The relationship between unsystematic security returns and earnings forecast errors : Australian findings

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THE RELATIONSHIP BETWEEN UNSYSTEMATIC SECURITY RETURNS AND EARNINGS FORECAST ERRORS: AUSTRALIAN FINDINGS

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by

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I hereby certify that the work contained in this thesis has not been submitted for a higher degree to any other university or institution.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

This study provides empirical evidence on the contemporaneous relationship between changes in accounting earnings and changes in share prices. The strength of this relationship is documented by considering both the sign and magnitude of earnings forecast errors.

Beaver, Clarke and Wright [1979; p.317, hereafter BCW] described the nature of this relationship as follows:

> Capital market equilibrium can be characterised as a mapping from states into a set of security prices. Similarly, earnings are signals from an information system which is a mapping from states into signals. In general, there could be any relationship between prices and earnings depending upon the nature of the two mappings. If one assumes that prices and earnings reflect a common set of events, it is not unreasonable to assume that the two might be associated.

This association is described for annual earnings announcements made by a sample of 120 Australian listed companies between 1964 and 1972.

1.2 MOTIVATION FOR THE STUDY

The study is motivated by the following considerations:

Firstly, the literature is accounting and finance contains extensive scepticism regarding the usefulness of accounting income numbers. Treynor [1972; p.41], for example, commented:

> The accountant defines it (earnings) as what he gets when he matches costs against revenues, making any allocation of costs to prior periods; or as the change in the equity account over the period. These are not economic definitions of earnings but merely descriptions of the motions the accountant goes through to arrive at the earnings numbers.

Because accounting income does not correspond to the economic definition of income, it's utility is often questioned.[1] Of course

1. See, for example Chambers (1974), Briloff (1974), Sterling (1980).

accounting earnings may be of dubious analytic meaning, yet still possess empirical significance.[2] The empirical usefulness of accounting earnings is the central issue of this study.

Secondly, the study is justified by lack of empirical evidence in Australia. Brown [1970], Brown and Hancock [1977] and Brown, Finn and Hancock [1977] all find an association between the sign of earnings forecast errors and the sign of share price revisions at the announcement date of earnings. None of these studies exploits both the sign and magnitude of the earnings forecast error. A dichotomous classification of earnings forecast errors ("good news", "bad news") ignores the ordinal properties of the data and thus limits our understanding of the strength of any revealed association with price revisions. Further, there is no Australian evidence where the question is turned the other way, i.e., to what extent are price residuals associated with accounting income numbers?[3]

Finally, a justification can be found in providing evidence relevant to evaluating the divergent points of view that have been advanced in the literature to explain price reactions to earnings announcements. A controversy exists between advocates of the efficient markets hypothesis (EMH) and those subscribing to a mechanistic view of the adjustment process. Sterling (1970; p.453) argues:

> Accounting reports have been issued for a long time, and their issuance has been accompanied by a rather impressive ceremony

2. Benston [1967; pp.27-28] found a significant relationship between the rates of change of key signals found in corporate published reports and rates of change of stock prices, but that the information contained in published accounting reports was only a relatively small portion of the information used by investors. Refer to Chapter 3 below for a review of further empirical evidence.

3. This approach was first suggested by Beaver, Lambert and Morse [1980]. See page 28 below for further discussion.

performed by the managers and accountants who issue them. The receivers are likely to have gained the impression that they ought to react, and have noted that others react, and thereby have become conditioned to react.

In contrast, the EMH implies that market prices react immediately and without bias (i.e., traded prices are equilibrium prices) to the information contained in earnings announcements.[4]

1.3 THE NOTION OF USEFULNESS

Usefulness is examined from the point of view of ordinary shareholders. The effect of earnings announcements on the prices of ordinary shares is documented. Thus usefulness, as tested, implies utility for shareholder wealth assessments and shareholder investment decision making.

Shareholders are, or course, only one group of users of accounting information, and price revisions are but one use of accounting information.[5] Two grounds justify the selection of shareholders as the focus of the empirical test. Firstly, accounting bodies generally regard shareholders as the primary user group.[6] Secondly, data are readily available to assess the wealth effects (for shareholders) of earnings announcements. The measurement problems associated with wealth effects of, say, creditors, employees, managers and regulators are far more intractable. Further, the empirical

4. This refers to the semi-strong form of market efficiency, where publicly available information is assumed to be impounded in prices rapidly and efficiently. For an excellent discussion on market efficiency, refer to Fama [1976].

5. Another approach to assess the information content of earnings announcements is to examine the trading volume reaction to such announcement, as in Beaver [1968]. Further, recent accounting literature in 'agency theory', sees an alternative role for accounting as the reduction of agency engendered costs. See Watts & Zimmerman (1978).

6. See, for example, the FASB's statement of Financial Accounting Concept No.1 [1978].

methods used in capital market research (an information perspective) are (probably) better developed and accepted than those in the costly contracting/monitoring approach (stewardship and agency theory views).

1.4 STRUCTURE OF THE STUDY

The information content of earnings announcements is assessed by documenting the relationship between

(i) the unexpected change in the rate of return on total assets and unsystematic security returns; and

(ii) the unexpected change in the rate of return on ordinary shareholders funds and unsystematic security returns.

