components of operating cash flow with the exception of tax which was insignificantly negative, a statistically significant positive coefficient for debt issuance, a statistically significant positive coefficient for dividends, a statistically significant negative coefficient for investment in unconsolidated subsidiaries (this finding was inconsistent with their expectation that increases in investment increase future cash flow expectations) and a statistically significant positive coefficient for accruals. All other coefficient estimates were statistically insignificant. In addition, they were able to reject at less than 1%, the hypothesis that all operating cash flow components have equal coefficients (taking account of the sign of each operating component) and that all financing flows components have equal coefficients, although pairwise tests were not able to discriminate between the

coefficients for debt, common-stock and preferred-stock issuance. Livnat and Zarowin also carried out a regression of abnormal returns on aggregate operating cash flow, financing flow, investing flow and accruals which resulted in clearly significant mean coefficients for only operating cash flow and accruals variables and a regression of abnormal returns on aggregate operating cash flows and accruals alone where both coefficients were significantly positive but where it was not possible to reject the hypothesis that the coefficients were equal. They argue that the latter result is consistent with Bernard and Stober (1989) to the extent that the disaggregation of earnings into operating cash and accruals components does not improve the association with security returns.

Finally, a study by Charitou and Ketz (1991) employed a share price level, as opposed to share return, methodology based on the Litzenberger and Rao (1971) valuation model to examine the information content of cash flows, accruals and dividends for 403 US firms over the period 1976–1985. Under the assumed valuation model, the market value of the firm's equity is a linear function of permanent earnings, risk and growth and Charitou and Ketz use accounting earnings, beta and the growth in the book value of total assets as empirical proxies for each of these variables. Given that accounting earnings can be expressed as:

$$CAAI - TAC + EXP + DIV + INV$$

where CAAI is cash available after investment and dividends but before external financing, TAC is total accruals, EXP is capital expenditure, DIV is dividends and INV is investments, their cross-sectional empirical valuation model, estimated for each of the ten

sample years, expresses the market value of equity as a linear function of these five variables and the beta and book value growth variables. Their findings for all years indicate statistically significant coefficients at the 1% level for all seven explanatory variables, and all coefficients have the expected sign ie: all are consistently positive with the exception of those for TAC which are consistently negative. While they conclude that "these results indicate that the accrual and cash flow components of earnings are valued in the market place" (p 61), they do not provide formal statistical tests of the extent to which the valuation coefficients for the five components of earnings given above differ. Casual inspection of the estimated coefficients for CAAI, (minus) TAC, EXP and INV, however, suggests that these coefficients are of similar magnitude in most years (Table 3 p61), with DIV consistently greater in all but one year. This may imply that disaggregation of accounting earnings into cash flow and accrual components provides little incremental information content for share prices beyond aggregate accounting earnings and dividends, although, of course, without formal statistical tests of equality between the various coefficients, such a view can only be regarded as speculative.

The empirical evidence from the US therefore provides strong evidence in support of the hypothesis that operating cash flow is a valuation-relevant component of accounting earnings but only mixed and, more recently, negative evidence on the hypothesis that aggregate operating cash flow has incremental information content beyond accounting earnings. Disaggregated operating cash flow data and debt issuance do appear to have statistically significant incremental information content beyond accounting earnings according

to findings reported by Livnat and Zarowin (1990), although formal tests of this hypothesis are not carried out. We now consider some findings from outside the US.

Studies by Board et al (1989) and Board and Day (1989) provide the main evidence to date on the relative information content of cash flow, funds flow and earnings in the UK, in addition to some further evidence based on US data. The UK findings presented in these papers cover the period 1961-77 and are based on a sample of 39 manufacturing companies. Board et al (1989) provide evidence on the relative information content of earnings, working capital from operations and cash flow from operations, while Board and Day (1989) provide further evidence on net quick assets from operations (defined as working capital from operations plus the change in stocks and work-in-progress). Both studies use a cross-sectional regression methodology where for each year monthly market model residuals cumulated over a 12-month period ending two months after the fiscal year-end were initially regressed on forecast errors for each of the accounting variables individually, the latter defined as the change in the accounting variable from the previous year scaled by opening book value. Their findings from these univariate regressions indicated statistically significant regression coefficients in 9 (out of 16) years for earnings, 7 years for working capital from operations and only 1 year each for net quick assets from operations and cash flow from operations. The second stage of their analysis involved obtaining the residuals from pairwise regressions of one accounting variable on another and then regressing cumulative market model residuals on these residuals to test for incremental information content. Their findings indicated that earnings

contained significant incremental explanatory power beyond cash flows from operations in 9 years, net quick assets from operations in 9 years and working capital from operations in 7 years. Cash flow from operations did not contain incremental information beyond earnings in any year and both net quick assets and working capital from operations contained incremental explanatory power beyond earnings in just 2 years. The findings of these studies therefore fail to support the view that cash flow and net quick assets have any significant explanatory power for share returns and, while finding some explanatory power for working capital from operations, are not consistent with significant explanatory power for this variable beyond accounting earnings.

Similar results were obtained from applying the same methodology to a sample of 193 US companies for the 18 year period 1965-82, univariate regressions of market model residuals on cash flow from operations indicating significant regression coefficients in only 5 years and incremental information content tests providing no evidence at all that either cash flow from operations or working capital from operations have incremental information content beyond earnings. Strong evidence, on the other hand, for the incremental information content of earnings was provided, with earnings demonstrating significant incremental information content beyond cash flow and working capital from operations in 18 and 17 years (out of 18) respectively.

A study by Sudarsanam and Fortune (1990) provides an alternative analysis of the information content of a range of accounting earnings and operating cash and funds flow measures for the UK using a share

price level approach based on the Litzenberger and Rao (1971) valuation model. Using a cross-sectional regression methodology for the period 1979-86 based on a maximum of 442 companies in any year, they provide evidence that yield variables based on operating cash flow and operating funds (working capital) flow are more consistently negatively associated with the rate of growth in those accounting variables in the following year than are yield variables based on accounting earnings. They interpret these findings as strong evidence that operating cash or funds flows are more consistent with the assumed model of security valuation than are accounting earnings, noting that the coefficient for the growth variable in regressions based on accounting earnings tended to be statistically insignificant and in a few years were, perversely, significantly positive. These results, although based on a different research design to Board and Day (1989) and Board et al (1989) and covering a much larger sample of UK companies over a shorter time period, provide a very different view of the information content earnings and cash and funds flow data in the UK capital market.

A study by Kinnunen and Niskanen (1991) analyzes the relative information content of earnings and cash flow data in a pooled sample of 35 Finnish companies for the fiscal years 1976, 1979 and 1982. A notable feature of this study is the use of a long time series of annual report data back to 1951 to estimate forecast models for the firm-variables at the dates given above. In addition to a random walk model, Kinnunen and Niskanen estimated exponentially weighted moving average (EWMA) and ARIMA forecast models for all firm-variables at the above dates and then used a cross-sectional regression methodology, with market model residuals as the dependent

variable, to test for the individual and relative information content of accrual income measures and cash flow measures. Their findings suggest that forecast errors for cash flow from operations and cash flow after investment are significantly related to abnormal returns for EWMA and ARIMA prediction models, while accrual income forecast errors are significantly related to abnormal returns for all prediction models. In relation to relative information content of accrual and cash flow data, they found that working capital from operations consistently had incremental information content beyond cash flow from operations but not vice versa. On the other hand, the evidence in relation to the incremental information content of net income beyond cash flow after investment was mixed, and there was some evidence of incremental information content for the latter over the former for EWMA and ARIMA forecast models. In summary, Kinnunen and Niskanen's findings provide strong support for the information content of both operating cash flow data and investment flows for non-random-walk forecast models and provide some evidence in support of mutual incremental information content for net income and cash flow after investment for such forecast models.

In summary, the limited evidence concerning the information content earnings, funds and cash flow data from the UK provides conflicting evidence concerning the relative information content earnings and operating measures of cash and funds flow, evidence from Board et al (1989) and Board and Day (1989) based on a more conventional research design providing strong evidence of the informational superiority of earnings data and evidence from Sudarsanam and Fortune (1990) based on a share price level approach suggesting the opposite. The other non-US study considered above based on Finnish data, and

incorporating non-operating cash and funds flow data, provides a more balanced view concerning the relative status of earnings and cash and funds flow data in relation to the explanation of abnormal share returns.

b. Discussion and Directions for Future Research

The previous review of MBAR concerned with the information content of cash and funds flow data indicates a substantial attempt to address the concerns of Lev and Ohlson (1982) cited in section 1 of this chapter concerning the need for research into the relative information content of cash flow and earnings. However, a notable difference between the empirical studies reviewed in section 3(b) and section 4(a) is the general failure of the latter work to explicitly incorporate insights from informational models of security valuation. Thus, while Lev and Ohlson's (1982) argument for a more explicit link between security valuation theory and empirical research has been assimilated to an increasing extent in research concerned with the contemporaneous relationship between share returns or prices and accounting earnings data, it has not yet penetrated the growing research area concerned with the information content of cash and funds flow data, with only two of the studies reviewed attempting to apply valuation framework based on the early work of Litzenberger and Rao (1971). The main aim of this sub-section is to indicate some of the possible ways in which valuation perspectives may be developed to provide more complete analyses of the potential role of cash and funds flow data in an efficient market setting, as a basis for further empirical research in the area. The issue of potential

capital market inefficiency in relation to cash and funds flow data is also briefly considered as an area for future research.

One possible direction for an informational valuation perspective on cash flow accounting is based on the Ohlson (1989b) clean-surplus valuation model. In particular, Green and Stark (1991) have noted that the clean surplus concept does not apply exclusively to accrual accounting and use a cash flow income concept taken from Lawson (1981 1985) as a basis for developing empirical tests of the relative explanatory power of cash flow and accruals data vis-a-vis shares price based on estimation of the following equation:

$$P = \alpha_0 + \alpha_1 CFI + \alpha_2 IA + \alpha_3 CFBV + \alpha_4 BVA + \alpha_5 SHCF + \mu$$

where P denotes share price, CFI denotes cash flow income, IA denotes book value accruals, CFBV denotes cash flow book value, BVA denotes book value accruals and SHCF denotes shareholder cash flows. CFI in the above equation, following Lawson, is defined as operating cash flow less investment expenditure, interest payments and tax payments, IA represents the difference between accounting CFI and accrual income (note that their definition of income accruals differs from the usual definition in capital market research of total accruals as the difference between operating cash flow and accrual income), CFBV represents cash less total short, medium and long-term interest bearing debt (this is the book value concept corresponding to the Lawson measure of CFI if, as is required by the Ohlson model, the clear surplus relation holds), BVA is the difference between accrual accounting book value and cash flow book value (CFBV) and SHCF represents dividends paid less net equity capital contributions. The inclusion of CFI, CFBV and SHCF as explanatory variables for P

follows directly from Ohlson's analysis because the clean surplus relation is inherent in the cash flow accounting framework adopted by Green and Stark. They add IA and BVA to the share price equation by modelling these two variables, consistent with the received wisdom in accounting, as 'additional information' relevant to the prediction of future cash flows and dividends (see Ohlson 1989 pp36-40 for the incorporation of 'additional information' into his linear information dynamics model).

An appealing empirical feature of Green and Stark's adaptation of the Ohlson linear information valuation model to the analysis of the relative (share price) information content of cash and accruals data is the circumvention of the need both to estimate unexpected returns and accounting variable forecast errors. There are, however, empirical problems associated with multicollinearity between the variables specified in their share price equation, which have rendered estimation and testing difficult. For this reason, Green and Stark's empirical model is still to be verified as a practical approach to the analysis of the relative information content of cash flow and accrual accounting data. In principle, the incremental information content of accrual data beyond cash flow data simply depends on α_2 and/or α_4 being significantly different from zero, while the incremental information content of cash flow data beyond accruals data depends on $\alpha_1 + \alpha_2$ and/or $\alpha_3 + \alpha_4$. If the estimation and testing problems associated with their approach can be resolved, it may represent a useful basis for future research in the area.

The Ohlson (1989b) linear valuation framework, as discussed above, provides one possible basis for development of valuation-based

approaches to the empirical analysis of the information content of cash and funds flow data. In addition, more recent theoretical developments by Feltham and Ohlson (1992), based on the abnormal earnings capitalisation valuation model (Edwards and Bell 1961, Edey 1962, Peasnell 1981 1982) provides a further possible basis for examination of the relative information content of accounting earnings data and cash flow data, as discussed further in Appendix A of this thesis. A third possible approach is to adapt the linear valuation framework developed by Kormendi and Lipe (1987) and Lipe (1986) into a form that can also deal with non-earnings accounting data. The latter approach forms the basis for the empirical study reported in Chapter 4 and a detailed discussion of this approach is provided there. It is useful, however, to briefly consider the general nature of this approach here.

The adaptation of the 'earnings persistence' approach to analysis of the information content of cash flow data is achieved by replacing the assumption of capitalisation of changes in earnings expectations with the more fundamental assumption of classical valuation theory of capitalisation of changes in dividend expectations. Using basic accounting identities to express dividends in terms a number of cash flow and accrual components, and making the further assumption that these components are generated by a multivariate ARIMA process where expectations of each component is dependent on lagged values of all the components, permits the derivation of a linear returns equation where unexpected returns in a particular period are a function of the forecast errors of the various components in that period. This result is analogous to Lipe's (1986) analysis of the relationship between unexpected returns and the components of accounting earnings

but with dividends replacing accounting earnings as the focus for the assumed valuation model.

The above adaptation of the earnings persistence perspective to the more general case of dividend capitalisation provides a basis for the analysis of both the information content of cash and funds flow data and the relative information content of this data and earnings data. For example, if dividends are expressed as operating cash flow less investment plus financing and multivariate ARIMA forecast models can be estimated for each of these three accounting variables, the dividend capitalisation model suggests that unexpected returns can be expressed as a linear function of the forecast errors associated with each of these variables. Alternatively, if dividends are expressed as accounting earnings plus accruals less investment plus financing and multivariate ARIMA forecast models can be estimated for each of these variables, unexpected returns can be expressed as a linear function of the forecast errors for these variables. If the assumed forecast models correspond to those used by investors, the coefficients in the returns equation will be related in a more or less complex fashion, depending on the structure of the ARIMA forecast models, to the parameters of the market forecast models. Judgements regarding the information content and relative information content of the various accounting variables can then be made on the basis of the size (difference from zero) of and equality between the estimated coefficients for the forecast errors corresponding to accounting variables.

The previous discussion provides a brief indication of the theoretical perspective underlying the approach adopted in the

empirical study described in the next chapter. As noted by Brennan (1991), the valuation framework employed in the study by Kormendi and Lipe (1987), and in that of Lipe (1986), may be regarded as a rational expectations model which "implicitly assumes that the whole of each firm's earnings are paid out in dividends, and this may be the reason for their formal rejection of the model" (Brennan 1991 p75). The approach adopted in the next chapter, as discussed above, attempts to overcome the problem generated by the earnings capitalisation assumption by focussing on dividends. Nevertheless, as will become apparent, the findings are far from consistent with a one-to-one relationship between persistence measures based on forecast model parameter estimates and share response coefficients to accounting forecast errors. While this suggests the need for further research, the more formal approach to the analysis of information content of accounting earnings data developed by Kormendi and Lipe (1987) and Lipe (1986), and extended to the case of earnings and cash flow data in the next chapter, hopefully provides an improved basis for the evaluation of the information content of accounting data.

Finally, it is appropriate to conclude this section with some brief comments on the possible implications of potential anomalies regarding share price responses to non-earnings accounting data. That such anomalies might be expected is succinctly expressed by Bernard and Thomas (1990) in their analysis of post-earnings-announcement drift where they conclude that "if market prices fail to reflect fully the implications of information as freely available as earnings, how well do they reflect information that is not as well-publicised?" (Bernard and Thomas 1990 p339). There appears to have been little research to date concerned directly with the issue of

market efficiency with respect to cash and funds flow data, an interesting exception being the study by Kinnunen and Niskanen (1991) previously reviewed which found pronounced post-announcement drift in share price responses to earnings, funds flow and cash flow forecast errors in their sample of publicly quoted Finnish companies. If such a finding reflects a delayed share price response to accounting data, as casually suggested by Kinnunen and Niskanen, and is also applicable to the larger US and UK capital markets, this would imply the rejection of rational expectation models of stock market response to accounting data. Most of the recent US research concerning market efficiency in relation to non-earnings data has focussed on financial statement data in general (Ou and Penman 1989, Holthausen and Larcker 1991) and therefore only provides indirect, but positive, evidence of possible inefficiency in relation to funds statement data. A more direct research programme addressing capital market efficiency in relation to cash and funds flow data in developed capital markets such as those of the US and the UK would seem to provide a useful complement to research based on the contemporaneous relationship between share prices and such accounting data.

5. Conclusion

This chapter has provided a review and analysis of a number of papers concerned with the informational efficiency of capital markets and the relationship between share prices and accounting data. The review of studies concerned with capital market efficiency began with a comparison of two important concepts of market efficiency developed by Fama (1970 1976) and Beaver (1981) and it was argued that, while

the Beaver concept avoids some of the conceptual problems associated with the Fama concept, in particular the notion of the 'market's expectations', it is difficult to employ empirically due to its lack of correspondence to an operational valuation theory incorporating heterogeneous beliefs and private information. For this reason, the Fama concept based on valuation models incorporating the assumption of homogeneous expectations dominated the empirical studies of market efficiency reviewed, although with the inevitable cost that apparent deviations from market efficiency in this research could be interpreted as reflecting deficiencies in the valuation model / efficiency concept framework employed.

The review of empirical market efficiency studies focussed on the debate over the volatility of share prices in comparison to subsequent dividend realisations and on the extent to which share price movements display serial correlation which can be interpreted as evidence of weak-form informational inefficiency. The findings from the volatility literature are particularly open to alternative interpretations based on different assumptions regarding the nature of the stochastic process generating dividends. If a stationary dividend process is assumed, then the findings may suggest excess volatility and market inefficiency, while if a non-stationary dividend process is assumed, many of the findings are best viewed as indeterminate. The findings from both serial correlation tests at the aggregate stock market level and filter rule tests applied to individual shares suggest some long-horizon serial correlation in returns, although it should be noted that the extent to which any mis-pricing is severe at the individual security level is probably small. A possible exception relates to the case of extreme

performing stocks identified by DeBondt and Thaler (1985 1987) where excess long-term returns were of a considerable magnitude, although the interpretation of these findings as indicative of market inefficiency has been increasingly challenged in the literature.

The main aim of the review and analysis of the stock market volatility and long-term return serial correlation studies was to provide a useful basis from which to view studies of the relationship between share prices and accounting data. If share prices are at least efficient in the weak-form, one aspect of error in share prices as a benchmark for evaluating accounting data is eliminated and there may perhaps be greater confidence in relation to the speed and accuracy with which share prices respond to accounting data. It is probably reasonable to argue that the evidence in relation to market efficiency in the US is sufficiently positive as to support the development of valuation approaches to the analysis of accounting data based on the assumption of market efficiency. Indeed, the empirical literature concerned with the application of various valuation approaches to the analysis of accounting earnings data reviewed in this chapter has achieved a measure of support for the relevance of this approach for increasing our understanding of relationship between share prices and accounting data. On the other hand, the anomalous evidence in relation to possible weak-form market efficiency also suggests that tests of the semi-strong efficiency hypothesis in relation to accounting data are justified, as confirmed by continued findings of post-earnings-announcement drift and other financial statement release anomalies in the US.

Following arguments at the end of Chapter 2, one of the main aims of this chapter was to evaluate the evidence in relation to the relationship between share prices and accounting earnings, funds flow and cash flow data and to consider ways in which the relative information content of earnings and CFFA data may be analyzed in future research. A notable feature of most research concerned with implementing valuation approaches to the analysis of share prices and accounting data has been the focus on accounting earnings. Thus, while this research provides continued, and in some cases more statistically convincing, empirical support for the information content of earnings data, studies of the information content of cash flow data have not widely adopted explicit valuation perspectives, this perhaps explaining some of the weak empirical findings in this area. Indeed, several studies reviewed above have focussed on operating cash and funds flow measures exclusively, such an approach representing a rather extreme rejection of the valuation perspective in relation to cash and funds flow data where non-operating flows must be regarded as of considerable importance to a complete analysis.

The main conclusion to be drawn from the empirical studies of the information content, and relative information content, of earnings and CFFA data is, perhaps unsurprisingly, one of unfinished business. There would appear to be a good case for further work in the development of research designs which provide a more balanced basis for comparing earnings and cash and funds flow data. The next chapter attempts to provide such a study for the UK using a valuation approach briefly outlined at the end of section 4(b) above. Clearly alternative approaches to this area exist, as also indicated in

section 4(b) above, and future research may also wish to address the issue of possible differential capital market efficiency in relation to earnings and cash and funds flow data.

CHAPTER 4 -
AN EMPIRICAL STUDY OF THE INFORMATION CONTENT OF ACCOUNTING EARNINGS,
FUNDS FLOWS AND CASH FLOWS IN THE U.K.

1. Introduction

The aim of this chapter is to develop and test a model of the relationship between measures of cash flow, funds flow and earnings and equity returns. Following research reviewed in the previous chapter (Lipe 1986, Kormendi and Lipe 1987), the proposed model is based on the standard MM equity valuation (Modigliani and Miller 1961, Fama and Miller 1972). A major difference between the proposed model and this previous research, however, is the exclusion of the earnings capitalisation assumption adopted in prior work. The relaxation of this assumption provides the basis for testing the information content of cash and funds flow data and the relative information content of cash, funds and earnings data. A derivation of the proposed model is presented in Section 2, data and statistical methods are described in Section 3, the results of the study are presented and discussed in Sections 4 and 5 respectively and Section 6 concludes the chapter. The remainder of this section is concerned with the hypotheses of the study and the role of the equity valuation model.

The hypotheses of concern to this study may be stated as follows:

- H_{1A}:** Accounting earnings data have no information content in relation to company share prices.
- H_{1B}:** Accounting earnings data have no incremental information content beyond cash flow or funds flow data in relation to company share prices.
- H_{2A}:** Cash flow or funds flow data have no information content in relation to company share prices.
- H_{2B}:** Cash flow or funds flow data have no incremental information content beyond accounting earnings data in relation to company share prices.

As noted in the previous chapter, US evidence in general has rejected H_{1A} , H_{1B} and H_{2A} , while evidence on H_{2B} has been more mixed. In the UK, on the other hand, the limited evidence available (Board and Day 1989, Board Day and Walker 1989) has failed to reject H_{2A} and H_{2B} when cash flow or funds flow data were defined either as operating cash flow or as net current monetary assets from operations and has only convincingly rejected H_{2A} for a working capital definition of operating funds flow. In relation to H_{1A} and H_{1B} , the UK evidence (as for the US evidence) strongly rejects H_{1A} and also rejects H_{1B} for operating definitions of cash and funds flow.

A criticism of prior information content studies of cash and funds flow considered in previous chapters, including the UK studies, has been their focus on operating flows rather than a broader set of cash or funds flows incorporating investment and financing flows (see also Arnold et al 1991, Kinnunen and Niskanen 1991). Hence the role of the MM equity valuation model in the present study is to provide a simple basis for incorporating investment and financing flows into tests of H_{1B} , H_{2A} and H_{2B} . As previously stated, the detailed implications of the MM equity valuation model are discussed in the next section of this chapter. The main point to note here is that the MM valuation model implies that dividends or net dividends is the appropriate aggregate measure of equity cash flow for equity valuation purposes (see Lawson 1981 1985). Surprisingly this well-known result has not been fully utilised in previous share price studies of the information content of cash and funds flow accounting.

The previous chapter focussed in some detail on dividend and earnings valuation models and argued that only recently has

theoretical research begun to establish an informational role for a concept of accounting earnings, based on the clean surplus relation (Ohlson 1989, Feltham and Ohlson 1992), which is consistent with the dividend capitalisation model in an arbitrage free economy. Given the early stage of this theoretical research (see Appendix A and Green and Stark (1991) for discussion of the possible implications of this research for the relative information content of accounting earnings and cash flow data), the approach in the present study was to combine the more limited perspective of earnings as a 'primitive signal' with the dividend equity valuation model to generate a linear unexpected returns equation capable of addressing hypotheses $\{H_{1A} H_{1B} H_{2A} H_{2B}\}$ of the form:

$$UR_t = f(UW_t, UX_t, UO_t, UI_t, UF_t)$$

where UR_t denotes unexpected returns for a particular firm in period t , UW_t denotes unexpected working capital from operations in period t , UX_t denoted unexpected long-term accruals in period t , UO_t denotes unexpected operating cash flow in period t , UI_t denotes unexpected investment in period t and UF_t denotes unexpected financing flow. A number of observations regarding the general significance of this model are appropriate here.