These relationships are described at both portfolio and individual security levels. This part of the test replicates the BCW U.S. results. Their tests are extended, however, by exploiting information in prices to more finely partition portfolio formation (i.e., to reduce classification error).

This report proceeds as follows:

In the next chapter, the link between earnings and the value of the firm is developed, given an information perspective. Chapter 3 reviews the previous empirical evidence and literature and develops a series of specific hypotheses related to this evidence. Chapter 4 describes the data and empirical methods used in the study. Chapter 5 contains the results. Conclusions and future research suggestions are presented in Chapter 6.

CHAPTER 2

ACCOUNTING INFORMATION AND THE VALUE OF THE FIRM

2.1 OVERVIEW

In the previous chapter, earnings numbers were described as signals from an information system. In other words, accounting earnings were viewed from an 'information' perspective. Alternatively, earnings could be viewed from an income measurement theory perspective. Under certain conditions, (i.e., perfect and complete capital markets) well developed theoretical links exist between income measurement and stock prices.[1] In these settings perfect positive correlation between the return on shareholders funds and the return from share investments would be expected. Unfortunately, once perfect and complete market assumptions are relaxed, income measurement is no longer well defined.[2] Accounting simply does not have an accepted theory that links income to price in a world of imperfect and incomplete markets. A pure income measurement theory perspective is thus not available, hence an information content view is adopted here.

Accounting earnings are considered a source of information investors use in the process of assessing the value (price) of securities. Beaver, Lambert and Morse [1980; p.5] described this as follows:

> If the two mappings reflect similar attributes of the state, a contemporaneous relationship between earnings changes and price

1. In this situation, income, for a period, may be defined as the difference in wealth (which is a function of price), at the beginning and end of the period. See Beaver (1979).

2. For example, S. Alexander (1962; p.127) commented that "...in a dynamic economy, when values are changing both because of changes in prices and changes of expectations of future earning power, there is no unique well-defined ideal concept of income against which can be compared the actual practice of income measurement". See also Beaver, Griffin & Landsman (1982).

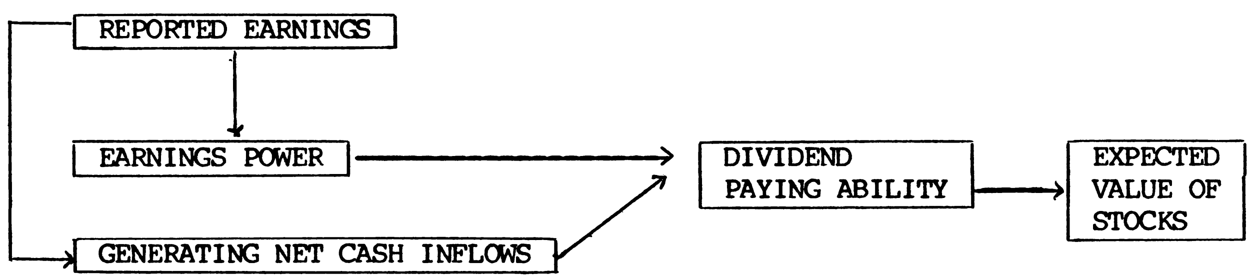
changes would be expected. Prices will be characterised as if they were a function of future, expected earnings. Price changes will depend upon changes in expectations regarding future earnings. The change in expectations will in turn depend on both earnings and other information.

This information perspective view is also emphasised by FASB in its Statement of Financial Accounting Concepts No.1 [1978]:

> Financial reporting should provide information that is useful to present and potential investors ... in assessing the amounts, timing, and uncertainty of prospective cash receipts. [p.viii].
>
> ... The primary focus of financial reporting is information about earnings and its components. [p.ix].

2.2 CAUSAL LINK BETWEEN PRICE AND EARNINGS

While a theory linking price and earnings in conditions of uncertainty does not exist, a causal link can be developed by considering the following three elements: (i) a link between current price and future dividends, (ii) a link between future dividends and future earnings, and (iii) a link between future earnings and current earnings. This conceptual framework was illustrated by Abdel-Khalik and Keller [1979; p.10] as follows:



An implication of the above relationship is that the ability of the firm to pay dividends is greater, ceteris paribus, given greater earning power. Further, the higher the dividend payments, the higher the price of the share, again ceteris paribus. The importance of expected earnings was noted by Graham Dodd and Cottle [1962] as the major factor determining the "intrinsic value"[3] of a security:

> The most important single factor determining a stock's value is now held to be the indicated average future earning power, i.e., the estimated average earnings for a future span of years.

While the Graman Dodd and Cottle notion, that market price can systematically deviate from intrinsic, value is now no longer accepted by Efficient Capital Market researchers, this period's accounting earnings still play the role of altering investors' beliefs about the firm's expected future period earnings. These future earnings reflect the firm's ability to generate net cash inflows, and thus its capacity to pay dividends. Thus current price can be influenced by current earnings. These causal links were described at length by Beaver [1981]. A summary of these arguments is provided in the followng sections.

2.3 THE LINK BETWEEN PRICES AND FUTURE DIVIDENDS

Future dividends and current price are linked via valuation models. In general, valuation models express price as a function of the state of the world, the amount of the dividend (D) to be received in each state in each time period (t), the beliefs of investors regarding the probability of each state and the value of receiving $1 in state s in period t (i.e., a discount rate). Assuming for the moment, that earnings and dividends are related,[4] prices can be viewed as a function of the expected value of future earnings.

3. Lorrie and Hamilton [1973; p.114] defined intrinsic value as "the value that the security ought to have and will have when other investors have the same insight and knowledge as the analyst."

4. See page 9 for empirical evidence that supports this assumption.

A simple formalisation of the model may take the form:

$$V_o = \sum_{0}^{\infty} D_t/(1+k)^t \tag{2.1}$$

or, expressed as a function of expected earnings:

$$V_o = \sum_{0}^{\infty} \mu \exp(E_t)/(1+k)^t \tag{2.2}$$

where,

μ = an assumed constant dividend payout ratio,

$\exp(E_t)$ = expected earnings in time t, and

k = the discount rate.

Assume investors use such valuation models to determine the value of securities. It is expected that any two investors reading the financial statements of a particular firm will have distinctly different perceptions of the expected stream of dividends (or expected earnings), and different values of k. This means that they would arrive at a different value for the firm. However, if it is assumed that investors can buy and sell their holdings freely in a perfectly competitive market, it is expected that, in equilibrium, the value of the firm is that as viewed by the 'market'. Beaver [1981; p.160] described this concept as follows:

> Consider each individual containing a "small" amount of knowledge and a considerable amount of idiosyncratic behaviour. This can be modelled as each individual receiving a garbled signal from an information system that provides an ungarbled signal disguised by a "noise" component. The garbling is so large that any inspection of that individual's behaviour provides little indication that such an individual is contributing to the efficiency of the market with respect to the ungarbled information system. Moreover, assume that this is true for every individual who comprises the market. However, the idiosyncratic behaviour, by definition, is essentially uncorrelated among individuals. As a result, security price, which can be viewed as a "consensus" across investors, is effectively able to diversify away the large idiosyncratic component, such that only the knowledge (i.e., the ungarbled signal) persists in terms of explaining the security price.

Valuation models which relate earnings (and/or dividends) to the value of the firm are well accepted in the finance literature. The seminal empirical work came from Miller and Modigliani (MM). MM [1966] provided empirical evidence showing that reported earnings (after adjustment for measurement error through the use of instrumental variables), were the most important explanatory variable in the prediction of the market value of 63 electric utilities.[5] They found that the earnings term in their valuation model explained about 70% of the total valuation, and that current earnings provided more efficient estimates of expected average annual earnings than did "equally weighted two - and five-year averages of past reported earnings". Other empirical support for the importance of earnings is given in Chapter 3.

2.4 THE LINK BETWEEN FUTURE DIVIDENDS AND FUTURE ACCOUNTING EARNINGS

Here, future dividends are perceived to be statistically dependent on future earnings, and earnings are considered to be an indicator of future dividend-paying ability.

Empirical evidence (Fama and Babiak [1968] and Watts [1973], among others) documents that earnings changes are correlated with dividend changes. Hence, the assumption that there exists a statistical dependence between future earnings and future dividends seems reasonable. However, Beaver [1981; p.104] cautioned against a reliance on empirical evidence in the absence of a conceptual understanding of the relationship:

> It may be intuitively appealing to conclude that the observed dependency arises because of management's perceptions of the ability of earnings to reflect dividend-paying ability. However, this begs the deeper question and leaves a weak foundation for the relevancy of earnings. The fundamental problem is, of

5. That utilities are rate-regulated biases the explanatory power of earnings upward as compared to non-regulated companies.

course, that there is no general theory of managerial choice (e.g., market maximisation) under imperfect or imcomplete markets.

2.5 THE LINK BETWEEN FUTURE ACCOUNTING EARNINGS AND CURRENT ACCOUNTING EARNINGS

The relationship between past earnings and future earnings can be expressed in terms of the stochastic process by which earnings are generated. A discrete linear stochastic process is one where each observation z_t may be expressed in the form:

$$z_t = \mu + \mu_t + \Omega_1 \mu_{t-1} + \Omega_2 \mu_{t-2} + \dots + \Omega_k \mu_{t-k} \qquad (2.3)$$

where μ and Ω_i are fixed parameters of the process. The μ_t term is referred as a disturbance term. The time series $(\mu_t, \mu_{t-1}, \dots, \mu_{t-k})$ has a sequence of independently and identically distributed random disturbance with mean zero and variance of σ^2_μ. The process is considered discrete because each z_t is observed at a discrete interval, and linear because z_t is a linear combination of the current and past disturbances. Empirical studies on the time-series behaviour of earnings are discussed in section 2.8.

When an earnings series is described as a stochastic process, there are two components to the earnings series, a "transitory" component and a "permanent" component. Events occurring within a particular period, that are not expected to have the same impact on earnings in subsequent period contribute to the transitory component. One such kind of event is a strike. Permanent events, by contrast, are expected to impact on earnings in future periods. An example of a permanent event would be the opening of a new production facility.