An interesting implication of the linear returns equation presented above relates to the interpretation of previous studies concerned with the information content of accounting earnings and dividend announcements (for example, Aharony and Swary 1980, Kane Lee and Marcus 1984). More specifically, if the coefficients on UW_t and UX_t are equal and the coefficients on UO_t , UI_t and UF_t are equal, the above returns equation reduces to:

$$UR_t = f(UE_t, UD_t)$$

where UE_t denotes unexpected accounting earnings and UD_t denotes unexpected dividends. In other words, previous studies concerned overtly with the incremental information content of dividends beyond earnings can be interpreted as providing evidence on the incremental information content of an aggregate measure of unexpected cash or funds flow [ie: $UD = UO + UI + UF$] beyond accounting earnings. To the extent that these studies find positive incremental information content for dividends, they should be regarded as reinforcing the results based primarily on operating flows (Wilson 1986 1987, Bowen et al 1987) which suggest incremental information content for cash or funds flow data beyond earnings. For this reason, as discussed further in Section 3 of this chapter, the incremental information content of earnings and dividends data were examined for the UK data considered in this study.

A second implication of the linear returns equation presented above is that previous studies which have focussed primarily on operating flows may be misspecified due to the omission of relevant variables from the returns equation. In the UK, this may be a particularly serious problem as previous research (Board and Day 1989, Board Day and Walker 1989) failed to establish information content for cash flow data when the latter was defined in terms of operating flows alone. Furthermore, in a similar vein, the linear returns equation above suggests caution in the interpretation of the findings of studies which examine non-operating flows. For example, for returns equations which include unexpected dividends as an explanatory variable (eg: Livnat and Zarowin 1991, equation (1)), it is important

to emphasise that tests of statistical significance on the other explanatory (cash flow) variables represent tests of the incremental information content of these other variables beyond unexpected dividends. Thus, while such variables may not have incremental information content beyond dividends, as was largely the case in Livnat and Zarowin 1990, they may nevertheless have information content as components of dividends and hence may be 'valuation relevant' in this more conventional sense. (See Jennings (1990) for a discussion of this point in relation to earnings).

The previous two paragraphs have considered implications of the standard MM equity valuation model for the interpretation of previous research and this issue will be discussed further following the presentation of the results of this study. Clearly, the theoretical limitations of this model (see Watts and Zimmerman 1986 Chapter 2, for example, for a discussion of the limitations of the model) undermine its usefulness as a benchmark for analysis of previous empirical research in accounting and for design of further research. On the other hand, as outlined in the previous chapter, valuation theory is increasingly influencing the design of event studies in financial accounting and this is reasonably viewed as a step forward from purely ad hoc regression analysis. The aim of the next section of this chapter therefore is to extend the linear earnings valuation model of Lipe (1986) into a linear dividend valuation model for testing H_{1A} H_{1B} H_{2A} H_{2B} .

2. The Unexpected Returns Model

The unexpected returns model used in this study is based on a simple adaptation of the Lipe (1986) earnings component unexpected returns model. This section provides a brief derivation of the model and discusses the implications of hypotheses H_{1A} H_{1B} H_{2A} H_{2B} for the linear coefficients of the unexpected accounting variables suggested by the model. Appendix B provides a more detailed derivation of the model which extends the original Lipe formula (Lipe 1986 pp61-63) to accommodate first-order serial autocorrelation in the prediction model residuals (see Section 3(b)(ii) of this chapter for evidence of serial correlation in the prediction models used in this study).

It is convenient to begin the analysis by expressing dividends per share in period t , D_t as follows:

$$D_t \equiv E_t + X_t + Y_t + I_t + F_t$$

where E_t denotes accounting earnings in period t , X_t denotes long-term accruals in period t , Y_t denotes current accruals in period t , (minus) I_t denotes investment in period t and F_t denotes net financing receipts in period t and where all variables are expressed on a per share basis. The specification of the above identity together with detailed definitional issues pertaining to the accounting variables are not relevant here and are discussed prior to reporting the results from the empirical analysis. In addition, define O_t and W_t , operating cash flow and working capital from operations per share respectively, as follows:

$$O_t \equiv E_t + X_t + Y_t$$

$$W_t \equiv E_t + X_t$$

Let $\underline{dC}_t = \underline{C}_t - \underline{C}_{t-1}$ be a 5 x 1 vector comprising the difference between period t and period t-1 of any five of the eight accounting variables given in the above funds flow identities such that knowledge of $\underline{dC}_t$ permits the inference of the change in all eight variables between t and t-1. For example, $\underline{dC}_t$ could take the form $[dE_t \ dX_t \ dO_t \ dI_t \ dD_t]$ but not $[dE_t \ dX_t \ dY_t \ dO_t \ dI_t]$ where d represents the first difference operator. Given this property of $\underline{dC}_t$, note that the vector $[dE_t \ dX_t \ dY_t \ dI_t \ dF_t]$ may be written as $\underline{A} \underline{dC}_t$, where $\underline{A}$ is a 5 x 5 matrix.

The model assumes that the appropriate prediction model for $\underline{dC}_t$ is AR1 such that:

$$\underline{dC}_t = \underline{Z} \underline{dC}_{t-1} + \underline{V}_t \quad (1)$$

where $\underline{Z}$ is a 5 x 5 matrix of coefficients and $\underline{V}_t$ is a serially correlated disturbance term such that:

$$\underline{V}_t = \underline{\alpha} \underline{V}_{t-1} + \underline{UC}_t \quad (2)$$

and where $\underline{\alpha}$ is a 5 x 5 diagonal matrix of serial correlation coefficients and $\underline{UC}_t$ is a 5 x 1 vector of shocks corresponding to the accounting variables comprising $\underline{dC}_t$. The aim of the analysis is to obtain a 5 x 1 vector of 'persistence measures', based on $\underline{A}$, $\underline{Z}$ and $\underline{\alpha}$, which provides measures of the share return response to a fl shock in the relevant accounting variable.

If $e_t(\underline{dC}_{t+s})$ represents the expectation of $\underline{dC}_{t+s}$ at time t, it is easily shown that:

$$e_t(\underline{dC}_{t+s}) = \underline{Z}^s \underline{dC}_t + \sum_{j=0}^{s-1} \underline{\alpha}^{s-j} \underline{Z}^j \underline{V}_t \quad (3)$$

and, by further manipulation, that:

$$e_t(\underline{dC}_{t+s}) - e_{t-1}(\underline{dC}_{t+s}) = Q_s \underline{UC}_t \quad (4)$$

where:

$$Q_s = \sum_{j=0}^s \alpha^{s-j} \underline{Z}^j$$

Next, equation 4 is manipulated in order to remove the first difference operator and yields the following expression for the change in expectations of $\underline{C}_{t+s}$ between time $t-1$ and time t :

$$e_t(\underline{C}_{t+s}) - e_{t-1}(\underline{C}_{t+s}) = [\underline{I} + \sum_{k=1}^s Q_k] \underline{UC}_t \quad (5)$$

Finally, equation 5 is premultiplied by $\underline{A}$ so that it now represents the change in expectations of a 5×1 vector $[E_{t+s} \ X_{t+s} \ Y_{t+s} \ I_{t+s} \ F_{t+s}]$ between time $t-1$ and time t , a discount factor R^s is applied (where $R^s = 1/(1+r)^s$ where r is the appropriate discount rate) and the resulting vector is summed over $S = 0$ to ∞ such that:

$$\sum_{s=0}^{\infty} R^s \underline{A} [e_t(\underline{C}_{t+s}) - e_{t-1}(\underline{C}_{t+s})] = \underline{A} [(\underline{I} - \underline{Z}R)(1 - R)]^{-1} [\underline{I} - \alpha R]^{-1} \underline{UC}_t \quad (6)$$

Equation (6) represents a 5×1 vector of the discounted sum of revisions in future expectations of $E_t \ X_t \ Y_t \ I_t$ and F_t , $t = 0, 1, \dots, \infty$. Summing the components of this vector by premultiplying by $\underline{i} = [1 \ 1 \ 1 \ 1 \ 1]'$ gives a scalar quantity equal to the present value of revisions in future expected dividends per share induced by the shocks, $\underline{UC}_t$, as $D_t \equiv E_t + X_t + Y_t + I_t + F_t$. Alternatively stated, given the assumption of the constant discount rate dividend valuation model, this scalar quantity is equal to the unexpected return per share (measured in £s) induced by the shocks, $\underline{UC}_t$. Furthermore, it

follows that the impact on returns of a fl shock in the accounting variables comprising $\underline{UC}_t$, ie: the persistence measures associated with the set of five accounting variables comprising $\underline{UC}_t$, can be written as a 5 x 1 vector as follows:

$$\underline{PM} = [\underline{i}'\underline{A}[(\underline{I} - \underline{Z}R)(1 - R)]^{-1}[\underline{I} - \underline{\alpha}R]^{-1}]' \quad (7)$$

The preceding analysis has demonstrated that the share return response to the shock vector $\underline{UC}_t$ is a linear function of the individual shocks comprising that vector, the coefficients of which are given by the vector of persistence measures represented by equation (7). The derivation of equation (7) was based on Lipe's (1986) derivation of an earnings persistence vector, with the further complication of first order serial correlation in the disturbance term, $\underline{V}_t$, in the multivariate AR1 prediction model such that the vector of shocks in the accounting variables is given by $\underline{UC}_t = \underline{V}_t - \underline{\alpha} \underline{V}_{t-1}$. Indeed, if $\underline{A}$ is set equal to $\underline{I}$ (as assumed effectively by Lipe) and $\underline{\alpha}$ is set equal to $\underline{0}$, equation (7) reduces to the form of the Lipe persistence vector (p63 eq (B10)):

$$[\underline{i}'[(\underline{I} - \underline{Z}R)(1 - R)]^{-1}]'$$

A more important conceptual difference between the preceding analysis and that of Lipe is the use of a dividend capitalisation model as opposed to an earnings capitalisation model. As discussed in the previous chapter, the Lipe model requires the assumption that "the present value of revisions in expectations of future equity-benefits induced by a component shock can be approximated by the present value of the revisions in expected future earnings" (p38). While this assumption may be reasonable in the context of an analysis

focussing solely on the information content of earnings (and its components), it may not be an appropriate basis for an analysis of the relative information content of earnings and cash funds flow data. It is now necessary to show how the dividend capitalisation approach presented above provides such a basis.

The previous analysis has shown that unexpected share returns (measured in fs) at time t are a linear function of the shocks in accounting variables contained in $\underline{UC}_t$ given the joint assumption of dividend capitalisation at a constant discount rate r and a multivariate AR1 prediction model for $\underline{dC}_t$. As stated earlier, $\underline{dC}_t$ is defined as any set of (first differenced) accounting variables from which can be derived a set of (first differenced) accounting variables which sum to (first differenced) dividends, ie: $dD_t \equiv dE_t + dX_t + dY_t + dI_t + dF_t$ above. If this is the case, it follows that $\underline{UC}_t$ is a vector of accounting variable shocks from which a vector of shocks $[UE_t \ UX_t \ UY_t \ UI_t \ UF_t]$ can be derived using the basic accounting identities given above. Furthermore it follows that unexpected share returns can be expressed as a linear function of UE_t , UX_t , UY_t , UI_t and UF_t and hence, making further use of the accounting identities, as a linear function of, say, UW_t , UX_t , UO_t , UI_t , UF_t as outlined in the Introduction. Clearly a large number of linear unexpected returns model formulations are possible but the latter, represented by:

$$UR_t = a_1 UW_t + a_2 UX_t + a_3 UO_t + a_4 UI_t + a_5 UF_t \quad (8)$$

can be related quite simply to the hypotheses of this study and is therefore employed in subsequent empirical analysis. What are the implications of H_{1A} , H_{1B} , H_{2A} , H_{2B} for equation (8)?

For the purpose of discussion, we focus on the implications of equation (8) for the comparison of earnings and cash flow data ie: UW and UX are viewed as unexpected earnings components and UO, UI and UF are viewed as unexpected cash flow components (the status of UW as a measure of funds flow is considered at a later stage in the discussion of empirical results). The two hypotheses relating to the information content of cash flow data, H_{2A} and H_{2B} , would both be rejected if $a_1 = a_2 = 0$ and at least one of a_3 , a_4 , a_5 differs from zero. The two hypotheses relating to the information content of accounting earnings data, H_{1A} and H_{1B} , on the other hand, would both be rejected if $a_3 = a_4 = a_5 = 0$ and either a_1 or a_2 differed from zero. Note, however, that $a_1 = a_2 = 0$ does not necessarily imply failure to reject H_{1A} as UW_t and UX_t may have some explanatory power in relation to UR_t in the absence of UO_t , UI_t and UF_t . Similarly, $a_3 = a_4 = a_5 = 0$ does not necessarily imply failure to reject H_{2A} . Finally, note that the outcome where at least one of a_1 and a_2 and at least one of a_3 , a_4 and a_5 differs from zero would imply rejection of H_{1B} and H_{2B} , but would not provide a definite answer in relation to H_{1A} and H_{2A} for, as discussed by Bowen et al (1987), it is possible that both sets of data have incremental information content beyond the other while possessing no information content alone.

In summary, given the assumptions of the MM equity valuation model and a multivariate ARI market prediction model for accounting variables, a linear unexpected returns model, represented by equation (8), with implications for the four hypotheses of interest to this study has been derived. Clearly, as discussed further in Section 4 of this chapter, equation (8) primarily relates to the hypotheses of incremental information content (H_{1B} H_{2B}) and investigations of H_{1A}

and H_{2A} require investigation of the relationships between UR_t and UW and UX (for H_{1A}) and UO_t , UI_t and UF_t (for H_{2A}). Finally, although tests of H_{1A} and H_{2A} involve truncation of the full theoretical return response given by equation 8, such analysis would appear to be preferable to much previous work which has relied on analysis of the relationship between UR_t and a single earnings or cash flow forecast error for making inferences concerning information content.

3. Research Method and Data

This section provides a description of the research method and data used in the study. First, the dataset and sample used are described. The measurement of the accounting variables and the estimation of shocks in these variables are described next. Third, the measurement of unexpected returns and the estimation of the returns equations are considered. Finally, the statistical tests used in the study are outlined.

a. Datasets and Sample

The datasets used in the study are the Cambridge DTI Databank of Company Accounts and the London Share Price Database (LSPD), with Meeks (1985) and LBS (1987) used respectively for definitional matters. The sample consisted of all companies with continuous data on both datasets between 1955 and 1984 and which maintained either December 31st or March 31st accounting year-ends throughout the sample period. In total, 48 companies, 26 with December year-ends and 22 with March year-ends, were analyzed in the study. Table 1

provides a broad indication of the industrial sectors represented by these companies.

b. Measurement of Accounting Variables

The measurement of the accounting variables was guided by definitional information on the Cambridge DTI Databank in Meeks (1985) and Singh and Whittington (1968). Aggregate measures of earnings (E), long-term accruals (X), current accruals (Y), investment (I) and financing flows (F) were calculated for all company-years over the period 1955-84 and checked against aggregate dividends (D) for each company-year. For most company-years, the definitions of E Y X I F and D were such that the identity $D \equiv E + X + Y + I + F$ held exactly. Not surprisingly, however, the identity did not hold in some company-years due the existence of non-zero items which could not be appropriately classified. It is useful to describe in greater detail the definitions of these variables and the scaling methods used before considering the statistical procedures used to generate estimates of the unexpected component or shock corresponding to a variable in each company year.

(i) Definition and Scaling of Variables - The definition of the accounting variables E, X, Y, I, F were as follows:

E = Operating Profit + Dividend and Interest Income +
Other Income - Interest Expense - Tax Expense.

X = Depreciation Expense + Transfer to Deferred Tax
Reserve.

Y = Change in Trade and Other Creditors + Change in
Current Tax Liabilities + Change in Stocks and Work-in-
Progress + Change in Trade and Other Debtors.

$I = -(\text{Net Expenditure on Tangible Fixed Assets, Intangible Fixed Assets, Trade Investments and Subsidiaries} + \text{Change in Marketable Securities, Tax Reserve Certificates and Cash}).$

$F = \text{Net Proceeds from Ordinary Shares, Preference Shares and Long-Term Liabilities} + \text{Bank Credit Received}.$

A more detailed account of the derivation of these measures from the Cambridge DTI Databank is provided in Appendix C. From the variables given above, measures of working capital from operations ($W \equiv E + X$) and operating cash flow ($O \equiv E + X + Y$) were obtained. The measure of dividends (D) was taken directly from the databank.

All variables used in the estimation of prediction models for sample companies were converted into real terms using the Retail Price Index and expressed on a per share basis. Monthly RPI data and year-end share numbers were taken from the LSPD. In addition, the scaling of the variables onto a per share basis was adjusted for bonus and rights issues using adjustment factors provided by the LSPD. Further details on the scaling of the accounting variables is provided in Appendix C. Finally, as pointed out by Lipe (1987), the use of the RPI to deflate the accounting variables is primarily an adjustment to reduce the possibility of heteroskedasticity in the disturbance terms of the assumed market prediction models (and also potential problems of multicollinearity between explanatory variables in the prediction model) and not an attempt to measure constant purchasing power accounting figures.

(ii) **Estimation of Accounting Prediction Errors** - As discussed in Section 2, the market prediction model assumed in this study is an AR1 multivariate model of the form given in equation (1). For the purpose of estimation, $\underline{dC}_t$ was defined as the vector $[dE_t \ dX_t \ dO_t \ dI_t$

dD_t] where d is the first difference operation and E_t , X_t , O_t , I_t and D_t are measured in real £'s per share, as discussed in the previous paragraph. The main reason for choosing this E X O I D combination was that significance tests on the coefficients of this model provides direct evidence on the validity of the random walk model in relation to accounting earnings, operating cash flow and dividends. This issue is discussed more fully in Section 4. In addition, the Pearson correlation coefficients for each of the accounting variables in Table 2 shows that pairwise correlations between this set of (first-differenced) variables were quite low in comparison to the other possible combinations, possibly indicating less estimation error due to multicollinearity than for other combinations.

For each company, five prediction equations of the following form were estimated using OLS:

$$dC_{it} = \sum_{j=1}^5 Z_{ij} dC_{j,t-1} + V_{it} \quad i = 1, 2, \dots, 5 \quad (9)$$

where dC_{it} represents the i^{th} component of the vector $\underline{dC}_t$.

Studentized residuals were then analyzed to identify outliers exceeding a cut-off of 3 standard deviations. As explained by Maddala (1989 p412), there is a better chance of detecting outliers using studentized residuals rather than standardized OLS residuals as the outlier observation itself is not included in the estimation of studentised residuals. The selection of a cut-off is necessarily arbitrary but it was felt that a cut-off of 3 standard deviations would at least ensure the deletion of larger rogue observations, while maintaining a low probability of deletion of good observations. In addition, equation (9) was re-estimated using a maximum likelihood

procedure which provided significance tests for α_1 in the following autocorrelation function:

$$V_{1t} = \alpha_1 V_{1t-1} + W_{1t} \quad (10)$$

As discussed in Harvey (1981), the reason for using this test for autocorrelation is that the conventional Durbin-Watson test statistic is biased towards 2 when there is a lagged dependent variable, as in equation (9).

For the company equations which did not reject the hypothesis that autocorrelation coefficient was equal to zero and for which there were no outliers according to the above criteria, the OLS residuals were used as estimates of UC_{1t} . For those company equations with no outliers but autocorrelation coefficient estimates which were significantly different from zero, the residuals from the maximum likelihood estimate were used to estimate UC_{1t} as follows:

$$UC_{1t} = W_{1t} = V_{1t} - \alpha_1 V_{1t-1} \quad (11)$$

Finally, for those company equations containing one or more outliers, the outlier observations were deleted and the equation re-estimated using OLS and maximum likelihood procedures. Depending on the evidence regarding autocorrelation in the re-estimated equation, either OLS residuals or maximum likelihood residuals (as in equation (11)) were used as estimates for UC_{1t} .

From a total of 240 company prediction equations, 87 (36.25%) contained one or more outliers and 54 (22.5%) showed evidence of autocorrelated residuals. Table 3 provides a more detailed breakdown

of the incidence of outliers and autocorrelation according to dependent variables across the 48 sample companies.

The procedure described above generated a series of forecast errors for earnings (UE), long-term accruals (UX), operating cash flow (UO), investment (UI) and dividends (UD) for each company. Where no autocorrelation or outliers were detected, a series consists of 28 annual observations. In cases where autocorrelation was detected, the use of equation (11) to estimate forecast errors results in the loss of the observation at the beginning of the series and the existence of outliers results in further loss of observations. Given that the full returns equation involves a regression for each company of a measure of unexpected returns on five forecasts error series based on those described above, it can be argued that deletion of an observation from all forecast error series in a year where there is a missing value in one, or perhaps two, of these series is particularly wasteful of data. On the assumption that outliers in the prediction equations are caused by an omitted (discontinuous) variable and given that the expectation of a forecast error is zero, these outlier observations were given a value of zero.

c. Unexpected Returns and the Returns Equations

The main returns equation used in the study involved a regression of unexpected returns at time t on the forecast errors for working capital from operations (UW_t), long-term accruals (UX_t), operating cash flow (UO_t), investment (UI_t) and financing (UF_t). UW_t and UO_t were estimated from the forecast series described in the previous sub-section by utilising the two basic funds flow identities, $UW_t \equiv UE_t + UX_t$ and $UF_t \equiv UD_t - UO_t + UI_t$. Before discussing the returns

equations in greater detail, it is necessary to consider the measurement of unexpected returns.

(i) **Unexpected Returns** – Following Lipe (1986), residuals from an annual market model were used as the measure of unexpected or abnormal returns for each company. This can be expressed algebraically as follows:

$$R_{it} = a + bR_{mt} + URR_{it} \quad (12)$$

where R_{it} is the company's return in year t , R_{mt} is the return on FTA share return index in year t , a and b are regression coefficients for the company and URR_{it} is the residual return in year t . Monthly returns data for each sample company were aggregated into 30 annual returns observations per company and regressed using OLS against 30 annual market return observations.

For December 31st (March 31st) year-end companies, the annual return for year t represents the sum of the 12 monthly returns between May (August) of year t and April (July) of year $t+1$. A simple summation of monthly returns is only required as LSPD returns are measured on a continuous compounding basis. A four month lag in the annual return cumulation period was chosen (compared to a 2 month lag in Board and Day (1989) for example) in order to increase the probability that relevant information releases, in particular the publication of the annual report, occurred within the return cumulation period. Table 4 provides summary statistics for the 48 annual market model regressions.

(ii) **The Returns Equations** - A set of six returns equations of the following form were estimated for each company in the sample using OLS:

$$URR_t = \beta_0 \frac{1}{P_t} + \beta_1 \frac{UW_t}{P_t} + \beta_2 \frac{UX_t}{P_t} + u_t \quad (13)$$

$$URR_t = \beta_0 \frac{1}{P_t} + \beta_1 \frac{UE_t}{P_t} + u_t \quad (14)$$

$$URR_t = \beta_0 \frac{1}{P_t} + \beta_1 \frac{UO_t}{P_t} + \beta_2 \frac{UI_t}{P_t} + \beta_3 \frac{UF_t}{P_t} + u_t \quad (15)$$

$$URR_t = \beta_0 \frac{1}{P_t} + \beta_1 \frac{UD_t}{P_t} + u_t \quad (16)$$

$$URR_t = \beta_0 \frac{1}{P_t} + \beta_1 \frac{UW_t}{P_t} + \beta_2 \frac{UX_t}{P_t} + \beta_3 \frac{UO_t}{P_t} + \beta_4 \frac{UI_t}{P_t} + \beta_5 \frac{UF_t}{P_t} + u_t \quad (17)$$

$$URR_t = \beta_0 \frac{1}{P_t} + \beta_1 \frac{UE_t}{P_t} + \beta_2 \frac{UD_t}{P_t} + u_t \quad (18)$$

where P_t represents real share price (adjusted for rights and bonus issues) at the beginning of year t , u_t is a disturbance term and all other variables are as previously defined. It is useful to consider equation (17) first as this is the empirical counterpart to equation (8) derived in section 2 and is the central focus of the empirical analysis.

Equation (17) can be viewed as a transformation of equation (8) involving the addition of intercept and disturbance terms to the latter and the division of the equation by P_t , the opening share price. In particular, division of equation (8) by the share price at the beginning of period t converts UR_t , unexpected return in period t measured in £s, into the unexpected rate of return, URR_t , for that period. As discussed by Lipe, such a transformation permits regression analysis in terms of percentage returns as is usual practice in capital market research in accounting. In addition, it

is likely that the transformation reduces possible problems of heteroskedasticity in analysis based on untransformed data. Finally, given that estimates of the forecast errors in equation (17) are measured in real terms, it is appropriate to define P_t , the share price at the beginning of the period, in real terms. Estimates of the β coefficients can therefore be interpreted as estimates of the real (money) reaction to a one-pound real forecast error, given the other forecast errors.

Equations (13) to (16) above represent restricted versions of the full model given by equation (17) and consider separately the share return response to earnings and cash flow forecast errors. The estimated forecast errors used to estimate these equations are again those based on equation (9) above and hence accrual data has been used to estimate cash flow forecast errors and vice versa. Thus, the findings concerning the separate information content of these two datasets relate strictly to share return responses to forecast errors and do not preclude the possibility of either dataset playing a significant forecasting role in relation to the other.

Finally, as noted in the earlier discussion of equation (8) in section 2, a linear regression of unexpected returns on any five accounting forecast errors fully reflecting unexpected dividends, such as equation (17), is theoretically consistent with the assumed AR1 multivariate prediction model. Due to estimation error and inaccurate assumptions in relation to the market prediction model, it is likely that the relationship between the estimated regression coefficients from equation (17) and estimates of the corresponding persistence measures derived from the substitution of prediction

model regression coefficient estimates into equation (7) will be less than perfect. Nevertheless, it is desirable to investigate the relationship between β estimates based on equation (17) and persistence estimates based on the assumed AR1 prediction model, equations (1) and (2). Following a similar approach to Lipe (1986), the following univariate regression of estimates of β_1 (based on equation (17)) on estimates of PM_i (based on estimation of equations 1 and 2 and substitution of resulting estimates of $\underline{Z}$ and $\underline{\alpha}$ in equation 7) was therefore carried out for each of the 48 companies:

$$\hat{\beta}_1 = d_0 + d_1 PM_1 + u_1 \quad i = 1, 2, \dots 5 \quad (19)$$

where d_0 and d_1 are intercept and slope coefficients and u_1 is a disturbance term. The findings were then analyzed in order to test the null hypothesis of no association ($d_1 = 0$) between the variables in equation (19). As discussed more fully in Appendix D, the estimates of β_1 and PM_1 used to estimate equation (19) for each company relate to the forecast errors UE , UX , UY , UI and UF rather than UW , UX , UO , UI and UF used in equation (17), as this reduces the chance of spurious correlations and is more readily comparable with the previous earnings-based results of Lipe.

d. Statistical Tests

The hypotheses of the study were tested individually for each firm on the basis of T- and F-statistics generated from the estimation of equations 13-18 and these test statistics were then, following Lipe (1986), aggregated across firms in the sample using the binomial test (see Siegel and Castellan 1988 pp 38-44 for a description of the binomial test). For example, if the significance level for T- or F-tests is set at 10%, the binomial test suggests that the number of

such test statistics rejecting the null hypothesis at this level for a sample of 48 companies should exceed 10 (8) for rejection of the null hypothesis across the whole sample at the 1% (5%) level. The binomial test requires that more than 12 out of 48 company test-statistics reject the null hypothesis at the 10% level for the null hypothesis to be rejected across the whole sample at the 0.1% level.

Clearly, more demanding significance levels (for example, 1% or 5%) could be used in place of 10% for T- and F-tests on individual company data but it should be noted that aggregation across the sample using the binomial test might give undue weight to outlier companies if such an approach were adopted. For example, it is necessary that only more than 3 out of 48 company test-statistics reject the null hypothesis at the 1% level for the null hypothesis to be rejected across the whole sample at the 1% level. Although the choice of significance level for judging individual company test statistics is somewhat arbitrary, it was decided that a 10% level for these statistics, used in conjunction with a cross sample binomial test providing evidence of rejection of the null hypothesis at the 5%, 1% and 0.1% levels, provides an appropriate test of the study's hypotheses.

4. Empirical Findings

This section begins with an analysis of the estimated forecast equations from which the accounting forecast errors were derived. The empirical results from the estimation of equations (13), (14), (15) and (16) are then considered and their implications for H_{1A} and

H_{2A} are discussed. Thirdly, the results from estimation of equations (17) and (18) are considered in relation to the two hypotheses, H_{1B} and H_{2B} , concerned with the incremental information content of cash flow and earnings data. Finally, the results from estimation of equation (19), dealing with the relationship between estimated returns coefficients (based on equation (18)) and corresponding persistence estimates, are examined.

a. Forecast Equations

Table 5 provides a summary of estimated forecast equation coefficients and associated t-statistics. A notable feature of Table 5 is the relatively large number of significant negative t-statistics for the lagged dependent variable in the forecast equations for E, X, O and I. In all four cases, the number of statistically significant t-statistics is clearly greater than that expected by chance (as noted above, a binomial test indicates that if the number of significant t-statistics at the 10% level exceeds 10 out of 48, then the null hypothesis that there are no more significant coefficients than expected by chance is rejected at the 1% level). Furthermore, for the E, O, and I forecast equations, there appears to be a statistically significant predictive role for one or more of the additional lagged explanatory variables. The forecast equation for D, on the other hand, contains fewer statistically significant coefficients on the lagged explanatory variables and while the number of coefficients on lagged values of D and E which are statistically significant is greater than expected by chance, the sign of these coefficients varies across companies.

The main implication of Table 5 is that for the sample of companies considered in this study, a random walk prediction model for E, X, O and I is not appropriate. Estimation of the forecast equation for E across companies suggests that earnings changes may be negatively related to previous earnings changes and positively related to previous long-term accrual and operating cash flow changes. Further, the mean cross-company coefficients on the lagged dependent variable in the forecast equations for X, O and I (-0.322, -0.369 and -0.384 respectively) are more strongly negative than for earnings and there is some suggestion of a reciprocal predictive role for operating cash flow and investment changes, although the sign of these relationships varies across companies. Rejection of a random walk predictive model is less clearcut for D where there is only relatively weak evidence that previous period changes in earnings, long-term accruals and dividends influence the current period change in dividends.

b. Information Content of Earnings and Cash Flows and Related Hypotheses

A summary of the main empirical findings from estimation of equations (13), (14), (15) and (16) are provided in Tables 6 and 7. The main implications of these findings for H_{1A} and H_{2A} and related hypotheses are now considered.

The findings from estimation of equations (13) and (14) in Table 6 strongly reject H_{1A} . Thus, the number of statistically significant positive coefficients at the 10% level for UW in equation (13) and UE in equation (14) (using a one-tail test, see Jennings (1990)) exceeds 50% of the sample of companies (54% and 58% respectively), while the number of statistically significant negative coefficients at the 10%

level for UX (using a one-tail test) represents 37% of the sample and considerably exceeds the number of significant coefficients expected by chance on the basis of a 0.1% binomial test. The findings from estimation of equations (13) and (14) reported in Table 6 therefore suggest statistically significant associations of the correct sign between forecast errors and unexpected returns.

In addition to testing the individual coefficients of UW and UX in equation (13), a test of the equality of the coefficients of UW and minus UX across the sample of companies was carried out. The findings reported in Table 7 indicate that for only 7 companies is it possible to reject the hypothesis of equality of these coefficients at the 10% level (using a two-tail test). This suggests that, while UW and UX are individually value relevant components of UE, it is not generally possible to reject the hypothesis these components of UE provide no incremental information beyond that provided by UE alone on the basis of a 5% binomial test. Alternatively stated, H_{2B} , the null hypothesis concerning the incremental information content of cash flow or funds flow data beyond earnings data, cannot be rejected under the rather restricted interpretation that funds flow data refers only to working capital from operations.

The findings from estimation of equations (15) and (16) in Table 6 reject H_{2A} . In particular, the number of statistically significant positive coefficients at the 10% level for UO (one-tail test) represents just under 50% of the companies in the sample and a binomial test that this is no greater than expected by chance is therefore easily rejected at the 0.1% level. A notable feature of the findings in relation to equation (15) reported in Table 6 is the

similarity in the cross-company distribution of the estimated coefficients for UO, UI and UF. This raises two issues of particular interest. Firstly, given the appropriateness of applying a one-tail test to the coefficient of UO (ie: a positive sign is anticipated for this coefficient), it would also appear appropriate to apply a one-tail test for the coefficients of UI and UF. This has been done in Table 6 where the number of significant positive coefficients for UI and UF is similar to that for UO. Secondly, the similarity of cross-company distribution of coefficients for UO, UI and UF suggests that the disaggregation of UD into these three components may add little information beyond that contained in UD alone (note that the findings for equation (16) in Table 6 confirm that the aggregate measure of UD has statistically significant explanatory power in relation to unexpected returns).

Table 7 contains a summary of the results of a number of tests of equality between the coefficients of UO, UI and UF in equation (15). Firstly, an F-test for equality of the three coefficients is rejected at the 10% level in 9 out of 48 companies, thus only rejecting the null hypothesis of equality across the sample using a 5% binomial test. Secondly, t-tests of pairwise equality of the coefficients clearly fail to reject the hypothesis of equality between the coefficients of UI and UF but offer somewhat different findings in relation to equality of UO and UI coefficients and UO and UF coefficients where 12 significant t-statistics at the 10% level represents a marginal rejection of the null hypothesis of equality of coefficients using a 0.1% binomial test. These findings therefore provide some evidence that operating cash flow has incremental information content beyond an aggregate measure of dividends.

In summary, the findings in relation to the information content of earnings and cash flow components decisively reject the hypotheses of no information content, H_{1A} and H_{2A} . In relation to the related issues of the incremental information content of working capital from operations and long-term accrual components beyond earnings and the incremental information content of operating cash flow, financing and investment components beyond dividends, the findings indicate no incremental information content in earnings components but offer some evidence of incremental information content for operating cash flows beyond dividends.

c. Relative Information Content of Earnings and Cash and Funds Flows

Findings from the estimation of equations (17) and (18) provide evidence in relation to the relative information content of earnings and cash flow components and the related issue of the relative information content of earnings and dividends. The findings from estimation of equation (17) reject both H_{1B} and H_{2B} as there are more significant coefficients at the 10% level (one-tail test) than expected by chance for all accounting variables in terms of a 0.1% binomial test. In the case of the earnings components, UW and UX, the sign of the estimated coefficients are broadly as expected (the mean and median of the coefficients on UW and UX are positive and negative respectively), hence justifying the use of one-tail tests. Similarly, a large majority of the coefficients on UO are positive as expected and, given again the similarity in the cross-company distribution of estimated coefficients for UO, UI and UF (as in equation 15), a one-tail test has been applied for each of these components. Note also that the findings indicate the rejection of

H_{1B} if unexpected working capital from operations, UW , is regarded as 'cash flow or funds flow data' rather than 'earnings data' due to the statistical significance of the estimated coefficients for unexpected long-term accruals, UX , for a substantial number of companies. Alternatively stated, the findings suggest that aggregate accounting earnings (or long-term accruals) have information content beyond that contained in an aggregated working capital based funds statement ie: the finding that UX has information content beyond UW , UO , UI and UF is equivalent to the finding that UE or UX has information content beyond funds statement components UW , UI , UF and UY , where $UY \equiv UO - UW$ represents unexpected current accruals.

The findings from estimation of equation (18) confirms, at an aggregate level, the rejection of both H_{1B} and H_{2B} . Thus, for both unexpected earnings and unexpected dividends there are more significant positive coefficients than expected by chance using a 0.1% binomial test. In terms of statistical significance, the finding of incremental information for earnings beyond dividends appears to be stronger than for the converse relationship, although the number of positive estimated coefficients on unexpected dividends (36 out of 48) exceeds the number of positive coefficients on unexpected earnings (32 out of 48).

Finally, pairwise tests of equality between the coefficients of UW and minus UX and between the coefficients of UO , UI and UF in equation (17) are reported in Table 7. Given the findings for equation (13) already discussed, rejection of equality between the coefficients of UW and minus UX is to be expected and is confirmed in Table 7. The more interesting issue concerns the tests for pairwise

equality of the coefficients of UO, UI and UF where, for the case of equation (15), equality between UO and UI and between UO and UF were both rejected at the 0.1 % level using a binomial test. In the case of equation (17), it can be seen from Table 7 that for both these pairwise tests it is no longer possible to reject the hypothesis of equality between these coefficients, rejection of equality occurring at the 10% level in only 6 companies for UO and UI and 7 companies for UO and UF, both these figures falling short of the 8 companies required for rejection of the hypothesis of equality over the whole sample using a 5% binomial test. Furthermore, the failure to reject the hypothesis of equality between UI and UF coefficients is stronger than for the case of equation (15), with only 4 companies rejecting equality between these coefficients at the 10% level. The implication is that in the presence of earnings data, represented by UW and UX, there is little difference in the share return response to shocks in the three cash flow components considered in the study.

d. Returns Equation Coefficients and Persistence Estimates

The analysis in section 2 of this chapter described the theoretical unexpected returns model underlying this study. As discussed in section 3, a corollary of adopting this model is to examine the relationship between estimated returns coefficients based on equation (17) and estimates of persistence based on the substitution of forecast equation coefficients in equation (7) (as explained in Appendix D, persistence and returns coefficient estimates based on E, X, Y, I and F rather than W, X, O, I and F are analyzed here). Table 8 provides summary statistics for persistence estimates for earnings (PE), long-term accruals (PX), current accruals (PY), investment

flows (PI) and financing flows (PF), where the average annual real rate of return over the sample period for each company is used as a proxy for the constant discount rate used in equation (7). Summary statistics for the corresponding returns equation coefficients are also provided in Table 8 for comparative purposes (note that return response coefficients for UE, UX, UY, UI and UF are derived from the estimation of equation (17), see Table 6, using basic accounting identities).

An important feature of Table 8 is the similarity in the cross-company distribution of the five persistence measures. In addition, the cross-company distribution of returns equations coefficients appear to be similar, with only the UE coefficient displaying notable divergence. A potential problem suggested by these summary statistics is that differences between persistence estimates for the five accounting variables, and between returns equation coefficient estimates, for a particular company are likely to be substantially affected by estimation error. In order to examine further the intra-company variation in persistence and returns equation estimates, mean absolute differences between persistence estimates, and between returns equation estimates, for the five accounting variables are provided in Table 9.

The mean absolute differences provided in Table 9 confirm the relatively narrow range of variation found between persistence estimates and between returns coefficient estimates for the average company. The range of variation for the persistence estimates, however, is substantially narrower than for returns equation coefficients, a point amplified by the fact that the mean / median

persistence estimate is nearly four times the mean / median returns coefficient estimate. For both persistence measures and returns coefficients, most variation occurs between E, X and the remaining group of variables, while there is relatively less variation within this latter group (ie: between Y, I and F).

The lack of variation both between persistence measures and between returns equation coefficients suggests that estimation error may seriously affect the findings from estimation of equation (19) on a company by company basis. The empirical results from estimation of equation (19) are summarised in Table 10. As expected, both the mean and median of the slope coefficient are positive. The number of statistically significant positive t-statistics at the 10% level for the slope coefficient is 12, thus rejecting the null hypothesis that there are no more significant positive coefficients than expected by chance using a 0.1% binomial test. In addition, there are five significant positive coefficients at the 1% level which is also significant at the 0.1% level using a binomial test. Thus, despite the likely impact of measurement error, these findings provide some evidence of a positive association between the estimated share return response to accounting shocks and persistence estimates based on an AR1 prediction model.

Although the above findings provide some support for a positive association between persistence and returns coefficients estimates, they are somewhat weaker than those presented by Lipe (1986) for components of earnings based on US data (see section 5(c) for discussion of this point). Furthermore, there is some evidence of a significant negative relationship between persistence estimates and

returns coefficients estimates in a number of companies. Thus, of the 18 companies (37.5%) with negative slope coefficients, the t-statistic is less than -1.64 (10% one tail test cut-off) for 10 companies. While these findings may indicate weaknesses in the share response model used in this study, they may also reflect the impact of measurement error as discussed above. It is useful to consider the issue of measurement error further.

Given that the theoretical model developed in section 2 implies a one-to-one relationship between returns coefficients and persistence measures, it follows, according to this model, that the dispersion of returns coefficients and persistence measures for a particular firm should be identical. An implication of this is that if the theoretical model holds but there is measurement error in either returns coefficients or persistence measure estimates, the dispersion of returns coefficient estimates and persistence estimates will not be identical. Hence, on the assumption that the theoretical model is correct, an indication of the extent of measurement error for a particular company may be given by the relative dispersion of returns coefficient and persistence estimates. Of course, measurement error in these variables may be offsetting and therefore not show up in a measure of relative dispersion and there are problems in defining the degree of inequality in the dispersion of the two variables which may be regarded as indicative of severe measurement error. Nevertheless, it is interesting to consider the impact on the findings reported in Table 10 of deleting those companies with relative dispersion greater than a given cut-off level.

Table 11 reports the effect of deleting companies from the sample for different cut-off levels of relative dispersion of returns coefficient estimates and persistence estimates. For each company, relative dispersion was measured as the ratio of the mean absolute difference among persistence estimates to the mean absolute difference among returns coefficient estimates when the former was less than the latter and by the reciprocal of this ratio when the latter was less than the former. Thus, given there are 5 persistence estimates and 5 returns coefficient estimates for each company, the mean of the 10 absolute differences for each of these two variables were used to calculate the ratio. This relative dispersion measure (RD) has a maximum value of 100% (which corresponds to the case where the theoretical model is correct and there is no measurement error) and a minimum value of 0%.

The first row of Table 11 corresponds to the overall findings reported in Table 10 indicating a clear majority of positive t-statistics, 12 of which are statistically significant at the 10% level, but also indicating 10 large negative t-statistics. The final column of Table 11 indicates the number of companies with RDs greater than the cut-off given in the first column and intermediate columns show the distribution of those companies according to the slope coefficient t-statistic. Table 11 indicates that if an RD cut-off of between 30% and 60% is viewed as appropriate for the purpose of identifying severe measurement error, then the proportion of positive t-statistics, together with the proportion of statistically significant positive t-statistics, in the reduced sample is considerably greater than for the sample as a whole and, perhaps more importantly, the number of t-statistics less than -1.64 is greatly

reduced. A cut-off RD of 40% provides findings which are most consistent with the theoretical model developed in section 2, with 77% of the reduced sample of 22 companies displaying positive slope coefficients, 36% with statistically significant positive slope coefficients and only 9% with negative slope coefficient t-statistics less than 1.64.

In conclusion, the findings of the study in relation to the association between returns equation coefficients and persistence estimates provide limited support for the theoretical share response model based on the assumed ARI multivariate prediction model. The weakness of the findings based on the full sample of 48 companies could be caused by inappropriate assumptions in the development of the model, such as the choice of prediction model and the use of the constant discount rate dividend capitalisation model, or by measurement error in relation to the estimation of return coefficients and persistence measures. Classification of the findings according to a measure of relative dispersion of returns coefficients and persistence estimates provides some support for the possibility that measurement error is a significant cause of the weak overall findings, although, of course, this does not preclude the possibility of more substantive theoretical causes.

5. Discussion

This section discusses the empirical findings of the study in the context of previous studies based on US and UK data. Firstly, the findings in relation to the information content of earnings and cash

and funds flow data are considered. Secondly, the relative information content of earnings and cash and funds flow data are discussed. Finally, the association between estimated returns coefficients and persistence estimates based on the dividend capitalisation model assumed in this study are compared with previous studies based on earnings capitalisation models.

a. Discussion of Information Content of Earnings, Funds Flows and Cash Flows

The findings of this study in relation to the information content of working capital from operations and long-term accruals is broadly consistent with previous findings based on UK data (Board and Day 1989, Board, Day and Walker 1989). Direct comparison of the findings is difficult due to methodological differences but the overall finding that the estimated coefficients on UW and UX were significantly different from zero but not significantly different from each other is consistent with the findings in these previous studies that both working capital from operations and earnings have information content individually but that only earnings has incremental information content beyond working capital from operations (and not vice versa). As noted by Board, Day and Walker (1989), some US studies (Wilson 1986 1987, Rayburn 1986) have found information content for working capital from operations measures (or cash flow from operations and current accruals) but no clear additional information content for long-term accruals. Other US findings by Bowen, Burghstahler and Daley (1987), however, that unexpected earnings have incremental information content beyond working capital from operations lend support to the argument that

long-term accruals have some additional information content beyond working capital from operations in both US and UK contexts and that the divergent findings of Wilson are best explained by methodological factors. In particular, the present study, Board, Day and Walker (1989) and Bowen et al (1987) are all based on an annual returns window, while Wilson's studies used an announcement date methodology with the resulting possibility of market knowledge of long-term accruals prior to the earnings announcement date.

A comparison of the findings of the present study in relation to the information content of cash flows with previous studies is again difficult due to differences in methodology and data. It is useful first to briefly consider the present findings in relation to previous studies in the UK and US which have focussed on operating cash flows and follow this with a more detailed comparison of the findings with previous (US) studies which have also considered non-operating cash flows.

The main UK studies to have analyzed the information content of operating cash flow (Board and Day 1989, Board Day and Walker 1989) failed to detect any statistically significant information content for this variable. This is in marked contrast both to the present findings that unexpected operating cash flows are significantly related (at the 0.1% level) to unexpected returns (when unexpected investment and financing flows are also considered) and to previous US findings (Rayburn 1988, Wilson 1987) that unexpected operating cash flow is a valuation relevant component of accounting earnings. Given that Board, Day and Walker (1989) also found only a weak association between unexpected returns and unexpected operating cash

flow for US (in addition to UK) data, it is possible that their results were affected by the omission of any further explanatory variables in addition to unexpected operating cash flow. Such omission would appear to be inconsistent with both earnings and dividend capitalisation models of security valuation.

Two major cross-sectional studies in the US (Bowen et al 1987, Livnat and Zarowin 1990) have considered the information content of both operating and non-operating cash flows. The findings of Bowen et al are consistent with the findings of the present study to the extent that operating cash flow was found to have significant information content in cross-sectional regressions of unexpected returns on unexpected operating cash flow and unexpected cash flow after investment in their study. The weaker, and largely statistically insignificant, association between unexpected returns and unexpected cash flows after investment, however, are in contrast to the relatively strong finding of statistical significance for unexpected investment in the present study.

The study by Livnat and Zarowin (1990) considered both aggregated and disaggregated cash flow data and encompassed financing flows in addition to operating and investment flows. Again, the finding of a strong statistically significant positive association between unexpected operating cash flow and unexpected returns reflects the findings of the present study. In relation to unexpected investment cash flows, they found some evidence of a statistically significant negative relationship with unexpected returns which is consistent with the finding of a statistically significant positive association (where investment is defined in negative terms) in the present study.

In relation to unexpected financing flows, there is some evidence of a positive association with unexpected returns which again does not conflict with the present findings.

A major difficulty in comparing the above US studies to this study concerns the definition of variables, the prediction models used and the specification of the returns equations (ie: the specification of the equation relating unexpected returns to unexpected accounting components). In relation to definition of variables, Livnat and Zarowin (1990) and Bowen et al (1987) exclude changes in marketable securities and cash from their definition of investment in contrast to the definition used here and include (Livnat and Zarowin only) dividends in the aggregate financing flow, again in contrast to the present study. In relation to the specification of the returns equation, Bowen et al (1987) focus on aggregate measures of unexpected operating cash flow and unexpected cash flow after investment, Livnat and Zarowin focus on the disaggregated components of unexpected operating, financing and investment flows and the present study focussed on aggregate measures of unexpected operating, financing and investment flows.

The findings of Bowen et al in relation to cash flow after investment cannot readily be explained in terms of the issues raised in the previous paragraph. Thus, although it might be argued that their definition of CFAI is not entirely consistent with the definition presented in Fama and Miller (1972) (which they reference on p732 as providing the main justification for considering CFAI), it is unlikely that this factor alone could account for the observed lack of statistical significance for unexpected CFAI in their study.

A second possibility of a multicollinearity problem between the two cash flow variables in the Bowen et al returns equation can be discarded given their low pairwise correlation (p735, Table 2). Finally, the use of a naive prediction model for CFAI may be of some relevance in explaining the statistical insignificance of this variable in the returns equation but little evidence is available on the efficacy of such an assumption in the US - in a related article, as discussed in Chapter 2, Bowen et al (1986) suggest that CFAI is a superior naive prediction of itself as compared to alternative accounting measures but they did not consider alternative prediction models.

The findings of Livnat and Zarowin in relation to the information content of both operating and non-operating cash flows, as noted in the Introduction to this chapter, should be considered in the context of the inclusion of unexpected dividends as a component of their measure of unexpected financing flows. Their finding of a strong statistical relationship between the components of operating cash flow and unexpected returns should therefore perhaps be compared with the weaker but statistically significant findings of the present study of inequality between the returns equation coefficient on unexpected operating cash flows and the returns equation coefficients on the other two components of unexpected dividends ie: unexpected financing and unexpected investment flows, in equation (15). Likewise, their finding that "the coefficients for (the components of) investing cash flows are generally small and insignificant" [p36] can be interpreted as broadly consistent with the failure of the present study to provide evidence of an inequality between the coefficient on unexpected investment flow and the other two

components of unexpected dividends ie: unexpected operating and unexpected financing flows, in equation (17), as their tests on unexpected investing flows effectively evaluate the incremental information content of investment beyond both earnings and dividends. Finally, their findings in relation to the components of unexpected financing flows are consistent with the present findings to the extent that "the coefficient for dividends is positive and statistically significant as predicted by theory" [p36], while in addition they present some evidence of incremental information content for unexpected debt issuance (but not unexpected common-stock and unexpected preferred stock issuance) beyond unexpected dividends which might be viewed as mildly conflicting with the lack of evidence in the present study that the coefficient on unexpected financing flows differs significantly from the coefficients on the other two components of unexpected dividends ie: unexpected operating and unexpected investment cash flows, in equation (17).