Accounting earnings can thus be viewed as consisting of two components reflecting the contribution of the two types of events, permanent earnings and transitory earnings. Permanent accounting earnings can be thought of as the expected value of future accounting earnings, and, at a point in time, is a vector rather than a single number. Permanent earnings (PE) could be expressed more formally as:

$$PE = [\exp(E_{t+1}), \exp(E_{t+2}), \ldots, \exp(E_{t+k})] \qquad (2)$$

where,

$k > 0$, and

$\exp(E_{t+k})$ = the expected earnings for time t+k assessed as of time t.

Either an individual or market-wide perspective can be taken in (2.4) as long as a given perspective is consistently maintained throughout. From an individual perspective, the beliefs are those of a particular individual; from a market perspective, the beliefs are a composite or consensus across investors.

The expected or permanent earnings for a given year may change over time. The next section expands the notions of permanent and transitory components in accounting earnings.

2.6 FORECASTING FUTURE EARNINGS FROM CURRENT EARNINGS

The information content of current and past earnings for future earnings prediction is defined as the extent to which the current earnings are larger (or smaller) than expected because of events occurring in the current year. These contemporary events lead to an <u>unexpected component</u> in this year's earnings (i.e., shocks to the earnings series). The importance of these shocks depends upon the extent to which they are expected to impact upon the level of future earnings, i.e., on the time series behaviour of earnings. Four possibilities could arise:

(i) All of the earnings change is considered permanent in nature. This means that the events that caused the change are expected to persist in all future periods. The transitory component of the change is zero.

(ii) The events that caused this year's <u>earnings change</u> are expected not to persist. Here, by contrast, all the earnings change is considered transitory. Thus, no effect on the level of future earnings is expected.

(iii) An "intermediate" case in which the nature of the current period event is such that only a portion of the current earnings change will effect the level of future expected earnings. Here, the change in earnings contains both permanent and transitory components.

(4) Finally, the current period events that caused this year's earnings change are expected to have even greater impact on future years' earnings than they did on current year's earnings. In this case, the current earnings change has not captured the full impact of current events on the level of future expected earnings.

The relationships between current earnings and permanent earnings can be expressed as sensitivity coefficients. The sensitivity coefficient is defined as the proportion of the earnings change that is permanent and would be respectively (i) 100%, (ii) 0%, (iii) less than 10% but greater than 0%, and (iv) greater than 100% for the cases above. The effect on permanent earnings in each of the above cases, given differing sensitivity coefficients, is stated in Table 2.1

Table 2.1

(Relationship Between Current Earnings and Permanent Earnings)

Actual Earnings:		
For the year ending at t=0	$1.50	
For the year ending at t=1	$2.00	
Permanent (or Expected) Earnings		
As of t=0		$1.50
As of t=1		
Case (i) (100% sensitivity)		$2.00
Case (ii) (0% sensitivity)		$1.50
Case (iii) (intermediate case)		$1.50 to $2.00
Case (iv) (greater than 100% sensitivity)		More than $2.00

Source: Beaver [1981; p.108]

2.7 PRICES AND EARNINGS: AN ILLUSTRATION

Here a relationship between current price and current earnings is illustrated by making some simple assumptions about each of the three causal links described in sections 2.3, 2.4 and 2.5.

With respect to the link between current price and future dividends (the first) assume:

(i) no growth in dividends, [i.e., as of time t, $\exp(D_{t+1}) = \exp(D_{t+k})$ for all $k > 1$];

(ii) current price is proportional to future expected dividends, and the proportionality factor (p = rho)) is constant over time [i.e., $P_t = \rho \exp(D_{t+k})$].

For the link between future dividends and future earnings, (the second) assume:

(i) a constant payout ratio (μ) over time so that an identical proportional revision in expected future dividends follows a revision of future expected earnings (i.e., current price can be expressed in terms of future expected earnings);

(ii) that dividend payments do not possess information content, and have no 'price effects'.[6]

The assumptions for the final link, that is, the relationship between current earnings and permanent earnings, were discussed in section 2.6. Four sensitivity coefficients were established given four possible divisions of an earnings change into permanent and transitory effects on future earnings.

With these specific assumptions about the links, it is possible to examine the sensitivity of a stock price change to earnings change. In the spirit of the no growth in dividends assumption, assume a payout ratio of 100%. Assume further that $\rho=10$. The sensitivity of price change depends upon what process is perceived to be governing the time series properties of earnings. In case (i), where the percentage change in current earnings is equal to percentage change in expected earnings, the sensitivity of price change to current earnings change is expected to be one to one. In case (ii), the change is considered transitory and has no information content with respect to future earnings or future dividends. In this case, the stock price would be expected to remain the same. For case (iii), there is a less than one to one relationship between the percentage change in current earnings and percentage change in expected earnings. Part of the current earnings change is considered transitory in nature. In this case, the stock price would be expected to increase but by less than the percentage change in current earnings. In case (iv), the percentage change in expected earnings is greater than the percentage change in current earnings due to current earnings not fully reflecting the impact of events which will have further impact on

6. Ex-dividend price will of course be equal to cum-dividend price less the dividend (i.e., no taxes).

future earnings. The change in the price of the stock is expected to be greater than the change in current earnings.