(Although this section is concerned with the information content of cash and funds flow data as opposed to their incremental information content beyond earnings data, the structure of the Livnat and Zarowin study, which includes a total accruals variable in addition to cash flow variables, is such that their findings in relation to unexpected investing and financing flows, but not operating cash flows, must be viewed as relative to accounting earnings. It is convenient, however, to compare all their findings with those of the present study at this stage of the discussion rather than in the following sub-section concerned with relative information content of earnings and cash and funds flow data)

In summary, the findings of this study in relation to the information content of accounting earnings are broadly consistent with previous UK and US findings in that unexpected earnings have a positive and statistically significant association with unexpected returns and that working capital from operations and long-term accruals are value-relevant components of accounting earnings. The findings of the study in relation to the information content of cash flows are inconsistent with previous UK findings that operating cash flows have no information content but are consistent with previous US studies which found operating cash flows to be significantly and positively associated with equity returns. There are no previous UK findings in relation to non-operating cash flows and comparisons with previous US studies are particularly difficult due to definitional and methodological reasons. In general, the latter studies find weak and, at best, marginally significant association between investing and financing flows and share returns in apparent contrast to the findings of a statistically significant association between unexpected investment and financing flows and unexpected returns in this study. It is suggested, however, that the main US study to date in this area (Livnat and Zarowin 1990) primarily relates to information content beyond dividends and that their relatively weak findings for investing flows and financing flows (excluding dividends from the latter) may be related to the findings of the present study of no statistically significant difference between the coefficients for unexpected investment and unexpected financing flows in equation (15) and between the coefficients of each of these variables and unexpected operating cash flow in equation (17).

b. Discussion of Relative Information Content of Earnings and Cash Flows

As described in section (4), the findings of this study provide relatively strong evidence that earnings and cash flow data have incremental information content beyond each other. The finding of information content for earnings beyond cash flow is broadly consistent with previous UK and US research, while the finding of information content for cash flow data beyond earnings is inconsistent with previous UK research but consistent, at least in part, with previous US research. A more detailed examination of each of these issues now follows.

As noted in the previous chapter, the incremental information content of earnings beyond operating cash flow data has been supported both by recent UK research (Board and Day 1989, Board, Day and Walker 1989) and by recent US research (Rayburn 1986, Wilson 1986), although there is little evidence in either country regarding the incremental information content of earnings beyond a broader set of cash flow data (an exception is Bowen et al 1987). The findings of the present study suggest that earnings data, represented by unexpected working capital from operations and unexpected long-term accruals, have incremental information content beyond a broader set of cash flow data, represented by unexpected operating cash flow, unexpected investment and unexpected financing flows. The implication is that the UK capital market does not regard cash flow data as a substitute for accrual accounting data, at least at the level of aggregation of data assumed in this study.

The discussion in the previous chapter suggested far less agreement in previous research regarding the incremental information content of operating cash flows data beyond accounting earnings data, with US studies by Wilson (1986 1987) and Bowen et al (1987) providing evidence of incremental information content and studies by Bernard and Stober (1989) and Jennings (1990) casting doubt on these findings. The UK findings of Board and Day (1989) and Board, Day and Walker (1989) strongly reject the hypothesis of incremental information content for operating cash flows. The findings of this study, in turn, cast doubt on the generality of these previous UK findings when a broader definition of cash flows, incorporating operating, investing and financing cash flows, is used. Indeed, the relatively large number of significant t-statistics for each of the three cash flow components in Table 6 (equation (17)) suggests that the finding of incremental information content for cash flow data beyond earnings data in the present study may be of a similar order to the finding of incremental information content for earnings data beyond cash flow data.

The relative importance of cash flow data in explaining share returns gathers some further support from an alternative approach to the assessment of the relative information content of accounting variables based on a simple comparison of the association of earnings and cash flows with share returns (Harmon 1984). As noted in the previous chapter, Harmon found using US data that income-based accounting variables were generally ranked higher than funds or cash flow variables in terms of their association with market model residuals around the earnings announcement date. Although the details of his methodology were questioned earlier, the idea of a

simple comparison of the association of earnings and cash flow variables with stock returns can be carried out informally for the present study through a comparison of the cross-company mean of the adjusted R-squareds from estimates of equations (13) and (15). Assuming a value of zero for cases where the adjusted R-squared is negative, the mean is 9.58% for the unexpected earnings / returns equation (equation (13)) and 9.80% for the unexpected cash flow / return equation (equation 15). In contrast to Harmon's findings, there is therefore no obvious support for the view that earnings data is superior to cash flow data in terms of this simple view of relative information content (the mean of the adjusted R-squareds for the full model, equation (17), was 15.55%, reflecting the additional explanatory power of equation (17) beyond both equations (13) and (15)).

Finally, the findings in relation to the relative information content of aggregate measures of accounting earnings and dividends appear to be consistent with previous US evidence. Thus, for example, Kane, Lee and Marcus (1984) find positive slope coefficients for both earnings and dividend surprises in a cross-sectional regression of cumulative abnormal residuals against these variables around quarterly earnings and dividend announcement dates. Given the interpretation of dividends as an aggregate measure of cash flow, the findings in both Kane Lee and Marcus (1984) and this study can be viewed as providing support for the rejection of both H_{1B} and H_{2B} . An interesting additional issue raised by Kane, Lee and Marcus is the possibility of a corroborative effect between dividend and earnings surprises. Their findings that such an effect was present in the US data used in their study suggests that the joint explanatory power of

disaggregated earnings and cash flow data might be increased by incorporating corroboration effects between cash flow and accrual accounting variables.

In summary, the findings of the study in relation to the relative information content of earnings and cash flow data tend to provide further support for the view that each data set provides useful information beyond that contained in the other. In addition, there is no obvious evidence that one of these data sets is more strongly associated with share returns than the other. In comparison to previous research, these findings may be viewed as providing stronger support for the role of cash flow accounting in financial reporting practice. Such a view, however, may overstate the implications of the overall findings of this study, as discussed further in the concluding section of this chapter.

c. Discussion of Association between Returns Equation Coefficients and Persistence Estimates

As already indicated, the analysis of the association between returns equation coefficient estimates and persistence estimates provided some evidence of a statistically significant positive association. This is consistent with Lipe's (1986) findings based on an analysis of the components of accounting earnings in a sample of US companies over a similar sample period, although his analysis indicated a stronger rejection of the null hypothesis of no association between earnings-based persistence estimates and returns equation coefficients than suggested by the dividend-based persistence estimates considered in the present study.

A number of factors could explain the weaker results presented in this study. Firstly, the earnings capitalisation model may be a more accurate description of the markets response to unexpected accounting information. However, given the additional assumptions required by an earnings capitalisation model beyond the dividend capitalisation model, this explanation is not entirely convincing. Secondly, differences are likely to arise due to the difference between US and UK capital markets and it is not clear that earnings-based persistence measures would perform better in a UK context than the dividend-based persistence estimates used in this study. Thirdly, and perhaps most importantly, the findings in the present study may be more adversely affected by measurement error than those of Lipe. As noted in the previous section, the five earnings and cash flow variables (E, X, Y, I and F) appeared in general to have persistence measures of similar magnitude (see Tables 8 and 9), thus suggesting that relatively small estimation errors in persistence estimates for a particular firm may lead to a failure to reject the null hypothesis of no association. Finally, the assumption of a multivariate AR1 prediction model in the present study may be less appropriate than it was in Lipe's study.

In summary, the weak finding of positive association between returns equation coefficient estimates and persistence estimates at least provides some indication of a statistically significant relationship between the assumed forecast model parameters and the market's response to forecast errors based on this model. Indeed, it is not surprising that empirical evidence on this association to date, whether based on earnings persistence or, as in this study,

dividends persistence, is weak given the considerable scope for model specification and estimation error.

6. Conclusion

This chapter has presented a theoretical model of the relationship between unexpected accounting numbers and unexpected share returns based on standard valuation theory and has attempted to utilize this model as a basis for testing a number of hypotheses concerning the information content of accrual and cash flow accounting data. The theoretical share response model was closely based on previous research by Lipe (1986) and showed how his methodology can be extended to an analysis of cash and funds flow data by simply replacing the assumption of an earnings capitalisation model with the more general assumption of a dividend capitalisation model. Given the assumption of an ARI multivariate prediction model incorporating both earnings and cash and funds flow data, it was shown that the revised model implied a simple linear relationship between unexpected share returns and forecast errors corresponding to accounting variables. Empirical estimation of the returns equation implied by the model suggested statistically significant coefficients for all five variables and subsequent analysis of the association between the returns equation coefficients and corresponding persistence estimates provided some evidence of the expected positive relationship.

A major concern of the chapter was to test the two hypotheses (H_{1A} and H_{2B}) concerning the relative information content of earnings and cash flow data as previous research, both in the UK and the US, has

focussed on a very restricted definition of cash flow (corresponding to operating cash flow). This analysis reinforced previous findings, principally based on an operating cash flow focus, that accounting earnings data possesses information content beyond cash flow data, indicating that unexpected working capital from operations and, perhaps somewhat surprisingly, unexpected long-term accruals both have information content beyond operating, investment and financing cash flows. Such a finding is clearly consistent with the view that the UK capital market behaves as if current and long-term accounting accruals convey valuation-relevant information beyond that supplied by cash flow data alone. Given an efficient capital market, this in turn may be regarded as good news for those who advocate the usefulness of accrual accounting to investor decisions. Thus, subject to the assumption of an efficient and rational capital market, the findings support the view that the provision of accrual accounting data increases the informational efficiency of the capital market.

The findings in support of the incremental information content of cash flow data beyond accrual accounting data, when considered in conjunction with the findings concerning the relative information content between the three cash flow components considered (ie: operating, investment and financing flows), can only be regarded as providing weak support for the provision of cash flow data from a perspective based on assumed capital market informational efficiency. Thus, while the findings confirm the information content of dividends beyond accounting earnings and further suggest that operating, investing and financing flows are valuation-relevant components of dividends, they only provide relatively weak evidence that share

prices respond differentially to unexpected operating, investment and financing flows (the findings indicated no statistically significant difference between share price responses to unexpected investment and unexpected financing flows and only relatively weak evidence of a differential response to operating cash flows). Given that dividends are revealed to the market independently of the provision of accounting information, the justification for cash flow accounting from an informational efficiency perspective must be based on a differential market response to the cash flow components of dividends.

To conclude, the analysis in this chapter has attempted to provide a more complete basis for evaluating the usefulness of accrual and cash flow accounting data to investor decisions. Given the limited empirical evidence available to date, it is necessary that further research, particularly research based on more disaggregated data, be carried out in order to establish more clearly the relative importance of accrual and cash flow accounting data to company valuation. Such research might take the form of more powerful capital market tests, for example by combining cross-sectional and time series data as carried out by Board and Walker (1990) and Strong and Walker (1991) in relation to evaluations of the information content of accounting earnings data, or employ alternative methodologies which are less reliant on the efficient markets hypothesis for the interpretation of empirical findings.

Table 1

Distribution of Sample Companies by Standard Industrial
Classification

<u>Standard Industrial Classification</u>	<u>Number of Companies</u>
Food	2
Drink	1
Chemicals and Allied Industries	8
Metal Manufacturers	2
Non-Electrical Engineering	3
Electrical Engineering	3
Shipbuilding and Marine	2
Vehicles	3
Metal Goods	7
Textiles	2
Bricks, Pottery, Glass, Cement etc	6
Paper, Printing and Publishing	2
Other Manufacturing	1
Construction	1
Transport	1
Wholesale Distribution	2
Retail Distribution	1
Miscellaneous Services	1
	48
	--

Table 2

Association between Accounting Variable, 48 firms, 1955-84

	E	X	O	I	D	W	F	Y
E	-	6	4	3	22	44	3	20
X	0.0455	-	4	4	7	44	6	21
O	0.0206	0.0385	-	24	1	9	25	47
I	-0.0459	-0.0226	-0.3521	-	5	2	36	19
D	0.3841	0.0590	0.0217	-0.0082	-	18	3	5
W	0.6831	0.7241	0.0552	-0.0416	0.2850	-	5	31
F	0.0763	-0.0085	-0.3766	-0.6372	0.0785	0.0319	-	23
Y	-0.3254	-0.3479	-0.8288	-0.2829	-0.1215	-0.4648	-0.3388	-

Mean correlation coefficients below the diagonal, number of significant (1% one-tail test) correlation above the diagonal.

Table 3

Incidence of Autocorrelation and Outliers in Forecast Equation
Residuals

		Dependent Variable					
		E	X	O	I	D	Total
Autocorrelation							
Positive (10% level)		7	1	3	3	12	26
Negative (10% level)		9	4	8	7	2	30
Total		16	5	11	10	14	56
Outliers							
0		29	33	36	32	24	154
1		15	14	7	7	15	58
>1		4	1	5	9	9	28
Total		48	48	48	48	48	240

Table 4

Summary Statistics for Market Model Regressions, 48 firms, 1955-84

	Mean	Standard Deviation	1st Quartile	Median	3rd Quartile
Constant	-0.004	0.042	-0.029	-0.002	0.022
Slope	0.901	0.256	0.790	0.911	1.061
R-squared	0.415	0.171	0.280	0.430	0.540

Table 5

Summary of Forecast Equation Regression Coefficients, 48 firms,
1955-84

Regression 1: Dependent Variable E

	E	Lagged Explanatory Variables			
		X	O	I	D
Mean	-0.144	0.087	0.082	0.024	0.322
Standard Deviation	0.342	0.281	0.155	0.122	2.225
Significant t-stats:					
Positive (10% level)	5	14	16	7	6
Negative (10% level)	17	2	2	2	5
Total	22	16	18	9	11

Regression 2: Dependent Variable X

	E	Lagged Explanatory Variables			
		X	O	I	D
Mean	0.023	-0.322	0.044	-0.030	-0.183
Standard Deviation	0.332	0.189	0.136	0.101	1.770
Significant t-stats:					
Positive (10% level)	3	0	2	2	4
Negative (10% level)	6	28	5	4	4
Total	9	28	7	6	8

Regression 3: Dependent Variable O

	E	Lagged Explanatory Variables			
		X	O	I	D
Mean	-0.202	0.173	-0.369	0.017	0.385
Standard Deviation	0.766	0.672	0.287	0.266	3.772
Significant t-stats:					
Positive (10% level)	1	4	1	8	3
Negative (10% level)	8	8	32	7	4
Total	9	12	33	15	7

Regression 4: Dependent Variable I

	Lagged Explanatory Variables				
	E	X	O	I	D
Mean	-0.087	-0.022	-0.085	-0.393	-0.558
Standard Deviation	0.831	0.725	0.340	0.282	4.047
Significant t-stats:					
Positive (10% level)	5	5	7	0	4
Negative (10% level)	4	3	9	33	3
Total	9	8	16	33	7

Regression 5: Dependent Variable D

	Lagged Explanatory Variables				
	E	X	O	I	D
Mean	0.003	0.001	0.003	0.000	0.042
Standard Deviation	0.047	0.045	0.018	0.014	0.308
Significant t-stats:					
Positive (10% level)	7	5	6	4	9
Negative (10% level)	6	7	3	2	6
Total	13	12	9	6	15

All the above regressions are based on real first differenced variables. All t-tests are 2-tail tests.

Table 6

Summary of Returns Equation Coefficient Estimates, 48 firms, 1955-84

	Mean	Standard Devn.	Min.	1st Quartile	Median	3rd Quartile	Max.	Number of Signif. t-stats
Equation (13):								
UW	1.081	1.785	-3.158	-0.023	0.924	1.956	6.748	26
UX	-1.055	1.919	-6.691	-1.985	-0.915	0.016	4.446	18
Equation (14):								
UE	1.111	1.728	-2.918	0.045	1.052	1.875	6.590	28
Equation (15):								
UO	8.576	8.579	-5.459	2.576	7.698	13.818	38.132	23
UI	8.703	8.694	-5.090	2.393	7.907	14.265	37.238	21
UF	8.381	8.470	-5.124	2.242	7.630	14.103	37.636	22
Equation (16):								
UD	7.852	7.510	-5.370	1.404	6.043	14.615	23.843	21
Equation (17):								
UW	0.908	1.755	-4.327	-0.047	0.783	2.078	4.566	17
UX	-0.863	2.010	-6.475	-1.808	-0.652	0.376	3.306	15
UO	7.248	10.084	-8.174	0.128	5.878	12.236	46.084	18
UI	7.328	10.172	-8.239	-1.330	6.037	13.689	44.841	18
UF	7.228	10.172	-9.010	-0.839	6.196	13.483	44.973	18
Equation (18):								
UE	0.902	1.821	-3.776	-0.186	0.737	2.017	6.286	22
UD	6.155	8.189	-13.569	0.117	5.859	11.520	27.679	16

All tests at 10% significance level. All t-tests are 1-tail tests.

Table 7

Summary of Tests for Equality of Returns Equation Coefficients,
48 Firms, 1955-84

Equation (13): Test of Equality of UW and -UX coefficients		
Number of T-stats where $ t > 1.708$	=	7
Equation (15): Test of Equality of UO and UI coefficients		
Number of T-stats where $ t > 1.711$	=	12
Test of Equality of UO and UF coefficients		
Number of T-stats where $ t > 1.711$	=	12
Test of Equality of UI and UF coefficients		
Number of T-stats where $ t > 1.711$	=	6
Test of Equality of UO, UI and UF coefficients		
Number of F-stats where $F > 2.59$	=	9
Equation (17): Test of Equality of UW and UX coefficients		
Number of T-stats where $ t > 1.717$	=	6
Test of Equality of UO and UI coefficients		
Number of T-stats where $ t > 1.717$	=	6
Test of Equality of UO and UF coefficients		
Number of T-stats where $ t > 1.717$	=	7
Test of Equality of UI and UF coefficients		
Number of T-stats where $ t > 1.717$	=	4

All tests at 10% significance level. All t-tests are 2-tail tests.

Table 8

Cross-Company Summary of Persistence Estimates and Returns Equation
Coefficients Estimates, 48 Firms, 1955-84

Persistence Estimates

	Mean	Standard Devn.	Min.	1st Quartile	Median	3rd Quartile	Max.
PE	30.800	30.145	6.196	18.832	23.704	29.714	193.09
PX	30.422	28.158	5.820	18.011	23.688	29.851	175.83
PY	30.775	30.181	5.838	18.169	23.620	24.506	192.25
PI	30.633	29.807	5.842	17.927	23.315	29.445	189.05
PF	30.731	30.325	5.809	18.104	23.546	29.422	193.27

Returns Equation Coefficient Estimates

	Mean	Standard Devn.	Min.	1st Quartile	Median	3rd Quartile	Max.
UE	8.156	9.666	-6.258	1.660	6.368	13.886	46.471
UX	7.293	10.091	-8.097	0.650	5.455	12.064	48.604
UY	7.248	10.084	-8.174	0.128	5.878	12.236	46.084
UI	7.328	10.172	-8.239	-1.330	6.037	13.689	44.841
UF	7.228	10.172	-9.010	-0.839	6.196	13.483	44.973

Table 9

Cross-Company Mean Absolute Differences (a) between Persistence Estimates and (b) between Returns Equation Coefficients, 48 Firms, 1955-84

	PX	PY	PI	PF
PE	1.137	0.682	0.708	0.617
PX	-	0.891	0.910	0.995
PY	-	-	0.312	0.225
PI	-	-	-	0.253
	UX	UY	UI	UF
UE	1.619	1.511	1.848	1.984
UX	-	1.202	1.550	1.558
UY	-	-	0.731	0.763
UI	-	-	-	0.533

Table 10

Summary Statistics from Regressions of Returns Coefficient Estimates on Persistence Estimates, 48 Companies

	Mean	Min.	1st Quartile	Median	3rd Quartile	Max.
Slope Coefficient	0.371	-16.285	-0.483	0.384	1.187	12.386
t-statistics	0.778	-7.256	-0.979	0.586	1.588	24.928

Table 11

Distribution of Persistence Slope t-statistics according to
Relative Dispersion (RD) of Returns Equation Coefficient and
Persistence Estimates, 48 Firms, 1955-84

RD>*	t>1.64	0<t<1.64	0>t>-1.64	t<-1.64	Total
0%	12 (25.0%)	18 (37.5%)	8 (16.7%)	10 (20.8%)	48
10%	11 (26.2%)	16 (38.1%)	6 (14.3%)	9 (21.4%)	42
20%	9 (24.3%)	13 (35.1%)	6 (16.2%)	9 (24.3%)	37
30%	8 (29.6%)	10 (37.0%)	5 (18.5%)	4 (14.8%)	27
40%	8 (36.4%)	9 (40.9%)	3 (13.6%)	2 (9.1%)	22
50%	6 (33.3%)	7 (38.9%)	3 (16.7%)	2 (11.1%)	18
60%	5 (33.3%)	5 (33.3%)	3 (20.0%)	2 (13.3%)	15
70%	2 (18.2%)	5 (45.5%)	3 (27.3%)	1 (9.1%)	11
80%	1 (20.0%)	3 (60.0%)	1 (20.0%)	0 (0.0%)	5
90%	0 (0.0%)	2 (66.7%)	1 (33.3%)	0 (0.0%)	3

* RD is measured as the ratio of the mean absolute difference among persistence estimates to the mean absolute difference among returns coefficient estimates for companies where the former is less than the latter and by the reciprocal of this ratio for companies where the latter is less than the former. RD therefore lies between 0% and 100%.

**CHAPTER 5 –
SUMMARY AND CONCLUSIONS**

1. Introduction

This study has considered the relative usefulness of cash flow, funds flow and earnings data to investors from a number of different perspectives. The main aim of this chapter is to briefly summarise the main issues arising from the analysis of the academic debate on the relative merits of accrual accounting and cash flow accounting and to summarise the findings to have emerged from MBAR in relation to these two categories of accounting data. The chapter concludes by summarising the main areas in which the study has sought to contribute to analysis of the usefulness of such data to investors.

2. Development of Cash and Funds Flow Reporting Proposals

Chapter 2 of this study considered the development of arguments for cash and funds flow accounting (CFFA) in recent years, starting with proposals which were primarily concerned with clearly differentiating the information provided by funds statements from that provided by the historic cost income statement and concluding with more recent proposals which argue for the development of integrated financial reporting systems which combine CFFA data with current value asset (CVA) data. It was argued that this development in the CFFA literature reflects a movement from perspectives on financial reporting which were principally concerned with emphasising the events basis of the funds statement and its potentially allocation-free characteristics to a more explicit concern with the possible usefulness of CFFA data to investors in relation to their decision to buy, hold or sell particular shares.

Although the review of the CFFA literature identified what may be interpreted as a progression from more general views of the utility of CFFA, based principally on the somewhat negative reasoning that it avoids the arbitrary allocation and valuation assumptions inherent in the historic cost income statement and balance sheet, to a more specific and positive view of CFFA as providing information useful for estimating the cash flow potential of the firm, this transition has not been unproblematic and further work appears necessary in order to provide a more convincing rationale for the combined provision of CFFA data and current value data as advocated in recent proposals. Thus, the development of proposals based on the cash flow potential perspective on CFFA has given rise to a number of suggestions, such as Lee and Lawson's early interest in the provision of cash flow forecast data and Ijiri's interest in the provision of investment project based cash flow data, which have not received much further attention either in the research literature or in the pronouncements of professional bodies in recent years. The recent proposals concerning the development of integrated CFFA and CVA financial reporting systems may be similarly disregarded unless further impetus is provided by research indicating more explicitly the utility of such data for corporate performance measurement. Furthermore, academic and professional interest in this area is likely also to be influenced by the incidence of inflation in the future and hence perceptions of the need to replace or supplement historic cost financial data with current value information.

Despite the difficulties and the doubts regarding the elevation of the status of CFFA relative to that of the historic cost income statement and balance sheet, recent developments in financial

reporting requirements in both the UK and the US suggest an increasing awareness among standard-setting bodies of the potential utility to investors of CFFA data. Hence, the new UK standard on cash flow statements (ASB 1991) differs from the previous working capital funds statement (ASC 1975) not only in the choice of funds flow concept ie: cash as opposed to working capital, but also in the requirement that the new statement differentiates between operating, investing and financing flows and the recommendation that a direct approach to the disclosure of operating cash flows, as opposed to the add-back method previously advocated, be used. The new UK standard follows the introduction of a similar reporting requirement in the US (FASB 1988) requiring the preparation of a statement of cash flows. While these new reporting requirements may not be sufficiently stringent to satisfy the aspirations of many advocates of CFFA – for example, there is only a recommendation, not a requirement, in both UK and US standards for the use of the direct method as opposed to the add-back method of reporting – and the classification of certain items may be subject to debate (see discussion in Chapter 2 section 4), it might be argued that the new standards represent a move towards a view of CFFA as a source of data to investors which is, at least potentially, of equal or greater value to the historic cost income statement and balance sheet. Given that previous research regarding the (limited) usefulness of funds statement data to investors and their surrogates considered briefly in Chapter 2 was based on earlier reporting requirements which required less uniformity in CFFA reporting practices, there is clearly a need for evidence regarding the influence of the new reporting proposals on investor perceptions of the relative utility of CFFA data.

In summary, the CFFA research literature in recent years has provided a normative rationale for an increased emphasis on this data in financial reporting which has, at least partly, been reflected in recent developments in financial reporting practice. Existing reporting practice nevertheless falls short of the recommendations which have appeared in the literature both in terms of presentation of the CFFA data and in relation to the current trend towards viewing CFFA data and CVA data as complementary parts of a single financial reporting system. Further empirical research concerning the usefulness of the new cash flow reporting requirements to investors, together with further conceptual justification for the utility of CFFA data to investors, possibly within the context of the integrated CFFA and CVA systems referred to above, represent possible interesting directions for future research.