The purpose of the preceding discussion was to provide a framework for casually linking earnings and prices. A complete or general analysis would involve identifying the events that led to an earnings change and an ability to classify the effects of these events into permanent and transitory components. At present, no model is available that can identify and classify the effects of these events into sub-components. This study must therefore rely on expectation models which have been found to have empirical support. The empirical evidence on the time series of earnings is discussed in the following section.

2.8 TIME SERIES PROPERITIES OF EARNINGS

Given the different relationships that can exist between current earnings and permanent earnings, how can a past earnings pattern be used to make a prediction about future earnings? How can a stock price reactions to an unexpected earnings change be explained? To see if past earnings can be used to make predictions about future earnings, it is necessary to examine the time series behaivour of such numbers.

The time series behaviour of earnings has been examined in some detail in the U.S. and Australia. Initially these studies were concerned with examining the time series behaviour of earnings at an aggregate level. Here inferences were based on mean or median results. Such studies include Beaver [1970], Ball and Watts [1972] and Lookabill [1976]. Later studies involved time series analysis at a firm-specific level. These studies include Albrecht, Lookabill and McKeown [1977], Watts and Leftwich [1977] and Whittred [1978].

Whittred's study was conducted in the Australian context. He examined the time series behaviour of earnings of 104 firms using both parametric and non-parametric tests of independence of the earnings streams. He found that successive changes in reported earnings were well approximated by a random-walk.[7]

Beaver [1970] investigated the time series properties of earnings using the accounting rates of return.[8] He found that the accounting rates of return series followed a moving-average-mean-reverting (MAMR) process. This process implies that each year's unexpected earnings consists of a transitory factor and a non-transitory factor, the effects of which persist for a finite number of periods into the future.

In general, the evidence suggests there are two processes that describe the time series properties of earnings. These are the martingale and sub-martingale processes. A random-walk is considered as a generalisation of the martingale process although strictly, there is a major difference between them. This difference is that for the random-walk process, serial covariances between the earnings series for any lag must be zero. This is not a necessary condition for a martingale process.

In a martingale process, successive earnings changes are independent over time with an expected value of next period's earnings no different from the realised value of last period's earnings. In formal terms,

$$\exp(E_{t+1}) = E_t$$

7. Whittred used four definitions of earnings: (i) Net income after taxes; (ii) Net income after taxes, and extraordinary items; (iii) Earnings per share (adjusted for changes in the basis of capitalisation), after taxes; (iv) Earnings per share (adjusted) after taxes and extraordinary items.

8. This refers to the return on equity and return on total assets ratio series.

If earnings are expected to drift (usually upwards) over time, then the process is described as a sub-martingale process. In this case, the expected value of next year's earnings is greater than the most recent year's. In formal terms,

$$\exp(E_{t+1}) > E_t \quad \text{or,}$$

$$\exp(E_{t+1}) = E_t + d$$

where d = the drift factor

It is important to understand the time series properties of earnings, because realised earnings can only be evaluated as favourable or unfavourable by comparison to an expectation. Prices are driven by expectations of the future. Realised events are relevant only to the extent that they alter expectations. Thus market expectations must be modelled to assess directional share price change implications. The choice of a model to generate market expectations should be influenced by the empirical nature of the actual earnings change series. Whether a particular model adequately describes the earnings series involves comparing known theoretical properties of that model's autocorrelation function with the sample autocorrelation function for the firm's earnings.

A recent study conducted in Australia (Finn and Whittred [1982]) investigated how the martingale and sub-martingale models performed in forecasting corporate earnings of 70 Australian firms over the period 1960 to 1978. Finn and Whittred found that the sub-martingale models incorporating drift factors estimated over a large number of past observations consistently outperformed those using fewer observations, while the martingale model always outperformed the sub-martingale with drift factors estimated over less than six prior earnings changes. Both models will be used in the present research.

It is important to note that this study, in testing for the information content of accounting numbers, is a joint test of whether the two models adopted are descriptively valid. A similar argument applies to the 'market'[9] model used to calculate unsystematic returns, that is, it is assumed that the market model adequately describes the stochastic process by which security returns are generated. Any failure to find an association between income number changes and unsystematic security returns could be caused by misspecification of the models used.

9. The 'market' model is described in section 5.1

CHAPTER 3

LITERATURE SURVEY

3.1 OVERVIEW

The evidence reviewed in this chapter on the information content of earnings announcements is confined to those studies which have employed models derived from the two-parameter asset pricing model developed by Sharpe [1964], Lintner [1965], and others. Further, 'seminal' papers, Australian studies and papers most directly relevant to the current study are emphasised. Excellent summaries of other research can be found in Gonedes and Dopuch [1974], Foster [1978] and Beaver [1981]. Section 3.2 reviews evidence where earnings signals have been classified as dichotomous, i.e., 'good' and 'bad' news. Section 3.3 discusses the BCW study, and others where both the sign and magnitude of earnings forecast errors have been considered. The BCW study is central to the thrust of this paper. Section 3.4 summarises this empirical evidence. The implications of these studies are then discussed in Section 3.5.

3.2 DICHOTOMOUS CLASSIFICATION STUDIES

The earliest and most widely quoted study on the information content of income numbers is Ball and Brown [1968]. Ball and Brown examined the capital market reactions to announcements by firms with positive and negative earnings forecast errors. The study is based on 261 New York Stock Exchange firms that made annual earnings announcements in the years 1957 to 1965. Two models (an index model and the random walk earnings expectations model) were used to classify firms into positive and negative earnings forecast categories in each year. The index model[1] is of the form:

$$\Delta Y_{it} = \hat{\alpha} + \hat{\beta}\Delta X_{M,t} + e_{it} \quad (3.1)$$

where,

$Y_{i,t}$ = earnings of the i (th) firm in period t,

$X_{M,t}$ = average earnings of all other Compustat firms in period t,

Δ = first difference operator, and

e_{it} = firm-specific change in earnings.

The coefficients, $\hat{\alpha}$ and $\hat{\beta}$, were obtained by regressing the change in firm i's income on the change in the average income of all firms (other than firm i) in the market using data up to the end of the previous year, using the OLS technique. The expected income change, or forecast error (e_{it}), is the actual income change minus the expected one:

$$\hat{e}_{it} = \Delta Y_{it} - \Delta\hat{Y}_{it} \quad (3.2)$$

where $$\Delta\hat{Y}_{it} = \hat{\alpha}_{it} + \hat{\beta}_{it}\Delta X_{Mt} \quad (3.3)$$

The second model, the random walk model, is of the form:

$$\exp(Y_{i,t}) = Y_{i,t-1}$$

A firm had a positive change if $Y_{i,t} > \exp(Y_{i,t})$ and a negative change if $Y_{it} < \exp(Y_{i,t})$, where exp( ) refers to the market expectation as derived from the model.

Ball and Brown used an abnormal performance index (API) method to estimate security returns in the period surrounding the earnings announcement.[2] As discussed further[3] in Chapter 4, this

1. See Foster [1978; p.334] for discussion on how the index model and random walk model are affected by diversity (across firms and across time) in accounting techniques used to calculate earnings.

2. The API reflects the value, at the end of month t, and after filtering market effects, of a total investment of one dollar made 12 months before the annual disclosure month and spread equally over all securities.

3. See section 4.2 for further discussion of an analogous concept, the cumulative abnominal return (CAR), which is employed in this thesis.

method permits the estimation of firm-specific changes in security returns. Ball and Brown estimated the market model (3.4) over at least 100 monthly rates of return.

$$\tilde{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i \tilde{R}_{mt} + \hat{U}_{it}$$

where,

$\tilde{R}_{it}$ = return on security i in period t,

$\tilde{R}_{mt}$ = return on the link relative of Fisher's "Combination Investments Performance Index" in period t;

$\hat{U}_{it}$ = the estimate of the effect on returns of security i of firm-specific information made available in period t.

The U_{it} for each firm were cumulated for the 12 months up to and including the earnings announcement and for the 6 months subsequent to that announcement.

Ball and Brown found a positive (and significant) association between the sign of the earnings forecast error (3 separate error metrics were used) and securities abnormal performance, for both earnings "increase" and earnings "decrease" categories of securities. They concluded that most (85 percent) of the information contained in reported income is anticipated by the market[4] prior to the release of the annual report. Further, accounting income was concluded to be important to investors. About one half of the information which was not offsetting could be attributed to (associated with) information contained in income number.

Brown [1970] examined the same issues for 118 Australian firms announcing earnings between 1959 and 1968. Brown used a Classical

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4. This is consistent with an efficient market in which information is gathered in anticipation of the actual announcement and impounded in stock prices accordingly. Recall also, that U.S. firms typically have announced 3 quarterly results prior to the information release studied by Ball and Brown.

Naive Model[4] (which assumes that the world does not change) to derive market expectations of a firm's earnings. This model predicts that the next year's earnings is expected to be the same as the current realised earnings. Brown classified firms into 'good' news and 'bad' news categories, based on whether EPS increased or decreased.

Brown's results were similar to those of Ball and Brown. Firms with 'good' news reports had positive cumulative abnormal returns, and those with 'bad' news reports had negative cumulative abnormal returns. The greatest monthly adjustment in price, about 20-25 percent of the total adjustment for the year, took place in the annual report announcement month. Brown also concluded that approximately half the information coming to the market about the average Australian security was related to information from sources related to accounting information releases.

Brown and Hancock [1977] also documented a strong association between the direction of change in reported profit and the direction of share price movements concurrent with the release of the profit report. Brown and Hancock used daily rates of return and paid careful attention to identifying the <u>exact</u> date on which each profit report was made public.

Gonedes [1974] replicated Ball and Brown's study using financial ratios as well as the earnings-per-share (EPS) number to generate surrogates for market expectations of the firm's performance. He chose a linear combination of financial ratios estimated by discriminant analysis and compared this set with single financial ratios. He found that the EPS number captured most of the information contained in accounting numbers.