3. Market-Based Accounting Research and the Information Content of Accounting Earnings, Funds Flows and Cash Flows

The research considered in Chapter 2 was concerned principally with arguments and evidence regarding the usefulness of CFFA as a source of data for wealth maximising decisions by investors. The emphasis was on arguments as to why CFFA data should be of utility for this purpose and on the extent to which empirical evidence on the statistical relationships between CFFA and earnings data and future enterprise cash flows and the actual use of accounting data by investors was consistent with such arguments. Chapter 3, on the other hand, focussed on theoretical and empirical developments in MBAR concerned with evaluating the information content of accounting

data on the assumption that capital markets in aggregate utilise accounting information in a rational and efficient manner. In addition, some more general research from the economics and finance literature concerning the rationality and efficiency of stock markets was reviewed in order to provide background evidence on the validity of this assumption and some attention was given to recent empirical evidence which questions market efficiency in relation to accounting data. Furthermore, the focus on empirical studies adopting approaches with an explicit valuation orientation to the analysis of the relationship between share prices and accounting data provided an indication of the extent to which research designs which attempt to incorporate insights from a rational valuation perspective were able to provide more convincing empirical findings than has previously been the case in information content studies.

As already discussed, the review of research in economics and finance concerned with market efficiency indicated ambiguous findings both in relation to the movements in aggregate stock market indices and in relation to movements in extreme 'winner / loser' stocks, with researchers offering differing explanations of apparent anomalies both consistent with and inconsistent with market efficiency. A similar position prevails in relation to studies of capital market efficiency with respect to accounting data. While mounting evidence of stock market anomalies suggest the need for cautious interpretation of information content studies in accounting based on the assumption of market efficiency, it would appear that the evidence of inefficiency is not so overwhelming as to undermine the rationale for such research.

The review of the literature concerned with the relationship between share prices and accounting earnings indicated both theoretical and empirical advances in this area of research. Two main areas of improvement in the theoretical specification of the relationship between share prices /returns and accounting earnings were noted, one based on the recent work of Ohlson (1989b) which has derived a link between a clean surplus concept of earnings and share prices based on the joint assumption of linear information dynamics and Modigliani-Miller valuation precepts and the other based on the work of Lipe (1986) and Kormendi and Lipe (1987) which has developed the concept of earnings persistence based on the assumption of an earnings capitalisation model and ARIMA prediction models for accounting earnings data. While the latter approach has been criticised by Ohlson for 'finessing' the relationship between accounting earnings and share prices by assuming an earnings capitalisation model, as opposed to the more theoretically correct dividend capitalisation model, of share valuation, it was demonstrated that both approaches had been used with some success to gain greater insights into the empirical relationship between share prices and accounting earnings. Furthermore, the use of statistical methods which permit a more flexible approach to the analysis of the relationship between share prices and accounting earnings by allowing cross-sectional and time variation in earnings response coefficients have achieved substantial increases in the estimated strength of this relationship (Board and Walker 1990, Strong and Walker 1991).

The review of studies concerned with the relationship between share prices and cash and funds flow data indicated the largely ad hoc nature of empirical work in this area, with few studies explicitly

adopting a valuation perspective. The most common approach therefore has involved the cross-sectional regression of market model residuals against cash flow and funds flow forecast errors based on prediction models ranging from naive random walk model through to more elaborate ARIMA models. Some more recent studies have considered investment and financing flows in addition to operating flows, earlier studies focussing largely on only the latter. The very limited attempts to date to explicitly utilise insights from valuation theory have focussed on the relationship between share price levels, as opposed to unexpected returns, and have involved multivariate cross-sectional regressions of price levels against cash and funds flow variables incorporating operating, investment and financing flows. (Charitou and Ketz 1991, Green and Stark 1991).

The findings from this research, principally based on US data, in general provides support for the hypothesis that cash and funds flow data has information content in relation to share prices but only mixed, and more recently negative, evidence in relation to the incremental information content of such data beyond accounting earnings data. Hence, with the notable exception of Board, Day and Walker's (1989) study based on UK data, all the studies reviewed found positive information content for operating cash flows and funds flows. On the other hand, only three studies provided evidence in support of the hypothesis that cash flow data has incremental information content beyond accounting earnings, two based on US data (Bowen et al 1987, Wilson 1987) and one based on Finnish data (Kinnunen and Niskanen 1991), the findings of Bowen et al (1987) being subsequently interpreted as providing only extremely weak evidence for this hypothesis (Jennings 1990) and further evidence

suggesting that the findings of Wilson (1987) are specific only to the two years of (final quarter) data considered in that study (Bernard and Stober 1989).

The aim of the empirical study described in Chapter 4 was to carry out a study based on UK data of the relative information content of earnings, funds flow and cash flow data. Previous findings in relation to the information content of cash and funds flow data in the UK based on operating flows had only found convincing evidence of information content for a working capital from operations measure of funds flow (Board, Day and Walker 1989), and no evidence of incremental information content for measures of operating cash or funds flows beyond earnings. Based on the assumption of the simple dividend capitalisation model and an ARI multivariate prediction model for a set of earnings, funds flow and cash flow components jointly comprising dividends, a linear relationship between unexpected returns and forecast errors for the above variables was derived and estimated individually for 48 UK companies over the period 1955-1984. The findings indicated statistically significant response coefficients for forecast errors associated with all five accounting variables ie: working capital from operations, long-term accruals, cash flow from operations, investment and financing flows, when the number of statistically significant coefficients for each variable across the sample of firms was compared with that which might be expected by chance. Regressions based on earnings and cash flow forecast errors separately also provided evidence in support of statistically significant associations with unexpected returns.

The above findings are consistent with the hypotheses that earnings and cash and funds flow data are both relevant to an explanation of share price movements in the UK stock market. Furthermore, some weak evidence that the share response coefficients are positively related to persistence estimates based on the assumed multivariate prediction model was also provided. However, although these findings provide positive evidence for the view that cash and funds flow data are valuation-relevant and that operating, investment and financing cash flows have incremental information content beyond accounting earnings, the findings raised a new issue in relation to the usefulness of cash and funds flow data which has not been explicitly addressed in the MBAR literature. This issue concerns the extent to which disaggregated cash flow data has information content beyond aggregate dividends and the extent to which disaggregated cash and funds flow data have information content beyond aggregate earnings and aggregate dividends data.

The findings presented in Chapter 4 appear to have some similarities with findings from two recent studies based on US data (Livnat and Zarowin 1990, Charitou and Ketz 1991) which seem to suggest limited information content for cash flow components beyond aggregate earnings and dividends but for which formal tests of this hypothesis are not provided. Thus, Charitou and Ketz do not test for equality of the coefficients of the cash flow and accrual components of earnings in their cross-sectional regressions of share price against these components, dividends and growth and risk variables, although the reported coefficients for these components are of similar magnitude. Livnat and Zarowin, using highly disaggregated data, find only weak evidence for the incremental information content

of investment and financing flows beyond dividends and earnings in cross-sectional regressions using market model residuals as the dependent variable but present findings which suggest that the disaggregation of operating cash flows into constituent components might provide incremental information beyond aggregate earnings and dividends.

4. Concluding Remarks

This study has considered arguments and evidence concerning the relative merits to investors of accounting earnings, funds flow and cash flow 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 cash and funds flow accounting in financial reporting have been analyzed with a view to predicting future directions for this research and a proposal (Clubb 1988) consistent with recent research interest in the relationship between CFFA and current value accounting is enclosed. Secondly, the issue of the relative ability of accrual and cash flow data to predict future cash flows has been highlighted as an area of relevance for assessing the relative usefulness of these approaches to financial reporting in a manner consistent with both valuation theory and professional pronouncements on financial reporting and an analysis based on this perspective (Arnold, Clubb, Manson and Wearing 1991) is enclosed. Thirdly, the possible implications for MBAR of recent research concerned with the empirical validity of the efficient capital markets hypothesis has been considered and informational models of the relationship between

share prices and accounting earnings in an efficient market setting have been extended to provide new perspectives on the possible role of cash and funds flow data in such a setting. Finally, an empirical analysis of the information content of earnings, funds flow and cash flow data in the UK has been carried out, providing new evidence and insights into the nature of the relationship between share prices and such accounting data.

As discussed in this and previous chapters, there would appear to be a considerable number of interesting avenues that future research might take. These avenues include the use of normative methodology to examine, for example, the scope of cash and funds flow data in relation to corporate performance measurement and equity valuation and the use of more sophisticated empirical research methods to examine the use of earnings, funds flow and cash flow data by investors and to assess the relationship between such data and observed share prices. While the measurement and analysis of historic cost income remains the primary focus of research and practice in accounting concerned with the provision of information for investors, it is hoped that the analysis in this study indicates the usefulness of considering the alternative offered by cash and funds flow approaches to financial reporting.

**APPENDIX A - VALUATION AND CLEAN SURPLUS ACCOUNTING: SOME
IMPLICATIONS FOR THE RELATIVE INFORMATION CONTENT OF EARNINGS AND
CASH FLOWS.**

The aim of this analysis is to consider the implications of a recent advance in the theory of accounting information and share valuation (Feltham and Ohlson 1992) for market-based research in accounting concerned with the relative information content of earnings and cash flows. The first part of the paper provides a brief summary of the share price valuation model developed by Feltham and Ohlson (FO). The second part derives the implications of this share valuation model for the relationship between unexpected share returns and unexpected earnings and cash flows. The final part provides an interpretation of this relationship and discusses some possible implications for market-based research in accounting.

The Feltham and Ohlson Model

This section provides a description of the main aspects of the FO model necessary for the analysis of the relative information content of earnings and cash flows in subsequent sections. The following variables are defined by FO:

bv_t = firm book value, date t
 x_t = earnings for period $(t - 1, t)$
 d_t = dividends, net of capital contributions, date t
 fa_t = financial assets, net of financial obligations, date t
 i_t = interest revenues, net of interest expenses, for period $(t - 1, t)$
 oa_t = operating assets, net of operating liabilities, date t
 ox_t = operating earnings for period $(t - 1, t)$
 c_t = cash flows realised from operating activities, net of investments in those activities, date t
 p_t = firm market value, date t

The following accounting relations are assumed to hold:

$$\begin{aligned}bv_t &= fa_t + oa_t \\x_t &= i_t + ox_t \\bv_t &= bv_{t-1} + x_t - d_t\end{aligned}\quad (CSR)$$

where CSR denoted 'clean surplus relation'. Because fa_t refers to net financial assets, the following 'net interest relation' is assumed:

$$i_t = (R_f - 1) fa_{t-1} \quad (NIR)$$

where R_f denotes one plus the risk-free rate. Next, the 'financial assets relation' in the model is as follows:

$$fa_t = fa_{t-1} + i_t - [d_t - c_t] \quad (FAR)$$

Finally, FO point out that since the firm's activities are either financial or operating, CSR and FAR imply the following 'operating asset relation':

$$oa_t = oa_{t-1} + ox_t - c_t \quad (OAR)$$

Note that $c_t < 0$ represents net capital expenditures in operating assets.

An important point to note in relation to the analysis in subsequent sections is that "the cash flow concept is independent of the accounting rules for operating assets, and one can view cash flows as 'objectively' measured. The cash flow concept specified by OAR and FAR generally conforms with the 'free cash flow' concept used in finance" [Feltham and Ohlson, 1992, p 7].

The firm's market value, p_t , is assumed to be given by the following 'present value relation':

$$\sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[d_{t+\tau}] \quad (\text{PVR})$$

where $e_t[.]$ is the expected value operator conditional on the information available at date t . The use of the risk-free rate in the PVR indicates the assumption of risk neutrality among investors.

FO obtain a number of further relations given the above assumptions: Firstly, combining NIR and FAR we have:

$$d_t = c_t + R_F fa_{t-1} - fa_t.$$

Using this in PVR gives:

$$P_t = \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[d_{t+\tau}] = fa_t + \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[c_{t+\tau}]$$

provided $R_F^{-\tau} e_t[fa_{t+\tau}] \rightarrow 0$ as $\tau \rightarrow \infty$. Next, abnormal earnings, x_t^A , are defined as follows:

$$x_t^A \equiv x_t - (R_F - 1)bv_{t-1} \quad (\text{A.D1})$$

and combining with CSR gives:

$$d_t = x_t^A + R_F bv_{t-1} - bv_t.$$

Using this in PVR gives:

$$P_t = \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[d_{t+\tau}] = bv_t + \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[x_{t+\tau}^A]$$

provided $R_F^{-\tau} e_t[bv_{t+\tau}] \rightarrow 0$ as $\tau \rightarrow \infty$. Next, abnormal operating earnings, ox_t^A , are defined as follows:

$$ox_t^A \equiv ox_t - (R_F - 1)oa_{t-1} \quad (\text{A.D2})$$

which, given OAR, implies:

$$c_t = ox_t^A + R_F oa_{t-1} - oa_t$$

and hence:

$$\sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[c_{t+\tau}] = oa_t + \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[ox_{t+\tau}^A]$$

provided $R_F^{-\tau} e_t[oa_{t+\tau}] \rightarrow 0$ as $\tau \rightarrow \infty$. Using this in above gives:

$$P_t = \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[d_{t+\tau}] = bv_t + \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[ox_{t+\tau}^A].$$

Finally, defining goodwill, g_t , as follows:

$$g_t \equiv P_t - bv_t$$

and given the assumption in NIR that the return on financial assets is non-stochastic:

$$g_t = \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[ox_{t+\tau}^A] = \sum_{\tau=1}^{\infty} R_F^{-\tau} e_t[x_{t+\tau}^A]$$

since $ox_t^A = x_t^A$.

FO combine the above neo-classical valuation setting with a linear information model (LIM) to obtain a linear valuation function for the firm where P_t is a function of contemporaneous accounting numbers and 'other information' available at date t . To simplify the analysis in subsequent sections, the following representation of the LIM ignores 'other information'

$$OX_{t+1}^A = w_{11}OX_t^A + w_{12}oa_t + e_{1t+1} \quad (A.1a)$$

$$oa_{t+1} = w_{22}oa_t + e_{2t+1} \quad (A.1b)$$

where (to ensure that the asymptotic properties of the LIM are well-behaved) $0 \leq w_{11} < 1$, $1 \leq w_{22} < R_F$ and $w_{12} \geq 0$. They then show that this LIM implies the following valuation function:

$$P_t = bv_t + \alpha_1 OX_t^A + \alpha_2 oa_t \quad (A.2)$$

where

$$\alpha_1 = w_{11}/(R_F - w_{11}) \text{ and } \alpha_2 = w_{12}R_F/(R_F - w_{22})(R_F - w_{11})$$

Next, they consider the implications of two alternative possible relationships between accounting book value and firm market value for the parameter values of the above model. Firstly, they consider the possibility of 'unbiased accounting' which is defined to obtain if:

$$e_t[g_{t+\tau}] \rightarrow 0 \text{ as } \tau \rightarrow \infty$$

and prove that this possibility is equivalent to $\alpha_2 = w_{12} = 0$.

Secondly, they consider the possibility of 'conservative accounting' which is defined to obtain if:

$$e_t[g_{t+\tau}] > 0 \text{ as } \tau \rightarrow \infty$$

and prove that this possibility is equivalent to $\alpha_2, w_{12} > 0$. An implication is that if unbiased accounting characterises the relationship between book value and market value for the firm, the goodwill for the firm at the current date can be explained simply as a function of current abnormal earnings. On the other hand, if conservative accounting is a more appropriate characterisation of the book to market value relationship, the information on the firm's current stock of operating assets is also required to explain goodwill at the current date.

The Relative Information Content of Earnings and Cash Flows

The previous section provided a summary of the valuation setting, linear information model and linear valuation equation developed by FO and introduced the concepts of 'unbiased accounting' and 'conservative accounting' central to their analysis of the implications of the model. The aim of this section is to utilise the

relations summarised above to analyze the relationship between unexpected share returns and unexpected earnings and cash flow numbers implicit in the FO model. First, the basic relationship is derived by means of a number of straightforward substitutions. This is followed by some further simple manipulations which provide alternative representations of the relationship.

Using (A.D2) and OAR in equation (A.2), firm market value at date t can be written as:

$$\begin{aligned} P_t &= bv_t + \alpha_1 \{ox_t - (R_F - 1)oa_{t-1}\} + \alpha_2 oa_t \\ &= bv_t + \alpha_1 \{ox_t - (R_F - 1)(oa_t + c_t - ox_t)\} + \alpha_2 oa_t \\ &= bv_t + \alpha_1 R_F ox_t + \{\alpha_2 + \alpha_1(R_F - 1)\}oa_t - (R_F - 1)c_t \end{aligned} \quad (A.3)$$

Using CSR for bv_t , $(x_t - i_t)$ for ox_t and adding one to the time subscript in equation (A.3), we have on rearrangement:

$$\begin{aligned} P_{t+1} + d_{t+1} &= bv_t + (1 + \alpha_1 R_F)x_{t+1} - \alpha_1 R_F i_{t+1} + \\ &\quad \{\alpha_2 - \alpha_1(R_F - 1)\}oa_{t+1} - \alpha_1(R_F - 1)c_{t+1}. \end{aligned}$$

It therefore follows that:

$$\begin{aligned} P_t &= R_F^{-1} \{e_t[bv_t] + (1 + \alpha_1 R_F)e_t[x_{t+1}] - \alpha_1 R_F e_t[i_{t+1}] \\ &\quad + [\alpha_2 - \alpha_1(R_F - 1)]e_t[oa_{t+1}] - \alpha_1(R_F - 1)e_t[c_{t+1}]\}. \end{aligned}$$

Given the definition of unexpected returns:

$$ur_{t+1} = P_{t+1} + d_{t+1} - R_F P_t$$

it follows that:

$$\begin{aligned} ur_{t+1} &= (1 + \alpha_1 R_F)ux_{t+1} + [\alpha_2 - \alpha_1(R_F - 1)]uoa_{t+1} \\ &\quad - \alpha_1(R_F - 1)uc_{t+1}, \end{aligned} \quad (A.4)$$

where the prefix u denotes 'unexpected value'. Given that OAR implies:

$$uoa_{t+1} = uox_{t+1} - uc_{t+1} = ux_{t+1} - uc_{t+1}$$

we have on substitution in equation (A.4):

$$ur_{t+1} = (1 + \alpha_1 + \alpha_2)ux_{t+1} - \alpha_2uc_{t+1}. \quad (A.5)$$

Equation (A.5) represents the basic relationship between unexpected share returns and unexpected accounting data implied by the FO model. Given the definition of unbiased accounting and the FO result that this is equivalent to $\alpha_2 = 0$, it is clear that for this particular possible characterisation of the long-run relationship between book value and market value, accounting earnings have information content in relation to unexpected returns and that cash flows represented by unexpected 'free cash flow' have no incremental information content beyond earnings. On the other hand, for the case of conservative accounting where $\alpha_2 > 0$, 'free cash flow' has incremental information content beyond earnings. Thus, in contrast to the Ohlson (1989) model in which unexpected earnings was the single accounting explanatory variable for unexpected returns (although note Green and Stark (1991) point out that this 'earnings' measure could correspond to a 'cash flow income' concept such as that proposed by Lawson (1985)), the FO model contains a plausible case in which 'objectively measured' cash flows have incremental information content beyond a clean surplus measure of accounting earnings (although note Green and Stark also show how such a possibility is consistent with the Ohlson (1989b) model by modelling accruals as 'other information' beyond cash flow income useful for the prediction of dividends).

Finally, it is useful to re-express equation (A.5) making use of the following definitions:

$$ox_t \equiv o_t + a_t \quad (A.D3)$$

$$c_t \equiv o_t - l_t \quad (A.D4)$$

where a_t represents total accruals contained in operating income (this is sometimes split between long-term accruals such as depreciation and current accruals represented by the aggregation of changes in such items as stocks, accounts receivable, accounts payable, etc), o_t represents operating cash flows from trading activities and l_t represents net capital expenditure. Using (A.D3) and (A.D4) in equation (A.5) gives:

$$\begin{aligned} ur_{t+1} &= (1 + \alpha_1 + \alpha_2)(uo_{t+1} + ua_{t+1}) - \alpha_2(uo_{t+1} - ul_{t+1}) \\ &= (1 + \alpha_1)ux_{t+1} + \alpha_2(ua_{t+1} + ul_{t+1}) \\ &= (1 + \alpha_1)ux_{t+1} + \alpha_2 uoa_{t+1}. \end{aligned} \quad (A.6)$$

Clearly, equation (A.6) also follows directly from equation (A.5) but a useful feature of the derivation above is that it presents the FO model in terms of variables commonly employed in capital market studies of the relative information content of cash flow and earnings data. In particular, it emphasises the omitted variable problem likely to arise from exclusion of investment flows in most capital market studies. Note also that the model implies the following relationship:

$$ur_{t+1} = (1 + \alpha_1)uo_{t+1} + (1 + \alpha_1 + \alpha_2)ua_{t+1} + \alpha_2 ul_{t+1} \quad (A.7)$$

This representation confirms that unexpected accruals have information content beyond unexpected cash flows in the FO model under both unbiased and conservative accounting as the coefficient of ua differs from zero in both cases.

Discussion

Equation (A.6) provides a useful representation of the FO model for the purpose of analyzing implications for the relative information content of earnings and cash flows. The use of 'unbiased accounting' is considered first, followed by the case of 'conservative accounting'. The discussion concludes with some brief comments on the possible implications for empirical research.

As summarised earlier, FO define 'unbiased accounting' as the case where, in the long-run, expected goodwill of the firm is expected to be zero and they prove that this is equivalent to $w_{11} = 0$ in equation (A.1a). Under unbiased accounting, equation (A.6) indicates that ur_{t+1} can be expressed simply as:

$$(1 + \alpha_1)ux_{t+1}$$

where $\alpha_1 = w_{11}/(R_F - w_{11})$. Careful inspection of the LIM represented by equations (1a) and (1b) shows why this is the case. From equation (A.1a), it is clear that abnormal accounting earnings are expected to decline at the rate $(w_{11} - 1)$ regardless of any further additions to operating assets (as $w_{12} = 0$). Given that, by definition, unexpected earnings equal unexpected abnormal earnings, the return reaction to ux_{t+1} is equal to the increase in book value at date $t + 1$ (ie: ux_{t+1}) plus the present value of revisions in future expected abnormal earnings caused by ux_{t+1} . The latter is simply equal to $\alpha_1 ux_{t+1}$ from the basic formula for a growth (shrinking) perpetuity.

Again, as summarised earlier, FO define 'conservative accounting' as the case where, in the long-run, expected goodwill of the firm is

expected to be greater than zero and they show that this is equivalent to $w_{12} > 0$ in equation (A.1a). For this case, ur_{t+1} is represented by the complete version of equation (A.6). Once again, careful inspection of the LIM represented by equations (A.1a) and (A.1b) provides the rationale for this result. First, the share reaction to unexpected earnings at date $t+1$, $(1 + \alpha_1)ux_{t+1}$ is identical to the case of 'unbiased accounting'. The additional share response to unexpected operating assets at date $t+1$ is due to $w_{12} > 0$ under 'conservative accounting' as unexpected operating assets at date $t + 1$ are expected to have a direct impact on date $t + 2$ abnormal earnings of $w_{12}uoa_{t+1}$ which then affects subsequent periods' abnormal earnings expectations through the 'abnormal earnings persistence' parameter, w_{11} . Furthermore, if there is expected growth in operating assets (as assumed in equation (A.1b)), the effect of unexpected operating assets on future expected abnormal earnings is amplified by revisions in expectations of future levels of operating assets resulting from uoa_{t+1} . The total effects of unexpected operating assets on unexpected returns can be seen clearly by re-expressing α_2 as the product of the three components in square brackets below:

$$\alpha_2 = [1 + w_{22}/(R_F - w_{22})] [w_{12}] [1/(R_F - w_{11})]$$

The first component is simply the sum of a current period operating asset shock of 1 dollar and the present value of revisions in future expected operating assets induced by such a shock assuming a growth rate of $(w_{22} - 1)$. This is multiplied by w_{12} to incorporate the 'next period impact' on expected abnormal earnings of the current operating asset shock and subsequent operating asset revisions. Each of the

'next period impacts' on unexpected abnormal earnings are then assumed in equation (A.1a) to decline at the rate of $(w_{11} - 1)$ and are therefore multiplied by the growth (shrinking) perpetuity formula, $1/(R_F - w_{11})$.

The discussion above aimed to illustrate the significance of the FO valuation model for our understanding of the relative usefulness of earnings and cash flow accounting in explaining share returns. The central point of the FO model is that information regarding the operating assets of the firm is of importance to the share valuation (beyond earnings and total book value) if additions to that stock of assets are expected to generate future expected abnormal earnings with a positive present value (or, alternatively stated, if future investment is expected to have a positive net present value). FO's concept of conservative accounting refers to the case where this is so. By focussing on the relationship between unexpected returns and unexpected earnings and cash flow data in their model, it is hoped that this important point is reinforced.

Finally, the obvious and important implication of the FO model for market-based research in accounting is that if 'conservative accounting' is representative of firms analyzed in such empirical research, contemporaneous analysis of the relationship between returns and accounting earnings will omit significant cash flow accounting data. For example, cross-sectional studies which fail to control for the possibility of (varying degrees of) conservatism in their sample may be seriously mis-specified. In general, this indicates the importance of attempting to incorporate as fully as possible the characteristics of the predictive relationships between

accounting (and other) variables in analyses of the relationship between share returns and accounting data.

APPENDIX B - DETAILED DERIVATION OF UNEXPECTED RETURNS MODEL

As noted in section 2 of Chapter 4, the unexpected returns model is based on a multivariate AR1 prediction model of the form:

$$\underline{dC}_t = \underline{Z} \underline{dC}_{t-1} + \underline{V}_t \quad (\text{B.1})$$

where $\underline{Z}$ is a 5 x 5 matrix of coefficients and $\underline{V}_t$ is a serially correlated disturbance term such that:

$$\underline{V}_t = \underline{\alpha} \underline{V}_{t-1} + \underline{UC}_t \quad (\text{B.2})$$

where $\underline{\alpha}$ is a 5 x 5 diagonal matrix of serial correlation coefficients and $\underline{UC}_t$ is a 5 x 1 vector of shocks corresponding to the accounting variables comprising $\underline{dC}_t$. From B.2, we know that $e_t(\underline{V}_{t+s}) = \underline{\alpha}^s \underline{V}_t$ and hence from B.1 that:

$$e_t(\underline{dC}_{t+s}) = \underline{Z}^s \underline{dC}_t + \sum_{j=0}^{s-1} \underline{Z}^j \underline{\alpha}^{s-j-1} \underline{V}_t \quad (\text{B.3})$$

and

$$e_{t-1}(\underline{dC}_{t+s}) = \underline{Z}^{s+1} \underline{dC}_{t-1} + \sum_{j=0}^s \underline{Z}^j \underline{\alpha}^{s-j+1} \underline{V}_{t-1}. \quad (\text{B.4})$$

Substituting B.1 in B.3 and subtracting B.4 from the resulting equation gives:

$$\begin{aligned} e_t(\underline{dC}_{t+s}) - e_{t-1}(\underline{dC}_{t+s}) &= \sum_{j=0}^s \underline{Z}^j \underline{\alpha}^{s-j-1} (\underline{V}_t - \underline{\alpha} \underline{V}_{t-1}) \\ &= \underline{Q}_s \underline{UC}_t \end{aligned} \quad (\text{B.5})$$

where

$$\underline{Q}_s = \sum_{j=0}^s \underline{Z}^j \underline{\alpha}^{s-j-1}. \quad (\text{B.6})$$

Next, removing the first difference operator from B.5 and rearranging gives:

$$e_t(\underline{C}_{t+s}) - e_{t-1}(\underline{C}_{t+s}) = e_t(\underline{C}_{t+s-1}) - e_{t-1}(\underline{C}_{t+s-1}) + \underline{Q}_s \underline{UC}_t \quad (B.7)$$

and by repeated backward substitutions, we have:

$$\begin{aligned} e_t(\underline{C}_{t+s}) - e_{t-1}(\underline{C}_{t+s}) &= e_t(\underline{C}_t) - e_{t-1}(\underline{C}_t) + \sum_{k=1}^s \underline{Q}_k \underline{UC}_t \\ &= \sum_{k=0}^s \underline{Q}_k \underline{UC}_t \end{aligned} \quad (B.8)$$

where $\underline{Q}_k$ in B.8 is defined identically to $\underline{Q}_s$ (See B.6 above. Note $\underline{Q}_0 = \underline{I}$).

B.8 is an expression for the impact of the period t forecast error vector, $\underline{UC}_t$, on the expectation of the vector of future accounting variables, $\underline{C}_{t+s}$. Premultiplying B.8 by the conversion matrix $\underline{A}$ and the discount factor R^s and summing over $s = 0$ to ∞ gives:

$$\sum_{s=0}^{\infty} R^s \underline{A} [e_t(\underline{C}_{t+s}) - e_{t-1}(\underline{C}_{t+s})] = \underline{A} \left\{ \sum_{s=0}^{\infty} R^s \sum_{k=0}^s \underline{Q}_k \right\} \underline{UC}_t. \quad (B.9)$$

Expanding the expression in parenthesis on the right hand side of B.9 gives the following:

$$\underline{I} + R[\underline{I} + \underline{Q}_1] + R^2[\underline{I} + \underline{Q}_1 + \underline{Q}_2] + \dots$$

which simplifies to:

$$(1 - R)^{-1} \sum_{s=0}^{\infty} \underline{Q}_s R^s \quad (B.10)$$

Using B.6 to expand the summation in B.10 gives:

$$\begin{aligned}
 \sum_{s=0}^{\infty} Q_s R^s &= \underline{I} + [\underline{\alpha} + \underline{Z}]R + [\underline{\alpha}^2 + \underline{Z}\underline{\alpha} + \underline{Z}^2]R^2 + \\
 &\quad [\underline{\alpha}^3 + \underline{Z}\underline{\alpha}^2 + \underline{Z}^2\underline{\alpha} + \underline{Z}^3]R^3 + \dots \\
 &= [\underline{I} + \underline{Z}R + \underline{Z}^2R^2 + \underline{Z}^3R^3 + \dots] \\
 &\quad + R[\underline{I} + \underline{\alpha}R + \underline{\alpha}^2R^2 + \dots]\underline{\alpha} \\
 &\quad + \underline{Z}R^2[\underline{I} + \underline{\alpha}R + \underline{\alpha}^2R^2 + \dots]\underline{\alpha} \\
 &\quad + \underline{Z}^2R^3[\underline{I} + \underline{\alpha}R + \underline{\alpha}^2R^2 + \dots]\underline{\alpha} + \dots \\
 &= [\underline{I} - \underline{Z}R]^{-1} + R[\underline{I} + \underline{Z}R + \underline{Z}^2R^2 + \underline{Z}^3R^3 + \dots][\underline{I} - \underline{\alpha}R]^{-1}\underline{\alpha} \\
 &= [\underline{I} - \underline{Z}R]^{-1}[\underline{I} + R[\underline{I} - \underline{\alpha}R]^{-1}\underline{\alpha}] \\
 &= [\underline{I} - \underline{Z}R]^{-1}[\underline{I} - \underline{\alpha}R]^{-1} \tag{B.11}
 \end{aligned}$$

Substituting B.11 in B.10 and substituting the resulting expression back into B.9 gives:

$$\begin{aligned}
 \sum_{s=0}^{\infty} R^s \underline{A}[e_t(\underline{C}_{t+s}) - e_{t-1}(\underline{C}_{t+s})] &= \\
 \underline{A}[(\underline{I} - \underline{Z}R)(1 - R)]^{-1}[\underline{I} - \underline{\alpha}R]^{-1}\underline{U}\underline{C}_t
 \end{aligned}$$

This is equation (6) in Chapter 4.

APPENDIX C - MEASUREMENT OF ACCOUNTING VARIABLES AND FORECAST ERRORS

1. Using the Cambridge DTI Databank to estimate accounting variables

Accounting variables used in the study were estimated from the following set of funds flow and earnings items provided by the CDTI databank.

Item No	Title
<u>Sources of Funds</u>	
23	Issue of Shares - Ordinary
24	Issue of Shares - Preferences
25	Increase in liability to minority interests
26	Issue of long-term loans
27	Bank credit received
28	Trade and other credit received
29	Increase in dividend and interest liabilities
30	Increase in current tax liabilities
31	Increase in future tax reserves
32	Balance of Profit - Depreciation provision
33	Balance of Profit - Provision for amortization
34	Balance of Profit - Other provisions
35	Balance of Profit - Retained in reserves
36	Other receipts
<u>Uses of Funds</u>	
37	Expenditure, less receipts, on fixed assets - tangible
38	Expenditure, less receipts, on fixed assets - intangible
39	Expenditure, less receipts, on fixed assets - trade investments and investments in subsidiary companies
40	Increase in value of stocks and work in progress
41	Increase in credit given - trade and other debtors
42	Expenditure ex Provisions
43	Sundry expenditure
<u>Adjustments</u>	
44	Consolidation adjustment
45	Conversion adjustment
46	Residual adjustment
<u>Balance</u>	
47	Change in securities
48	Change in tax reserve certificates
49	Change in cash

Appropriation of income

50	Operating profit (before depreciation)
51	Dividends and interest received (gross of income tax)
52	Other income
53	Interest paid on long-term liabilities, gross
54	Tax on current profit
55	Dividend, net of income tax, Ordinary
56	Dividend, Other
57	To minority interest in subsidiaries (net of taxation)
58	Prior year adjustments - Tax
59	Prior year adjustments - General

The accounting variables were defined as follows:

$$\begin{aligned}E &= 50 + 51 + 52 - (32 + 33 + 34) - (53 + 56) - 54 \\X &= 31 + 32 + 33 + 34 \\Y &= 28 + 30 - 40 - 41 \\I &= -(37 + 38 + 39) - (47 + 48 + 49) - 44^* \\F &= 23 + 24 + 26 + 27 - (42 + 43) + 36 + 29 - 44^{**} \\D &= 55 \\Other &= 45 + 46 + 57 - 25 - 58 - 59\end{aligned}$$

* : if 44 is negative

** : if 44 is positive

For all company-years, the following identity was checked and shown to hold:

$$E + X + Y + I + F \equiv D + Other$$

The 'other items' were those which could not be classified in accordance with the variables used in the study. Item 44, the consolidation adjustment, arises for some company years when detailed balance sheet data on acquired subsidiaries is not available (Singh and Whittington 1968, p.216). The consolidation adjustment is positive if net financing flows are overstated and negative if net investment flows are overstated. It was decided therefore to allocate the consolidation adjustment as shown above, although it should be noted that due to the 'net' nature of this item, a non-zero consolidation adjustment is likely to be associated with measurement error in relation to I, F and possibly Y.

In general, it should be noted that the itemisation provided by the CDTI places some constraints on the measurement of the accounting variables. This, combined with cross-company and intertemporal variations in financial reporting practices, will inevitably lead to some measurement error and/or definitional inconsistencies. In general, however, the databank classification is broadly consistent with the measurement of the selected accounting variables.

2. Scaling of accounting variables by number of ordinary shares

All accounting variables were expressed on a per share basis using information taken from the Source File of the LSPD. The number of ordinary shares in issue at the start of each company year is provided in this file together with adjustment factors arising from bonus or rights issues made by a particular company.

The adjustment factors are defined as the 'factor by which old share prices must be adjusted to allow for capital changes' [LSPD Manual, p 17] and 'are based on the principle that the value of a share is unaltered by a change in capital structure' [LSPD Manual, p 5]. Alternatively, and as employed here, the reciprocal of the adjustment factor is the amount by which the number of shares in issue prior to the capital change must be multiplied in order to ensure equivalence in share values before and after the capital change. For example, the LSPD adjustment factor for a scrip issue of 1 or 2 is 0.667, which indicates that $1/0.667 = 1.5$ is the amount by which the number of shares in issue before the scrip issue should be multiplied to ensure equivalent share values before and after the issue.

Given the data on the number of ordinary shares in issue for each company over the sample period 1955 to 1984, and given the dates of capital changes and associated adjustment factors during the period, it was possible to construct an adjusted series for the number of shares in issue at the beginning of each accounting year for each company in the sample. Because the adjustment factors provided by the LSPD are not cumulative, it was necessary for most companies to multiply the number of shares in issue in the early years of the sample period by the reciprocal of several adjustment factors representing all capital changes between a particular sample year and the end of the sample period. The accounting variables, E, X, O, I and D (as defined in section 1 of this appendix) for each company year were then expressed on a per share basis using the adjusted number of shares in issue at the beginning of that year.

3. Real Terms Adjustment and First Differencing of Accounting Variables

The accounting variables expressed on a per share basis as described above were converted into real terms (1984£s) using the RPI index provided in the LSPD Indices File. Each accounting number was divided by the mid-month index for the relevant year and multiplied by the closing index for the sample period. The resulting real terms variables were then first differenced to generate a series of 28 annual observation for the variables dE, dX, dO, dI and dD as discussed in section 3.b.(ii) of Chapter 4.

4. Scaling Accounting Forecast Errors by the Real Share Price

As discussed in section 3.c.(ii) of Chapter 4, forecast errors estimated from the linear prediction model were scaled by the real share price at the beginning of the particular year in the returns equation (equations 13 to 18). The share price data was taken from the LSPD Source File and adjusted for capital changes, again using the adjustment factors provided in this file. The latter adjustment was necessary to maintain consistency between the adjusted share unit used to scale the accounting variables (see section 2 above) and the share price used to scale the forecast errors. For example, if a bonus issue doubled the number of shares in issue between two periods for a particular company from 500 to 1,000, the adjusted number of shares used to scale accounting variables in the first period would be 1,000 (not 500). Given the assumption of no overall change in firm value due to the bonus issue, consistency requires that the share price used to scale the forecast error in the first period be multiplied by the adjustment factor 0.5. Again, given the non-cumulative nature of the LSPD adjustment factors, it was often necessary to multiply share prices by several adjustment factors in order to obtain comparable nominal share prices for all periods in the sample period 1955 to 1984.

Finally, the nominal share prices adjusted for capital changes were put onto a real terms end-of-period basis using the RPI provided in the LSPD indices file.

APPENDIX D - ANALYSIS OF RELATIONSHIP BETWEEN RETURNS EQUATION COEFFICIENT ESTIMATES AND PERSISTENCE ESTIMATES

As indicated in Section 2 of Chapter 4 and Appendix B, the linear prediction model used in this study implies a linear relationship between unexpected share returns and any five unexpected accounting variables from which UE, UX, UY, UW, UO, UI, UF and UD may be derived using basic accounting identities. As described in Section 3(c)(ii), the five unexpected accounting variables used to estimate the returns equation were UW, UX, UO, UI and UF (see equation (17)). The aim of this appendix is to show that although the selection of these variables is convenient for the purpose of analyzing the relative information content of earnings and cash flow data, it is more appropriate to use returns coefficient estimates and persistence estimates based on E, X, Y, I and F for the purpose of estimating equation (19).

As discussed in Section 3(c)(ii), the association between returns equation coefficient estimates and persistence estimates was examined by means of 48 simple univariate regression (one regression per company), each consisting of 5 observations. Evidence of a relationship between the assumed prediction model and the share response coefficients is provided if the number of statistically significant positive slope coefficients from estimating equation (19) is greater than expected by chance. The question of interest here is whether the choice of accounting variables underlying the estimation of equation (19) might spuriously affect the findings and, if so, which choice of accounting variables is least likely to generate spurious findings.

In order to show that the choice of W, X, O, I and F as the basis for estimation of equation (19) may generate misleading results, it is useful to consider a situation where the markets response to unexpected accounting variables is completely independent of the assumed prediction model and yet estimation of equation (19) indicates an R-squared of 100%! Assume that the time series prediction model indicates that dividends follow a random walk. Under this assumption, the persistence measures associated with W and X will be zero (indicating that earnings data are not relevant to the prediction of future dividends), while the persistence measures associated with O, I and F will be identical and equal to the reciprocal of the cost of capital plus one (for example, assuming a cost of capital of 10%, the persistence measures for each of the variables will be 11). Next, assume that the (inconsistent) market response to accounting earnings forecast errors is non-zero but less than the market response to aggregate unexpected dividends (which in turn may be less than or greater than 11). Under these circumstances, a regression of return response coefficients on persistence measures associated with W, X, O, I and F will generate an R-squared of 100%.

The above example illustrates the problem which arises when the persistence measures associated with accounting variables are grouped (between earnings and cash flow persistence measures in above example). The possible extent of this effect is illustrated in the present study by the finding that regressions using persistence and share response estimates based on W, X, O, I and F generated 22 R-squareds (45% of sample) between 95% and 100%. While such a positive association is consistent with the share response model, for the

reasons given above, these findings can only be regarded at best as extremely weak evidence of the hypothesised relationship.

The use of returns coefficients and persistence measures based on E, X, Y, I and F avoids the dichotomisation of persistence measures between earnings and cash flow variables in the example above and, it would appear from Tables 8 and 9, in the data used in this study. In the example above where it was assumed that dividends follow a random walk, the persistence measures associated with E, X, Y, I and F will be 11 (assuming a cost of capital of 10%) for each variable, and hence any (inconsistent) differential share response to unexpected measures of the above accounting variables will not be associated with the type of spurious association described above. For this reason, analysis of the relationship between share response coefficients and persistence measures would appear to be best carried out in terms of these accounting variables. Furthermore, this is consistent with the earnings capitalisation model of Lipe (1986) where an equivalent assumption of a random walk for earnings implied equal persistence measures for the components of accounting earnings considered in that study. Not surprisingly, the findings based on E, X, Y, I and F reported in Section 4(d) are considerably weaker than the findings based on W, X, O, I and F referred to above.

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The Potential Role of the Funds Statement in Financial Reporting

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The analysis in this paper considers the potential role of the funds statement as the focus of financial reports providing both historic cost and current value information. The paper shows how a funds statement, based on the direct method of presentation widely advocated in recent accounting research, can both form the basis of an integrated approach to historic cost financial reporting and provide the necessary accrual accounting information for the preparation of current value income statements. The paper also argues that such a funds statement, employing an accrual rather than a cash-based definition of funds, provides the objective, transaction-based accounting information necessary for corporate performance evaluation.

INTRODUCTION

ALTHOUGH the funds statement has a long history in the USA [14] and has been recognised by the accounting professions of the USA and the UK as a major financial statement for several years, there remain some doubts about the objectives and usefulness of this statement in financial reporting practice. For example, in the JSA, Heath [5] has argued that the meaning of the term funds is unclear in the existing opinion on the funds statement and that the objectives of this pronouncement would be more effectively satisfied by three separate statements reporting cash receipts and payments, financing activities and investing activities. In the UK, Lawson [8] has argued that it is unclear what questions the funds statement proposed in Standard Statement of Accounting Practice No. 10

[12] is designed to answer and criticises in particular the "mixing up of operating, investing and financing transactions" in the approach adopted in the standard.

The aim of this paper is to suggest an alternative approach to the funds statement which accommodates criticisms of existing practice and which emphasises the important potential role of the statement in financial reporting. In pursuing this objective, the analysis recognises the importance of establishing a clearer conceptual basis for the funds statement in financial reporting practice. A major contribution to the development of this conceptual foundation has been provided by Sorter's [11] analysis of the role of the funds statement in accrual accounting in which "a narrow concept of the funds statement as an articulating statement describing the changes in certain balance sheet accounts" is rejected in favour of the view of the funds statement "as a statement reporting all events with significant cash impact and/or significant long-run cash consequences." Sorter's emphasis on the need for a view of the funds statement as a major statement systematically reporting financial events affecting a business enterprise represents an important theme of the analysis presented here. Furthermore, his argument for an accrual definition of funds, as opposed to a cash-based definition,¹ is broadly supported by the analysis in this paper.

As is briefly noted later in this paper, Sorter's emphasis on the cash impact of events does not amount to support for the use of a cash basis in the funds statement. On the contrary, the concept of cash impact is used to strongly support accrual accounting, both in general and in the funds statement. Thus he argues: "... we may term accruals as accounting for events producing a critical cash impact prior to the actual cash event and deferrals as accounting for actual cash flows that precede the event with critical cash impact" [12, p. 189]. The role of the funds statement in reporting events with cash impact or consequences suggested by Sorter therefore results directly in his advocacy of an accrual definition of funds in the statement.

The remainder of this paper is divided into three parts. The next part describes an integrated approach to historic cost financial reporting in which the funds statement plays a pivotal role. This reporting framework highlights the scope of the information contained in the funds statement and explicitly demonstrates the way in which transactions recorded in the funds statement affect the income statement and the balance sheet. The use of a funds statement in which funds from operations are reported on a direct basis and in which operating, investing and financing transactions are separately reported combines elements of the proposals made by Sorter and Lawson.

The third part of the paper extends the analysis of the potential role of the funds statement in financial reporting to the area of current value income measurement. It is shown that a funds statement of the type described above can be used to generate a current value income (CVI) statement, given only additional information on the current values of assets held at the beginning and end of the accounting period. The application of the funds based approach to the preparation of CVI statements employing proprietary and entity concepts of capital maintenance is considered and the approach is compared with the more conventional approach to CVI measurement based on adjustments to the historic cost income statement.

The fourth part of the paper considers the usefulness of information provided by the funds statement in relation to external performance evaluation, focusing on the contribution of funds flow data to the calculation of historic cost corporate recovery rates, as suggested by Ijiri [6, 7], and the potential contribution of a funds based reporting system incorporating CVI information to the assessment of enterprise performance. The aim of this part of the paper is to argue that the proposed focus on the funds statement in financial reporting is consistent with a view of financial reporting as primarily concerned with the provision of information useful for the purpose of performance evaluation. It is argued that the main role of the funds statement is to provide an objective and verifiable core of information useful for this purpose.

The final part of the paper summarises the analysis presented in the previous parts and calls for a broader acceptance of the important role

of the funds statement in the development of improved systems of financial reporting.

THE FUNDS STATEMENT AND AN INTEGRATED APPROACH TO FINANCIAL REPORTING

As stated in the introduction, this part of the paper presents an integrated approach to historic cost financial reporting in which the funds statement plays a central role. This approach focuses on the way in which transactions recorded in the funds statement affect the other main financial statements. Thus, rather than viewing the funds statement as merely an articulating statement describing changes in balance sheet accounts, it emphasises the more positive view that it is information recorded in the funds statement which determines many of the major changes in the balance sheet during an accounting period. As will be discussed following the presentation of the integrated reporting framework below, this view suggests a more significant role for the funds statement in financial reporting than is suggested by existing practice.

An integrated reporting framework

The reporting framework described here is based on the following incremental version of the basic historic cost accounting identity:

$$\begin{aligned}
 &\text{Change in Current Assets less Current Liabilities} \\
 &\quad \text{(excluding short-term loans and overdrafts)} \\
 &\qquad\qquad\qquad + \\
 &\qquad\qquad\text{Change in Fixed Assets} \\
 &\qquad\qquad\qquad = \\
 &\text{Change in Loans (including short-term loans)} \\
 &\quad \text{and Overdrafts} \\
 &\qquad\qquad\qquad + \\
 &\qquad\text{Change in Share Capital and Reserves}
 \end{aligned}$$

The first term represents the working capital definition of funds assumed in the framework and will be further discussed below. Given this definition of funds, this identity can be re-expressed in the following manner:

$$\begin{aligned}
 &\text{Change in Funds} + \text{Change in Fixed Assets} = \\
 &\text{Change in Loans and Overdrafts} + \text{Income and} \\
 &\qquad\qquad\text{Other Equity Changes}
 \end{aligned}$$

The latter identity forms the core of the proposed reporting framework which can now be

described more fully by means of a numerical illustration.

The framework is illustrated in Table 1 (a-c) using information taken from the 1986 accounts of a large UK retailing business.² Table 1a in his exhibit presents the opening and closing balance sheets in a form based on the first identity above. Table 1b is the core of the reporting framework and tabulates the components of the four terms in the second identity above. The first column of Table 1b therefore presents the funds statement for the year, the second column shows changes in tangible fixed assets and investments in related companies during 1986, the third column details the changes in loans and overdrafts and provisions during 1986 and the final column presents the income statement for the year together with equity capital contributions and withdrawals. Finally, Table 1c presents a summary of changes in balance sheet accounts, thus providing a link between information given in Tables 1a and 1b.

A number of important features of the reporting framework are apparent from inspection of Table 1 (a, b, c). First, Table 1b is structured on a double-entry basis so that the sum of the first two entries along a particular row equals the sum of the second two entries, if any, along that row (except for rows where totals are calculated). This reflects the transaction orientation of this table and the aim to distinguish between real financial events and accounting entries such as depreciation. Second, the funds statement presented in Table 1b is structured in such a way as to clearly distinguish between funds generated from operations, investment flows and financing flows, as broadly suggested by Lawson and widely recommended in the accounting literature.³ Third, the first and final columns of Table 1c in effect provide statements of movements in working capital and reserves respectively, while the second and third columns integrate information on fixed asset changes and loan changes, normally contained in the notes to

the accounts, into the main report. Finally, the identity between total changes recorded at the bottom of a given column in each of the three tables demonstrates the consistency between the information provided by these tables.

Implications for role of the funds statement in financial reporting

The reporting framework presented above emphasises the potential usefulness of the funds statement as a reporting mechanism within historic cost accounting. By juxtaposing the funds statement and the income statement, the reporting framework highlights both the broader range of information provided in the funds statement and the absence from this statement of some of the more dubious accruals, such as depreciation and gains/losses on the sale of fixed assets, contained in the income statement. Taken together, the information provided in Tables 1b and 1c shows the far-reaching effect of transactions recorded in the funds statement on both the income statement and the balance sheet. It is useful to consider the structure of this framework in relation to previous work referred to in the introduction.