Patell [1976] replicated Ball and Brown's study using a sample of

4. This can also be described as martingale model.

firms where management's estimate of earnings for the coming year was available. Patell found that the management forecast was only marginally superior, ex post, in predicting actual earnings for the year than the mechanical expectation models used by Ball and Brown. He also found that a trading strategy, based on management forecasts and assumed prior knowledge of the actual earnings, gave only slightly better returns than those achieved by employing the random walk model as a surrogate for the market's expected earnings.

3.3 MAGNITUDE AND SIGN EVIDENCE

Beaver [1974a] investigated a trading strategy in which the magnitude and sign of the forecast error were used to form portfolios. He found that the most extreme portfolios, that is, the ones containing firms with the largest positive and negative earnings forecast errors, had much larger abnormal returns than portfolios formed from firms whose earnings forecast errors were moderate in magnitude.

Niederhofer and Regan [1972] provided additional evidence on the importance of the magnitude of unexpected earnings. Their sample consisted of the 50 best and 50 worst performers on the NYSE in the year 1970. Earnings predictions for these firms were obtained from the March 1970 Standard and Poors Earnings Forecaster and compared with the actual 1970 earnings. The authors found that analysts had consistently under estimated the earnings gains of the top 50 firms and over estimated the earnings for the bottom 50 firms. They concluded that:

> Stock prices are strongly dependent on earnings changes, both absolute and relative to analysts' estimates ... the most important factor separating the best from the worst performing stocks was profitability.

BCW extended the Ball and Brown study by considering both the magnitude of the earnings change and the sign of the change. Their sample of 276 firms listed on the NYSE had financial years ending on 31 December over the whole of the period studied. The data they employed allowed for a ten-year forecast period, i.e., 1965 to 1974. OLS regression was used to estimate market risk and then cumulative abnormal returns for the twelve-month interval prior to the assumed public disclosure of the earnings signal. Public dissemination of the earnings signal was assumed to occur in the third month after the end of the financial year (i.e., March). The earnings forecast error metric adopted was the submartingale model with the number of observations used to calculate the drift increasing as the number of years of changes in available EPS data increased. An alternative model, which they identified as Model B, was also used. The latter model is very similar to the index model used by Ball and Brown.

Across all forecast years, they obtained about 2,700 observations. Based on these, they formed 25 portfolios on the basis of ranked percentage change in unexpected EPS. That is, the four percent of securities having the largest negative percentage change in earnings were grouped to form portfolio 1. This process was repeated for the next four percent and so on. BCW found that there was a positive relationship between abnormal returns and forecast errors, with abnormal returns increasing in a 'near monotonic' fashion from portfolio 1 to portfolio 25. Based on these portfolio results, rank correlations were calculated which ranged from 0.94 to 0.98. The associated t-values (about 20.0) were large. Individual security rankings were, not unexpectedly, weaker. Here, the mean rank correlation ranged from 0.3161 to 0.3738, still with significant t-values (7.074 to 9.301). Rank correlations between the forecast errors and unsystematic returns across years (at portfolio level) were also calculated. These averaged about 0.74 and are statistically different from zero (t-values in the range 10.3 to 13.9).

3.4 SUMMARY OF THE EVIDENCE

The above evidence provides convincing empirical support for the proposition that accounting numbers have information content. Prior knowledge of such numbers would enable an investor to earn superior returns. In summary, the conclusions are:

(i) There is a positive association between the sign and size of the accounting earnings change and the sign and size of the risk-adjusted security price change. The market acts as if it uses accounting data in setting equilibrium prices. That is, accounting data are consistent in many respects with the underlying information set the market uses to estimate the value of a firm.

(ii) Although the positive association is statistically significant, the relationship is not one-to-one. Percentage changes in price are smaller than percentage changes in earnings for extreme portfolios in the BCW study.

(iii) The explanation offered by Beaver (19810 for the less than perfect relationship in (ii) above is that prices act as if earnings are perceived to contain a transitory component. A portion of earnings is not expected to persist, and hence the 'permanent' level (i.e., the expected value) of future earnings is not equal to the current level. BCW found that while the earnings of the extreme decrease portfolio declined by

154.8%, the price declined by only 17.5%. For the extreme increase portfolio, earnings increased by 185.1% but price increased by only 29.2%

3.5 POSSIBLE METHODOLOGICAL PROBLEMS IN PREVIOUS STUDIES

In a subsequent study on the information content of security prices (Beaver, Lambert and Morse [1980] hereafter BLM), it was argued that grouping into portfolios on the earnings variable may have several undesirable properties. BLM suggested that grouping into portfolios based on price variables was preferable. By forming portfolios on the basis of earnings variables, and relating these to price changes, one would, in fact, be ignoring that investors may understand the permanent and transitory impact of a current earnings change on expected future earnings. That is, one would be wrongly assuming that investors are functionally fixated. The notion of functional fixation was proposed in the accounting literature by Ijiri, Jaedicke and Knight [1966]. Dopuch and Ronen [1973; p.193] explained this concept as follows;

> This hypothesis implies that the meanings attached by subjects to an accounting number (say income) may be conditioned over time in such a way that they cannot (or will not) make a transformation from one technique to another.

The implication of the functional fixation hypothesis is that two firms (securities) could be similar in all economic respects and yet sell for different prices because of the way the earnings numbers are calculated. The functional fixation hypothesis argues that the market ignores the fact that observed signals can be generated from different information systems. Thus markets are assumed to be inefficient in distinguishing between numbers produced by different accounting methods either through time or across firms.