The structure of Table 1b can be interpreted to a large degree as a reflection of Sorter's view of the need to recognise "the funds statement as a statement reporting all events with significant cash impact and/or significant long-run cash consequences". For example, by reconciling funds from operations with operating income in the manner shown in the first few rows of Table 1b, the framework emphasises that depreciation is an event without "cash impact" and is therefore irrelevant to the measurement of funds from operations. More generally, the considerable level of disaggregation of information in the funds statement in Table 1b reflects the concern that this statement be viewed as a statement of major financial events as opposed to a mere rationalisation of balance sheet changes.

The classification of the funds statement emphasising the distinction between operating, investment and financing flows is closely based on Lawson's suggested improvements to the UK standard on the funds statement [13]. In addition, at a more detailed level, the inclusion of interest receivable within funds from operations and its separation from interest payable reflects concerns raised by Lawson. The classification of

Table 1 (a, b and c) differs slightly from the structure suggested by the simple accounting identities above in order to deal with minority interests and provisions.

The funds statement in Table 1b is also structured to differentiate between two main types of investment activity and finance sources. Interest and tax outflows are dealt with separately as they are major items which cannot be unambiguously classified in terms of the other main categories.

Table 1a. Opening and closing balance sheets for y/e 31/12/86

Current assets less current liabilities (excluding loans and overdrafts)		+	Tangible fixed assets and investment in related companies	=	Loans and overdrafts, provisions and other liabilities	+	Share capital and reserves and minority interests	
Current assets			Tangible fixed assets		Loans and overdrafts		Share capital and reserves	
Stock	177.3		Properties:		7½% first mortgage debenture stock	0.5	Called up ordinary share capital	174.2
Debtors	27.4		Cost or valuation	626.7	6½% first mortgage debenture stock	1.7	Share premium account	5.6
ACT recoverable	9.3		Accumulated depreciation	0.8	10½% notes 1993	—	Revaluation reserve	34.0
Cash	87.2		Net book value	615.9	8% irredeemable unsecured loan stock	2.9	Non-distributable capital	213.8
Total	251.2		Fixtures, equipment and vehicles:		Mortgage loan	1.1	Profit and loss account	342.5
			Cost or valuation	365.2	Loans from minority Shareholder	7.2	Total	556.3
			Accumulated depreciation	104.9	Total due after one year	3.4	Minority interest	
			Net book value	260.3	Bank overdrafts	108.6	Total	7.5
			Total	876.2	Total due within one year	108.6		
			Investment in related companies		Total	122.0		
			Investments	26.9	Provisions and other liabilities			
			Share of post- acquisition reserves	16.1	Deferred income	17.8		
			Long term capital advances	5.8	Deferred taxation	2.8		
			Total	48.8	Total	20.6		
Total	469.8							
Total 31/12/85	-218.6		Total 31/12/85	925.0	Total 31/12/85	142.6	Total 31/12/85	563.8

Current assets		Tangible fixed assets		Loans and overdrafts		Share capital and reserves	
Stock	174.4	Properties:		7½% first mortgage		Called up ordinary	
Debtors	37.4	Cost or valuation	773.2	debenture stock	0.5	share capital	175.3
ACT recoverable	11.1	Accumulated depreciation	13.5	6½% first mortgage		Share premium account	12.0
Cash	48.6			debenture stock	1.5	Revaluation reserve	31.9
Total	271.5	Net book value	759.7	10½% notes 1993	60.0		
		Fixtures, equipment and		8% irredeemable	2.9	Non-distributable	219.2
		vehicles:		unsecured loan stock	—	capital	
		Cost or valuation	445.7	Mortgage loan			
		Accumulated depreciation	136.1	Loans from minority	8.2	Profit and loss account	434.3
		Net book value	309.6	Shareholder		Total	653.5
Proposed dividend	27.1	Total	1069.3	Total due after one year	73.1	Minority interest	
Accruals	11.0	Investment in related companies		Bank overdrafts	115.2	Total	7.4
Other creditors	88.7			Total due within one year	115.2		
Social security costs	7.5	Investments	24.8	Total	188.3		
Corporation tax	52.8	Share of post-					
Trade creditors	278.9	acquisition reserves	22.4	Provisions and other liabilities			
Bills payable	—	Long term capital					
Unpresented cheques	62.3	advances	8.4	Deferred income	13.6		
Total	528.3	Total	55.6	Deferred taxation	5.3		
				Total	18.9		
Total 31/12/86	-256.8	Total 31/12/86	1124.9	Total 31/12/86	207.2	Total 31/12/86	660.9
Total change	-38.2	Total change	99.9	Total change	64.6	Total change	97.1

Related investment funds flow					
Investment in related companies	-2.6	Investment in related companies			
Dividend from related companies	0.7	Profit retained in related companies			
Total	-1.9				
Debt financing funds flow					
Loan from minority interest	1.0				
Issue of 10 $\frac{1}{2}$ % notes 1993	60.0				
Increase in bank overdraft	6.6				
Redemption of mortgage loan and debentures	-1.3				
Total	66.3				
Equity financing funds flow					
Ordinary share capital issued	8.3				
Dividend	-38.7				
Total	-30.4				
Miscellaneous items					
Exchange rate effects on funds	4.0	Exchange rate effects on investments in related companies			
Expenses for issue of notes	-0.8				
Total	3.2				
Total change	-38.2	Total change	199.9	Total change	64.6
					97.1

Profit after tax from related companies

7.9

Net profit including minority interest

127.3

Other changes

Increase in creditors due after one year

1.0

Increase in creditors due after one year

60.0

Increase in bank overdraft

6.6

Reduction in creditors due after one year

-1.3

Ordinary share capital issued

8.3

Dividend

-38.7

Exchange rate effects on retained profit

1.0

Issue costs charged to share premium account

-0.8

Total

-30.2

Table 1c. Summary of balance sheet changes for y/e 31/12/86

Change in current assets less current liabilities (excluding loans and overdrafts)		Change in tangible fixed assets and investment in related companies		Change in loans and overdrafts, provisions and other liabilities		Change in share capital and reserves and minority interests	
+		-		-		+	
Current assets		Tangible fixed assets		Loans and overdrafts		Share capital and reserves	
Stock	-2.9	Properties:		7½% first mortgage debenture stock		Called up ordinary share capital	1.1
Debtors	10.0	Additions	159.3	6½% first mortgage debenture stock		Share premium account	6.4
ACT recoverable	1.8	Disposals: net book value	-12.2	10½% notes 1993		Revaluation reserve	-2.1
Cash	11.4	Depreciation charge	-3.3	8% irredeemable unsecured loan stock			
Total change	20.3	Change in net book value	143.8	Mortgage loan		Change in non-distributable capital	5.4
		Fixtures, equipment and vehicles:		Loans from minority shareholder			
Current liabilities		Additions	88.1	Change in total due after one year		Net profit including minority interest	127.3
Proposed dividend	5.5	Disposals: net book value	-1.8	Bank overdrafts	6.6	Loss attributable to minority interest	0.1
Accruals	3.7	Depreciation charge	-37.0	Change in total due with in one year	6.6	Dividend on ordinary shares	-38.7
Other creditors	-7.7	Change in net book value	49.3	Total change	66.3	Transfer from re-valuation reserve	2.1
Social security costs	1.8	Total change	193.1	Provisions and other liabilities		Currency movements	1.0
Corporation tax	12.5	Investment in related companies		Deferred income	-4.2	Change in profit and loss account	91.8
Trade creditors	41.4	Additional investments	-	Deferred taxation	2.5	Total change	97.2
Bills payable	0.0	Share of retained profits for the year	7.2	Total change	-1.7	Minority interest	
Unpresented cheques	1.3	Change in long term capital advances	2.6			Loss attributable to minority interest	-0.1
Total change	58.5	Currency movements: investments	-2.1			Dividend due to minority interest	-
		Share of post-acquisition reserves	-0.9			Total change	-0.1
		Total change	6.8				
Total change		Total change	199.9	Total change	64.6	Total change	97.1

funds flows in Table 1b also suggests that Heath's call for separate statements of investment activities and financing activities can in fact be accommodated within the structure provided by the funds statement.

The final issue of importance concerns the definition of funds used in the funds statement. The working capital approach adjusted for changes in short-term loans and overdrafts utilised in Table 1 (a, b, c) is one of many definitions that could be employed by the reporting framework presented here. The use of alternative definitions would simply require redefining the four columns used in Tables 1a, b and c. For example, a net monetary current asset definition would require the transfer of stocks from the first column to the second column, thus generating a stock change adjustment in the second row of Table 1b. Alternatively, a cash definition could be achieved by redefining the first column as cash and incorporating non-cash current assets in the second column and all current liabilities in the third column. This would clearly increase the required number of entries in the second and third columns of Table 1b in relation to the reconciliation of funds (cash) from operations and operating profit.⁴

In broad terms, it can be argued that the main distinction in relation to the definition of funds is between accrual definitions, such as working capital and net monetary current assets, and cash or near-cash definitions. The accrual approach utilised here diverges from the cash emphasis ultimately favoured by Lawson, although the treatment of overdrafts as a source of funds reflects Lawson's arguments regarding the role of overdrafts in corporate debt policy. On the other hand, this accrual approach is broadly consistent with Sorter's view of the funds statement as reporting events with cash impact as opposed to actual cash events. As already noted, the reporting framework presented above could readily be adjusted for alternative funds definitions and thus cannot be

viewed as clearly favouring any particular definition of funds. The analysis presented in the remainder of this paper, however, can be viewed as providing conceptual support for accrual-based definitions.

THE FUNDS STATEMENT AND CURRENT VALUE INCOME MEASUREMENT

The previous part of this paper considered the role of the funds statement in an integrated approach to historic cost financial reporting. This part extends the analysis to the area of current value accounting, demonstrating how the funds statement can be used in conjunction with information on the current values of assets held by an enterprise at the beginning and end of an accounting period to generate a CVI statement for the period. The analysis begins with an algebraic derivation of such a statement assuming a simple proprietary concept of capital maintenance and presents a CVI statement based on this algebra. The second section shows how this approach can be used to generate a CVI statement based on the entity concept of maintenance of the enterprise's operating assets. The final section considers the significance of the preceding analysis in relation to the integrated approach to financial reporting advocated in this paper and suggests that the relevance of the funds statement in CVI measurement be viewed as a further conceptual argument for the potential importance of this statement to external users of accounting information.

A proprietary CVI statement based on the funds statement

The potential role of the funds statement in CVI measurement can be demonstrated by means of simple algebra. The basic analysis presented here assumes a proprietary approach to income measurement, thereby eliminating the need for a capital maintenance adjustment if general price movements are ignored. The funds statement employed has the same structure as that used in the previous part of the paper but the analysis is simplified by ignoring taxation and assuming a company which has no interests in subsidiary or related companies.

A simplified version of the funds statement employed in the previous part of the paper can be expressed algebraically as follows:

The adoption of a cash definition of funds in the reporting framework would involve linking changes in non-cash current asset and current liability accounts with components of the income statement. In principle, a detailed statement of operating cash flows could therefore be presented. Given aggregation of information in published financial reports, however, a detailed analysis of actual cash flows (operating and others) is unlikely.

$$\Delta WH = [R - (X - \Delta SH)] - F^- - I + L^- + [E^- - D] \quad (1)$$

where ΔWH is change in historic cost working capital, R is sales revenue, X is operating cost affecting net monetary current assets, ΔSH is change in historic cost stocks, F^- is net expenditure on purchase of fixed assets, E^- is net proceeds from issue of equity capital, L^- is net proceeds from issue of debt capital, I is interest and D is dividends. This working capital funds statement can be converted onto a net monetary current asset basis as follows:

$$\Delta M = [R - X] - F^- - I^- + L^- + [E^- - D] \quad (2)$$

where $\Delta M = \Delta WH - \Delta SH$ is the change in net monetary current assets during the period. The derivation of the CVI statement simply requires the substitution of equation (2) in the following expression representing the change in the current value balance sheet of the enterprise during the accounting period:

$$\Delta E = \Delta F + \Delta S + \Delta M - \Delta L \quad (3)$$

where ΔF , ΔS , and ΔL represents the difference between opening and closing values of fixed assets, stocks and long-term debt respectively in the current value balance sheet, ΔM is as above, and ΔE is the difference between opening and closing value of equity capital in the current

value balance sheet based on these figures. The resulting CVI statement can be expressed as follows:

$$Z = \Delta E + D - E^- = [R - (X - \Delta S)] + [\Delta F - F^-] - [I + (\Delta L - L^-)] \quad (4)$$

where Z represents proprietary current value income for the period.

The first two components of the CVI statement shown in square brackets in equation (4) represent current value funds from operations and total gain/loss on fixed asset during the period. If it is assumed that debt capital is issued and redeemed at nominal value and that this is the valuation basis used in the current value balance sheet, then $(\Delta L - L^-)$ is equal to zero and the final component of equation (4) reduces to I , the interest expense for the period.

Equation (4) provides an outline of the structure of a proprietary CVI statement based on the historic cost funds statement. An example of a CVI statement based on this approach is given in Table 2. The first part of this statement corresponds to the first component of equation (4) and shows how current value funds from operations is obtained from historic cost funds (working capital) from operations. This figure contains realised and unrealised holding gains

Table 2. Proprietary CVI statement based on funds statement

<i>Current value funds from operations</i>		
Historic cost funds from operations	1000	
– Change in historic cost stocks	(50)	
Net monetary current assets from operations	950	
+ Change in current value stocks	100	
	1050	1050
<i>Change in current value of fixed assets due to Depreciation and holding and disposals gains</i>		
Current value of fixed assets at 31/12/X4	8000	
– Current value of fixed assets at 31/12/X3	(7500)	
Net change in current value of assets	500	
+ Proceeds from sale of fixed assets	200	
– Expenditure on acquisition of fixed assets	(600)	
	100	
<i>Represented by:</i>		
Depreciation	(400)	
Realised holding gains	50	
Unrealised holding gains	350	
Disposal gains	100	
	100	100
<i>Interest expense</i>		(80)
<i>Current value income</i>		1070

Table 3. Entity CVI statement based on funds statement

<i>Current value funds from operations after maintenance of working capital</i>		
Historic cost funds from operations	1000	
– Change in historic cost stocks	(50)	
Net monetary current assets from operations	950	
+ Change in current value stocks	100	
Current value funds from operations	1050	
– Working capital maintenance adjustment	(30)	
	1020	1020
<i>Change in current value of fixed assets due to depreciation and disposal gains</i>		
Current value of fixed assets at 31/12/X4	8000	
– Current value of fixed assets at 31/12/X3	(7500)	
Net change in current value of assets	500	
+ Proceeds from sale of fixed assets	200	
– Expenditure on acquisition of fixed assets	(600)	
Holding and disposal gains less depreciation	100	
– Fixed asset maintenance adjustment (holding gains)	(400)	
	(300)	
Represented by:		
Depreciation	(400)	
Disposal gains	100	
	(300)	(300)
Interest expense		(80)
Current value income		640

on stocks during the period. The second part of the statement corresponds to the second component of equation (4), demonstrating both the net effect of holding gains, disposal gains and current value depreciation on current value income and the size of each of these items. The latter information indicates consistency in relation to the calculation of relevant fixed asset value changes between the funds based CVI statement and the more usual CVI statement based on adjustments to the historic cost income statement.

The CVI statement presented above emphasises the importance of information contained in the historic cost funds statement to the measurement of CVI. Indeed, given opening and closing asset current values, the analysis demonstrates that the funds statement provides all the necessary information from the historic cost accounting system to enable the calculation of CVI. Moreover, given that opening and closing asset current values necessarily represent estimated values, it is clear that the historic cost funds statement contains all the verifiable transaction-based current value data, in the

form of asset acquisition and disposal values and net monetary current assets from operations, provided by the entire financial reporting system. The CVI statement given in Table 2 recognizes this by disclosing this information in the calculation of current value income.

An entity CVI statement based on the funds statement

The analysis presented above can readily be adapted to accommodate an entity approach to current value income measurement based on maintenance of the enterprise's net operating assets. Such a statement is given in Table 3. The only differences between the entity and proprietary CVI statements are the deduction of a working capital maintenance adjustment in the first part of the entity statement and the exclusion of holding gains on fixed assets from the total calculated in the second part of the entity statement. The working capital adjustment in the first part of Table 3 will include realised and unrealised holding gains on stocks and, in most cases, an adjustment for the maintenance of monetary working capital. These items might,

of course, be separately disclosed in the statement. The second part of the statement, in effect amounts to a re-arrangement of the fixed asset section of the proprietary statement given in Table 2, in order to exclude realised and unrealised holding gains in the measurement of entity current value income.

The presentation of the entity CVI statement in Table 3 differs from conventional presentations based on the historic cost income statement in two main respects. First, the structure of the statement is such that the working capital maintenance adjustment is unambiguously linked to the funds from operations generated by the enterprise during the accounting period, thus emphasising the relationship between changes in funds from operations due to selling price and input cost changes and the requirement for additional investment in working capital (in money terms) to maintain a given level of activity under such conditions. Second, working capital and fixed asset maintenance adjustments in the funds based CVI statement reflect realised and unrealised holding gains, whereas CVI statements based on adjustments to the historic cost income statement may incorporate only realised gains as in, for example, SSAP 16 [13]. It may be argued that in both these respects, the funds based approach represents a conceptually superior approach to the presentation of an entity CVI statement.

Some further comments

The analysis presented in this part of the paper provides further support for the general argument that the historic cost funds statement be viewed as the pivotal statement of financial reporting. The ease with which a CVI statement can be obtained from the funds statement and current value balance sheets is due to the current value nature of the information provided in the funds statement. Indeed, if the current value balance sheets are simply indexed historic cost balance sheets, the historic cost funds statement might be viewed as the only authentic current value financial statement!

The above argument suggests an important role for the historic cost funds statement within a formal financial reporting system incorporating current value accounting. It is also important to emphasise a less direct implication of the analysis, namely that the funds statement provides a basis for informed users of account-

ing information to prepare their own estimates of CVI. More specifically, the analysis demonstrates that if users possess estimates of the current value of the enterprise's assets at the beginning and end of an accounting period, the funds statement alone provides the necessary additional information for the estimation of proprietary CVI. This can be interpreted as a further conceptual argument, in addition, for example, to Sorter's argument based on the concept of cash impact, for the importance to the user of information provided in the funds statement and for the relevance of an accrual definition of funds.

To summarise, the analysis presented in this part of the paper has indicated the potential role of the funds statement as a major statement linking historic cost and current value accounting. Given the current value nature of the information in the funds statement, it would seem logical to centre an integrated historic cost and current value reporting system on the funds statement. In the absence of a formal financial reporting system incorporating current value accounting, the analysis emphasises the role of the funds statement as an important statement providing useful information for the purpose of user estimations of CVI.

THE FUNDS STATEMENT AND PERFORMANCE EVALUATION

The analysis in the previous two parts of this paper has suggested that the funds statement be regarded potentially as a central focus for financial reporting systems based on historic cost accounting alone or combining both historic cost and current value accounting. This view was based on its ability to record in a systematic manner major financial and economic events affecting a business during an accounting period and the current value nature of this information. This part of the paper seeks to reinforce this presentational case for an increased emphasis on the funds statement with an interpretative argument based on the relevance of funds data to performance evaluation.

The relevance of funds flow information to performance evaluation can usefully be elaborated by reference to some recent accounting research concerned with performance evaluation. The following discussion focuses on the work by Ijiri on corporate recovery rates (CRRs) [6, 7] and a recent exchange in the UK on the relative merits of income measurements

and cash flow accounting (CFA) [3, 4, 10]. Ijiri's work indicates the role of the funds flow data in a performance measure based solely on historic cost data, while the UK exchange between Eggington and Lee, it will be argued, indicates the potential usefulness in relation to performance evaluation of the funds based reporting framework incorporating CVI data suggested in this paper.

Ijiri's CRR

Ijiri's recommendation that corporate performance be evaluated in terms of recovery rates can be interpreted as supportive of the increased emphasis on the funds statement in financial reporting suggested in this paper. Thus Ijiri states that "the recovery figures used in the numerator of the recovery rate . . . amounts to the sums of (1) funds from operations (2) Interest (3) proceeds from the sale of fixed assets (4) net decrease in total current assets" [6, p. 347]. The sum of the first items (1) and (2) amounts to what was defined as funds from operations in this paper,⁵ while the net decrease in total current assets, which if it occurs is added to that sum, can be readily ascertained from the statement of changes in working capital accompanying the funds statement. The denominator in Ijiri's recovery rate is represented by the "gross assets" of the entity, which he defines as total (historic cost book value) assets plus accumulated depreciation averaged between beginning and ending balances. Information provided by the funds statement (and, in some cases, the accompanying statement of changes in working capital) is therefore sufficient for the calculation of the "cash recoveries" used in the numerator of the CRR, while balance sheet information is required for the denominator.⁶

The importance of funds flow information to the measurement of CRRs outlined above is explicitly recognised by Ijiri [7]. His detailed proposals for an external reporting system providing the information necessary to calculate recovery rates on an investment project basis, however, go beyond a change in emphasis in existing historic cost reporting practice, requiring a change from the existing approach to financial accounting based on the identity between assets and claims to an alternative reporting system based on an identity between investment and financing cash flows. Given the difficulty of obtaining agreement on such a radical adjustment to traditional accounting practice, even when implemented in conjunction with the traditional approach to historic cost accounting as suggested by Ijiri [6], the emphasis on the funds statement suggested in this paper may represent an alternative practical basis for the introduction of such performance measures in financial reporting.

Most importantly in relation to the concerns of this paper, Ijiri's analysis provides conceptual support for the interpretation of the funds statement as a financial statement of considerable relevance to performance evaluation. Thus, in addition to its relevance to CVI measurement outlined in the previous part of this paper and discussed further below, Ijiri's analysis suggests the relevance of the funds statement to an historic cost performance measure, the CRR, that can be used to estimate the average internal rate of return and payback period for an enterprise's project portfolio. The latter may be particularly important to external evaluations of managerial performance when management use such criteria for investment decisions.

Eggington and Lee on income measurement and CFA

A less explicit indication of the potential contribution of funds flow information to performance evaluation is provided by the Eggington/Lee exchange on the relative merits of income measurement and CFA in the evaluation of enterprise performance. Eggington argues that "a central difficulty of employing CFA for *ex-post* performance assessment is that CFA ignores non-cash movements in assets and liabilities" [3, p. 104]. This argument was in part illustrated by a simple numerical illustration to which Lee [10] responded in detail. The relevant

⁵ As indicated in note 3, funds from operations in Table 1 (a, b and c) does not include the deduction of interest, unlike both US and UK standard practice.

⁶ Edwards suggested that the balance sheet itself should be structured so as to represent a type of long-run funds statement, stating: "Ideally . . . the balance sheet or position statement of a firm at any particular date should represent the total net sources and uses of funds over the life-time of the firm to that date" [2, pp. 165-166]. Although not directly applicable to the funds statement structure proposed in this paper, Edward's analysis implies that the balance sheet can be viewed as essentially an aggregation of information provided by all previous funds statement, adjusted for the creation of reserves and provisions such as retained profit and accumulated depreciation.

Table 4. Example showing calculation of operating profit and operating cash flow in Eggington [3] and total cash flow from operations in Lee [5]

Operating profit [3]		Operating cash flow [3]		Total cash flow from Operations [5]	
Sales	375	Sales receipts	400	Realised operating cash flow	130
Costs	(290)	Operating payments	(270)		
Operating profit	85	Operating cash flow	130	Unrealised cash flow:	
				reduction debtors	(25)
				Increase in creditors	(20)
					(45)
				Total cash flow from operations	85

aspects of Eggington's illustration together with Lee's response are given in Table 4. This provides a useful basis for a brief outline of the issues raised in this debate and the possible relevance of the funds statement to the reconciliation of these issues.

As noted above, Eggington's main objection to the use of CFA in performance evaluation is its apparent inability to take account of the relevance of non-cash movements in assets and liabilities to the assessment of performance. While his simplified illustration is based on a firm where the assets are represented solely by cash and trade debtors and the only liability is represented by trade creditors, his broader analysis also focuses on additional distortions likely to arise from the use of a simple statement of cash receipts and payments for performance evaluation in practice—for example, a tendency to show "a surplus for a low-investment company which had not generated enough operating funds to cover the consumption of assets but a deficit for a high-investment growth company whose operating cash flows covered asset consumption many times over" [3, p. 104].

Lee's response [10] was to emphasise that the CFA system suggested in Lee [9] views the net realisable value of assets held by an enterprise as unrealised cash flows and that changes in the net realisable value of assets are included in the measurement of "total cash flow" under this system. Thus, in the case of Eggington's simple debtor/creditor example, Lee [10] argued that his latest approach to CFA [9], as indicated in Table 4, would produce a measure of "total operating cash flow" identical to Eggington's measure of operating profit. More generally, Lee argued that this approach to CFA generates a measure of realisable income that can be used for performance evaluation, although he argues [9, 10] that the system as whole is intended

primarily as a system of CFA and that "realisable profit . . . in Lee's system is explained as a measure of total cash flow" [10, p.95].

The funds based approach to financial reporting suggested in this paper can be interpreted as providing an alternative view of the role of financial reporting in the provision of information for performance evaluation. This view emphasises both the relevance of funds flow information to performance evaluation and the ease with which financial reporting can provide this information. The relevance of funds flow information to performance evaluation is illustrated by the simple example in Table 4 where it can be seen that Eggington's "operating profit" and Lee's "total operating cash flow" can be interpreted as "funds from operations", measured on either a net monetary current assets or a working capital basis (as the company in the illustration does not hold stocks).

Although Eggington's broader argument regarding the need for an overall measure of performance to take account of consumption of assets can readily be accepted, the funds based approach to financial reporting suggested here seeks to emphasise that such information is not provided automatically by the accounting system and requires additional estimation by the accountant. On the other hand, while the doubtful usefulness of depreciation estimates is suggested by the funds based interpretation of financial reporting advocated here, the failure of simple approaches to CFA, by definition, to take into account debtor/creditor accruals or the likely confusion to arise from the labelling of such accruals as components of "total operating cash flow", as in Lee [9], is also recognized.

The integrated historic cost reporting framework described in the second part of this paper attempts to re-express the traditional historic

cost reporting system in a form that highlights the objectivity and scope of information provided by the funds statement. The historic cost income statement is given lower status within the reporting framework as the double entry structure of Table 1b stresses the contribution of more arbitrary items, such as depreciation and gains/losses on sale of fixed assets, to historic cost income measurement. In addition, the preparation of additional CVI statements, based on alternative valuation and capital maintenance concepts and using the funds based approach described in the third part of this paper, could provide useful additional information for the purpose of performance evaluation. Such an approach to financial reporting recognizes, on the one hand, the strength of accrual accounting in providing information relevant to performance evaluation and income measurement and, on the other hand, the conceptual difficulties of basing a system of financial reporting on any single concept of income.

SUMMARY AND CONCLUSIONS

This paper has suggested that the funds statement represents a logical focal point for an integrated approach to financial reporting and that the statement should be regarded as an important source of objective and verifiable information useful for the purpose of performance evaluation. The former analysis, stimulated by previous work emphasising the positive view of the funds statement as a statement reporting major financial events [12], demonstrated not only the potential role of the funds statement in an integrated historic cost reporting system but also its relevance to CVI measurement. The argument regarding the relevance of the funds statement to performance evaluation considered the importance of funds flow data to the measurement of CRRs [6, 7] and developed a performance based interpretation of the funds based reporting system proposed in this paper. The latter drew on issues raised in a recent debate in the UK accounting literature regarding the relative merits of CFA and in-

come measurement in performance evaluation [3, 4, 10].

The main conclusion to emerge from this paper is that the funds statement is presently an under-rated financial statement. Indeed, given presentational improvements of the type suggested in the second part of the paper, it may be argued that it is perhaps potentially the most significant of all the major financial statements. The integrated reporting framework presented in this paper has the additional advantage of explicitly demonstrating the major attributes of the funds statement, thus encouraging an appreciation of the importance of data provided by the statement⁷ Whether or not such an integrated approach to financial reporting based on the funds statement is adopted in practice, it is hoped that the analysis presented in this paper leads to a greater acceptance of the potential role of the funds statement in improving financial reporting practice.

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⁷ This advantage of the integrated approach is perhaps made more significant by evidence that users have difficulties in interpreting funds statement information [1].

The Relationship between Earnings, Funds Flows and Cash Flows: Evidence for the UK

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Abstract—Recent UK information content studies have provided evidence of a significant relationship between earnings and share prices, as in the US, but have also identified an apparent lack of information content for operating cash flow, which is in marked contrast to findings from US research. This paper provides direct evidence on the relationship between earnings, funds flows and cash flows in the UK during the period 1965–84, using tests of association and predictive tests based on a research methodology applied by Bowen, Burgstahler and Daley (1986) to US data. The results provide UK evidence on the contemporaneous and predictive relationships between measures of earnings, funds flows and cash flows which are generally consistent with the US findings of Bowen *et al.* and which do not support the view that earnings in the UK are superior to cash flows as predictors of future cash flows.

Introduction

In the USA the Financial Accounting Standards Board (FASB) has defined the primary objective of financial reporting as being the provision of information to help investors, creditors and others to assess the amounts, timing and uncertainty of prospective net cash inflows to an organisation (FASB, 1978, para. 37). The FASB has also argued that the primary focus of financial reporting should be on earnings rather than cash flows because 'information about enterprise earnings based on accrual accounting generally provides a better indication of an enterprise's present and continuing ability to generate favourable cash flows than information limited to the financial aspects of cash receipts and payments' (FASB, 1978, p. ix).

In the UK the objectives of financial accounting have not been so clearly defined, although the Accounting Standards Committee (ASC) has described accounting standards as being applicable to all financial statements whose purpose is to give a true and fair view of the profit or loss and financial position of an organisation (ASC, 1986, p. 1). The ASC also welcomed the publication by the International Accounting Standards Committee (IASC) of a 'Framework for the Preparation and Presentation of Financial Statements', which had concluded 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 (IASC, 1989, paras. 15 and 17). The IASC expressed a preference for financial statements prepared on 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' (IASC, 1989, para. 22).

In the US, research has been carried out on association tests and predictive models and on capital market information content. Bowen *et al.* (1986) investigated the empirical relationships between accruals earnings and various measures of 'cash flow', including more traditional funds flow measures. They tested for the similarity in signal between these alternative contemporaneous measures and concluded that the observed correlations between traditional (funds-based) cash flow measures and earnings were high, but that correlations between traditional (funds-based) cash flow measures and 'alternative' cash flow measures, and between 'alternative' measures of cash flow and earnings, were low. They also obtained results, using naive one and two period prediction models, that were inconsistent with the FASB assertion that earnings numbers provide better forecasts than cash flow numbers of future cash flows.

Given the evidence in Bowen *et al.* (1986) that cash and funds flow measures provide no worse and, in some cases, superior predictions to earnings of one and two period cash flows, it might be expected that US capital market studies would reveal a significant relationship between cash and funds flow data and share returns. Consistent with this, Bowen *et al.* (1987) in a cross-sectional study

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based on a sub-set of the sample considered in their 1986 study, provided evidence 'that cash flow information is consistent with the information impounded in security prices and also has incremental explanatory power beyond that contained in accrual flows alone' (p. 746). More generally, other US capital market studies (Rayburn, 1986; Wilson, 1986, 1987) have provided evidence that cash and funds flow variables are (statistically) significantly related to share prices, although the issue of the incremental information content of cash flow data beyond earnings data is the subject of some debate (Wilson, 1987; Bernard and Stober, 1989; Livnat and Zarowin, 1990).

In the UK there have been two studies of capital market information content by Board and Day (1989) and Board, Day and Walker (1989) but no study using association tests or predictive models, equivalent to Bowen *et al.* (1986). The information content studies found 'considerable evidence of a consistent information content both in the traditional return on investment measure and in the working capital based measure of cash flow', but 'no evidence of information content in the net cash earnings figures' (Board and Day, 1989, p. 10). The complementary study (Board, Day and Walker, 1989) provided 'strong evidence... that stock market prices behave as if the market perceives accounting income to be a more relevant measure of firm performance than either cash flow or funds flow' (p. 1). While the UK evidence of a statisti-

presents the findings from the association and prediction tests. The final two sections discuss these findings and consider their implications for policy and research in the UK.

Variables and data set

Many of the differences between cash flows from operations, funds flows from operations and earnings are due to the recognition of trading items in different accounting periods. The treatment of capital expenditure, however, is fundamentally different. Both cash and funds flow accounting classify net capital expenditure, their equivalent of the (smoothed) depreciation charge, as an investment rather than operating flow,¹ thus implying that it may be more consistent to compare earnings with a post-investment cash flow. Previous research concerned with the use of cash flow and funds flow data in corporate performance measurement indeed argues that it is the full range of entity flows, not merely operating flows, that are central to the conceptual case for cash flow and funds flow accounting.²

Lawson (1983, 1985) has identified in some detail the relationship between entity cash flows and the standard valuation model of the firm (Modigliani and Miller, 1958, 1963). Our paper focusses on entity cash flows, or cash flows to and from long-term lenders and shareholders, based on Lawson's model:³

$$\text{Shareholder cash flows} + \text{Longterm lender cash flows} = \text{Operating cash flows} - \text{Investment cash flows} - \text{Tax paid} - \text{Liquidity change}$$

where, shareholder cash flows = distributions – equity receipts, and
longterm lender cash flows = interest payments – borrowings

cally significant relationship between earnings and funds flow accounting variables and share prices is similar to US findings, the apparent lack of information content for operating cash flow in the UK is in marked contrast to the US.

In order to provide direct UK evidence on the relationship between cash flows, funds flows and earnings and their ability to predict future cash flows, it was therefore decided, to:

- (a) assess the degree of association, for UK quoted companies in the period 1965–84, between a structured set of measures of earnings, funds flows and cash flows; and
- (b) provide UK evidence on the predictive relationships between these measures, and in particular on their ability to predict operating and entity cash flows.

The remainder of this paper is divided into four sections. The next section of the paper discusses the variables and the data set, and the following

Based on this model, six variables were defined which represent a sequence of successive adjustments from earnings to entity cash flows. To this we have added one further variable, Bowen *et al.*'s (1986) CC.

The variables are:

- (1) NI (net income), after depreciation and current taxation but before long-term interest and dividends

¹Assuming the usual classification into operating, investment, financing and taxation flows.

²See for example Lawson (1983 and 1985), Ijiri (1978), Lee (1981 and 1984), Egginton (1984 and 1985), Clubb (1988) and Arnold and Wearing (1988).

³There are difficult judgements involved in partitioning the total sources of capital to a firm. Our approach focusses on sources of capital which are likely to be securitised and therefore have a readily ascertainable market price. This avoids a narrow, shareholder view of the firm and differs from Lawson's model primarily in the treatment of short-term debt.

- (2) WO (working capital flow) = NI + depreciation + / - the change in deferred taxation
 (3) NQ (net quick flow) = WO + / - stock change
 (4) CO (cash flow from operations) = NQ + / - other working capital changes, including debtors and creditors
 (5) CI (cash flow from operations and investments) = CO - investments
 (6) CC (cash change), including short term marketable securities and tax reserve certificates
 (7) CIC (entity cash flows) = CI - CC = shareholder and longterm lender cash flows.

Data was taken from the Cambridge/DTI database, utilising Meeks (1985) for detailed definitional matters. A set of 171 quoted companies met our criteria, in that they:

- (a) were companies quoted on the London Stock Exchange;
 (b) had complete runs of relevant data over the twenty year period 1965-1984; and
 (c) had not made material accounting year-end changes during that period.⁴

Findings

Correlations

The first set of findings was based on the correlations, for each firm, between the seven variables defined above over the twenty-year period 1965-84. These correlations provide evidence on the degree of association between the different measures and hence indicate the extent to which these measures may provide similar or different signals of company performance over this period.

Correlation tests were carried out on the annual first differences and percentage changes in these variables (with information on a third aspect, annual totals, provided in a footnote).⁵ In both cases the percentage of significant correlations at the 0.05 level ($r^2 > 0.21$ for 19 years), together with the mean and median squared correlation

Table 1
Percentage of Significant Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	NI	WO	NQ	CO	CI	CC	CIC
(1) NI	—	74	39	30	25	26	19
(2) WO	60	—	53	38	30	24	21
(3) NQ	15	43	—	64	49	32	23
(4) CO	11	19	33	—	84	50	30
(5) CI	4	11	14	29	—	60	n/a
(6) CC	6	11	9	12	19	—	n/a
(7) CIC	8	12	13	16	n/a	n/a	—

First differences are shown above the main diagonal, percentage changes below.

Number of companies in sample 171.

Level of significance used 0.05.

r^2 significant > 0.21 .

coefficients, were computed. The percentage of significant correlations between pairs of variables is shown in Table 1 and the mean and median correlations in Appendices 1 and 2.⁶

The content of Table 1 indicates that, for the majority of companies in the sample, net income (NI) and working capital flow (WO) were significantly correlated at the 0.05 level, whereas the percentage of significant correlations between NI and the net quick flow (NQ) was much lower, at 39% and 15% respectively. There were also, for most companies (53%), significant correlations between WO and NQ for first differences.

Of the earnings and operating funds flow variables considered above, NQ was the most frequently correlated with cash flows from operations (CO), and with cash flow from operations and investments (CI), in 64% and 49% of the cases respectively for first differences, while the percentage of significant correlations between, on the one hand, NI and WO and, on the other, the cash flow variables, was considerably less than this. Amongst the cash flow variables considered there were (statistically) significant correlations for first differences between CO and CI in 84% of cases and between CO and CIC in 30% of the cases.

Predictions

The second set of tests concerned the predictive relationships between the various earnings, funds flow and cash flow measures with particular reference to the ability of individual measures to predict the conventional cash flow measure, cash flow from operations, and the measure we have advocated, following Lawson, entity cash flow.

The tests, of one and two period forecasts, were based upon a naive model, whereby the preceding

⁴'Material' was defined as more than one accounting year-end change in excess of one calendar month within the twenty years.

⁵The percentage of significant correlations (annual totals) was as follows:

	(1)	(2)	(3)	(4)	(5)	(6)
	NI	WO	NQ	CO	CI	CC
(2) WO	98	—				
(3) NQ	70	79	—			
(4) CO	58	73	86	—		
(5) CI	22	25	39	73	—	
(6) CC	21	19	26	42	55	—
(7) CIC	23	26	28	35	n/a	n/a

Number of companies in sample 171

Level of significance used 0.05

r^2 significant > 0.197

⁶Bowen *et al.* (1986) reported significant correlations on first differences and percentage changes at the 0.05 level.

Table 2
One Period Forecast Error Medians and Ranks

<i>Dependent Variables</i>	<i>Predictor Variables</i>						
	(1) <i>NI</i>	(2) <i>WO</i>	(3) <i>NQ</i>	(4) <i>CO</i>	(5) <i>CI</i>	(6) <i>CC</i>	(7) <i>CIC</i>
(1) <i>NI</i>	0.27 (1.0)						
(2) <i>WO</i>	0.48 (1.9)	0.27 (1.1)					
(3) <i>NQ</i>	0.49 (2.3)	0.41 (1.7)	0.46 (2.0)				
(4) <i>CO</i>	0.52 (2.7)	0.46 (2.0)	0.51 (2.3)	0.53 (3.0)			
(5) <i>CI</i>	1.39 (2.5)	2.02 (4.7)	1.57 (3.0)	1.65 (3.3)	1.23 (1.5)		
(6) <i>CC</i>	3.55 (3.4)	5.51 (5.7)	4.16 (4.2)	4.36 (4.5)	2.58 (2.2)	1.28 (1.0)	
(7) <i>CIC</i>	1.57 (2.2)	2.72 (4.7)	2.03 (3.2)	2.09 (3.8)	n/a	n/a	0.55 (1.1)

The first figure shown in each case is the median of the absolute forecast error, scaled by the actual value of the forecast series. The figures shown in parentheses are the 19 year averages of the annual rankings.

year's amount is the prediction of this year's amount. The medians of the absolute forecast errors (each error was calculated as the difference between the actual amount and the predicted amount, scaled by the actual amount) together

with the associated rankings are listed in Tables 2 (one period) and 3 (two period forecasts). In broad terms, the results of the one and two period tests were similar to one another, and to the corresponding results in the US. In general, the random walk

Table 3
Two Period Forecast Error Medians and Ranks

<i>Dependent Variables</i>	<i>Predictor Variables</i>						
	(1) <i>NI</i>	(2) <i>WO</i>	(3) <i>NQ</i>	(4) <i>CO</i>	(5) <i>CI</i>	(6) <i>CC</i>	(7) <i>CIC</i>
(1) <i>NI</i>	0.37 (1.0)						
(2) <i>WO</i>	0.55 (1.9)	0.35 (1.1)					
(3) <i>NQ</i>	0.54 (2.4)	0.43 (1.4)	0.52 (2.2)				
(4) <i>CO</i>	0.56 (2.9)	0.47 (1.6)	0.57 (3.0)	0.55 (2.5)			
(5) <i>CI</i>	1.29 (1.9)	1.88 (4.8)	1.50 (3.3)	1.49 (3.1)	1.21 (1.9)		
(6) <i>CC</i>	3.18 (3.4)	4.94 (5.9)	3.71 (4.3)	3.68 (4.3)	2.27 (2.1)	1.20 (1.0)	
(7) <i>CIC</i>	1.38 (2.1)	2.37 (4.6)	1.76 (3.7)	1.78 (3.6)	n/a	n/a	0.58 (1.1)

The first figure shown in each case is the median of the absolute forecast error, scaled by the actual value of the forecast series. The figures shown in parentheses are the 18 year averages of the annual rankings.

model (and its two period equivalent) provided the best predictions, with the exception of net quick flow and operating cash flows (CO), where the traditional funds flow measure (WO) was the best predictor for one and two period forecasts in the

UK. WO was also the best predictor of CO in the UK.

It can also be seen from Table 4, which lists the results of the pair-wise sign tests, that WO was superior to CO as a predictor of CO itself for both one and two periods ahead (at 0.07 and 0.03 significance levels respectively), and that NQ was a significantly better (at 0.02 level) one period predictor and CO a significantly better (at 0.10 level) two period predictor.

In relation to the prediction of cash flow measures that incorporate investment flows, NI and CI were generally significantly better predictors of CI than WO, NQ and CO but CI was a better (at 0.01 level) one period predictor of itself than NI. This is broadly comparable to US findings, with the exception that Bowen *et al.* (1986) found no statistically significant difference in the ability of their earnings or cash flow after investment variables to predict cash flow after investment. There is no US evidence relating to the prediction of entity cash flows; for the UK we found that CIC was a significantly better predictor (at the 0.01 level) of CIC than NI for both one and two periods ahead. Both CIC and NI are significantly better (at 0.01 level) at predicting CIC than WO, NQ and CO for both one and two periods ahead.

Discussion

The findings in relation to the contemporaneous association between the selected variables reported in this paper are broadly similar to those of Bowen *et al.* (1986) on US data for both first differences and percentage changes. Earnings and working capital flows were significantly correlated for the majority of companies, while the association between earnings and the remaining cash and funds flow (net quick flow) variables were not significant for the majority of companies. This suggests that earnings signals differ statistically from net quick flow and cash flow signals but less so from the working capital flow signal.

In relation to the association between funds flow and cash flow variables, in most cases the majority of correlations were not statistically significant for both first differences and percentage changes. Some interesting exceptions, however, were apparent, notably the association between net quick flow and cash flow from operations and that between cash flow from operations and cash flow after investment. A final point of interest is the small percentage of significant correlations between the overall measure of entity cash flow (CIC) and all other variables (including earnings) considered. This suggests that operating funds and cash flows (and accounting earnings) do not effectively capture, at least individually, the signal provided by entity cash flows.

Table 4
Significance Tests for One and Two Period Forecast Error Medians

Dependent Variable	Predictors Considered		Lowest Error Predictor	
			Period Ahead One	Two
WO	NI	WO	WO**	WO**
NQ	WO	NI	WO	WO
NQ	NI	NQ	NQ	NQ
NQ	WO	NQ	WO	WO*
CO	NI	WO	WO	WO*
CO	NI	NQ	NQ	NI
CO	NI	CO	NI	CO
CO	WO	NQ	WO	WO**
CO	WO	CO	WO	WO*
CO	NQ	CO	NQ*	CO
CI	NI	WO	NI**	NI**
CI	NI	NQ	NI	NI**
CI	NI	CO	NI*	NI*
CI	NI	CI	CI**	CI
CI	WO	NQ	NQ**	NQ**
CI	WO	CO	CO**	CO**
CI	WO	CI	CI**	CI**
CI	NQ	CO	NQ	CO
CI	NQ	CI	CI*	CI
CI	CO	CI	CI**	CI
CC	NI	WO	NI**	NI**
CC	NI	NQ	NI	NI**
CC	NI	CO	NI*	NI
CC	NI	CI	CI**	CI**
CC	NI	CC	CC**	CC**
CC	WO	NQ	NQ**	NQ**
CC	WO	CO	CO	CO**
CC	WO	CI	CI**	CI**
CC	WO	CC	CC**	CC**
CC	NQ	CO	NQ	CO
CC	NQ	CI	CI**	CI**
CC	NQ	CC	CC**	CC**
CC	CO	CI	CI**	CI**
CC	CO	CC	CC**	CC**
CC	CI	CC	CC**	CC**
CIC	NI	WO	NI**	NI**
CIC	NI	NQ	NI**	NI**
CIC	NI	CO	NI**	NI**
CIC	NI	CIC	CIC**	CIC**
CIC	WO	NQ	NQ**	NQ**
CIC	WO	CO	CO*	CO*
CIC	WO	CIC	CIC**	CIC**
CIC	NQ	CO	NQ	NQ
CIC	NQ	CIC	CIC**	CIC**
CIC	CO	CIC	CIC**	CIC**

Note: **indicates significant at 1% level, using sign pairwise test.

*indicates significant at 5% level, using sign pairwise test.

The FASB and the IASC have both claimed that accrual accounting provides superior information to cash flow accounting in relation to the ability of companies to generate cash flows in the future. The findings of Bowen *et al.* (1986) for the US were not consistent with the view that earnings numbers provide better forecasts of future cash flows than do cash flow numbers, although they did find that 'net income plus depreciation and amortization and working capital from operations appear to be the best predictors of cash flow from operations' (p. 724).

The UK evidence on predictive relationships in this paper is broadly similar. With the exception of net quick flow and cash flow from operations, the random walk model (and its two period forecast equivalent) appeared to provide the best naive prediction model for the variables considered. Working capital flow was the best predictor of cash flow from operations and of net quick flow. Thus, although accrual accounting appears to have some merit in relation to the prediction of future cash flows, accounting earnings were not found to display superior predictive properties in relation to any cash flow variable considered.

Conclusions

Recent capital market research in the UK has found 'no evidence of information content in the net cash asset earnings figures' and provided findings that 'do not support the notion that historic cost earnings should be replaced (or indeed supplemented)' (Board and Day, 1989, p. 10). These findings differ from those obtained by similar studies in the US. In contrast, we have not found substantial differences between the results of our association and predictive tests using UK data, and results obtained by Bowen *et al.* (1986) using US data.

The differences in the capital market findings are interesting and could be due to contextual factors or differences between capital market responses in the UK and US or definitional and methodological matters. Although we cannot identify any particular factors as decisive in this context we remain uneasy about two definitional matters. Firstly, although recent American studies have fully adjusted for accruals items,⁷ Board and Day (1989) in the UK have used tests on two funds flow measures, WCAP and NETQ,⁸ as the basis for conclusions about the informational value of cash flow based reports. Secondly, and more impor-

tantly, there has been a general tendency in the literature to equate 'cash flow' with 'cash flow from operations' despite the conceptual linkages between entity cash flows and standard valuation models of the firm. It would therefore seem desirable that further research be carried out in order to clarify the relationship between earnings, funds and cash flow data and company valuation in the UK.

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⁷See Rayburn (1986), Wilson (1986) and Bowen *et al.* (1987) for example.

⁸WCAP was defined as net income plus transfers to deferred tax plus depreciation, and NETQ as WCAP plus changes in stocks and work in progress (but without any adjustment for credit changes).

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WO/CIC	36	21	0.12	0.04
NQ/CO	109	64	0.34	0.33
NQ/CI	83	49	0.25	0.17
NQ/CC	54	32	0.15	0.08
NQ/CIC	39	23	0.12	0.05
CO/CI	143	84	0.54	0.59
CO/CC	86	50	0.25	0.19
CO/CIC	51	30	0.16	0.07
CI/CC	102	60	0.31	0.28

Appendix 2

Correlations (Percentage Changes) Between Earnings, Funds Flow and Cash Flow Measures

Number of
Significant
Correlations (%) Mean Median

Appendix 1

Correlations (First Differences) Between Earnings, Funds Flow and Cash Flow Measures

	Number of Significant Correlations	(%)	Mean	Median
NI/WO	127	74	0.49	0.54
NI/NQ	66	39	0.20	0.12
NI/CO	52	30	0.15	0.10
NI/CI	43	25	0.14	0.09
NI/CC	45	26	0.14	0.09
NI/CIC	32	19	0.11	0.04
WO/NQ	90	53	0.33	0.23
WO/CO	65	38	0.18	0.12
WO/CI	52	30	0.15	0.10
WO/CC	41	24	0.14	0.08

NI/WO	102	60	0.33	0.30
NI/NQ	25	15	0.11	0.04
NI/CO	18	11	0.09	0.03
NI/CI	7	4	0.06	0.03
NI/CC	10	6	0.07	0.02
NI/CIC	14	8	0.07	0.03
WO/NQ	74	43	0.27	0.13
WO/CO	33	19	0.10	0.04
WO/CI	18	11	0.07	0.02
WO/CC	19	11	0.07	0.02
WO/CIC	20	12	0.07	0.02
NQ/CO	57	33	0.19	0.08
NQ/CI	23	13	0.08	0.03
NQ/CC	15	9	0.06	0.01
NQ/CIC	22	13	0.08	0.02
CO/CI	49	29	0.14	0.07
CO/CC	21	12	0.07	0.02
CO/CIC	27	16	0.09	0.02
CI/CC	33	19	0.11	0.04