Ball [1972] examined this issue. Ball looked at the market reaction to 267 accounting changes over the period 1947-1960. These changes included 85 inventory changes, 75 depreciation changes and 52 subsidiary-accounting method changes. He found that in the year of the accounting change there appeared to be no unusual behaviour for the average (change) firm. The average residual in the month of the accounting change was only 0.12 of 1 percent. Also, in the 19 months after the accounting change, there was little abnormal price movement.

Empirical studies of Sunder [1973, 1975], Kaplan and Roll [1972] and Hong, Kaplan, and Mandelker [1978] also provide evidence that users are not functionally fixated with respect to reported earnings. These authors argue that markets are able to 'see through' reported earnings and properly understand the economic significance of the events, the net effect of which is reflected in reported earnings. Dopuch and Ronen [1973; p.191] summarised the evidence as follows:

> ...there is an impressive body of evidence supporting the efficient market hypothesis in the assessment of the impact of new information on the prices of securities in the captial market. At the aggregate level, there is little evidence to believe that the market is 'fooled' by different accounting methods.

Brown [1970] commented that the greater the discrepancy between actual EPS and the forecast EPS the greater the amount of information contained in the EPS report, and presumably the greater the impact of the report's announcement on share prices. This view supposes that large EPS forecast errors are driven on average by 'permanent' earnings changes. However, some extreme EPS changes are likely to be caused by 'transitory' events. Available evidence supports the view that investors can see through accounting numbers to understand the real economic effect of the earnings changes. In other words, the relationship between earnings forecast errors (which contain both permanent and transitory components) and stock prices should not be as strong as the relationship between the permanent component of forecast errors and stock prices.

The problem thus becomes one of being able to separate permanent and transitory components. It is argued by BLM that grouping based on residual returns, i.e., exploiting the additional information systems impounded in price, can be helpful in more finely partitioning sample securities. Their arguments are taken up below.

To understand why grouping by price (strictly return residuals) is superior, it is necessary to examine the relationship between the sign of earnings forecast error, the contribution of transitory and permanent components to this earnings forecast error and the expected effect on stock prices (residuals). These relationships can be represented by the matrix in Table 3.1.

Table 3.1

Matrix of Relationship between Earnings Forecast Errors and Expected Return Residuals

Case	Forecast Errors caused by: Permanent	Forecast Errors caused by: Transitory	Net Effect on Forecast Errors	Effect on Residuals*
1	+	+	+	+
2	+	-	depends on the magnitude	+
3	-	+	of individual components	-
4	-	-	-	-

*The impact on the residuals depends on the sensitivity coefficient as mentioned in Chapter 2, and the sign of the permanent forecast error.

In cases 1 and 4, where both the permanent and transitory component of earnings are of the same sign, the combined effect of these two components on the forecast errors is non-ambiguous, positive in case 1, and negative in case 4. Here, the sign of the residual should follow the sign (or direction) of the permanent component of the earnings change, for it is this component that is assumed to affect share prices.[5] Additionally, for these two cases, the sign of the expected residuals is also consistent with that of the net forecast error. In cases 2 and 3, it is not possible to specify the net effect on the forecast error. The sign of the forecast error will depend on the magnitude of the two components. Here the residuals should take a positive sign (although the forecast error may be negative) if the permanent component is positive. The fact that the transitory component is negative and greater than the positive permanent component should not affect the sign of the residuals. The earnings forecast error, can, however, potentially mis-classify firms if ranking is based on the earnings error alone. Empirical studies where portfolios were grouped on the basis of the forecast errors variable, either in terms of the sign or magnitude, thus potentially ignore the ambiguity that can occur in cases 2 and 3. Naturally, the explanatory power of these studies would be adversely affected.

BLM first suggested that portfolios be grouped by the percentage change in price. Their argument was:

> Grouping is one approach that has been used to reduce the errors-in-variables problem.
>
> ...The errors-in-variables problem is reduced if the grouping procedure is uncorrelated with the error and is highly correlated with the 'underlying' variable. In this case of the 'underlying' variable is the change in expected ungarbled earnings...[p.14]

This study takes up these BLM suggestions as a natural extension to a BCW replication.

Most empirical research has used earning-per-share as the accounting based performance measure. Lev [1974] pointed out that this measure may give ambiguous signals because of the earnings

5. This assumption was discussed in section 2.5.

retention phenomenon. The criticism is that a firm's earnings can be increased because of increased retained earnings, and EPS can correspondingly increase, although the firm's basic profitability (deflated by an increased asset base) may have decreased. Additional problems are involved in the adjustment and interpretation of EPS.[6]

Prices of shares are more likely dependent on variables such as current earnings and dividends (i.e., cash flow surrogates), the firm's retention rate and the rate of return on investments. In view of these problems associated with EPS, the following variables were selected for this study:

(i) net income to total assests, and

(ii) income available for ordinary shareholders to ordinary shareholders' equity.

As net income less dividends paid equals the net increase in investment associated with expansion by 'internal' funds operation, the ratio of net income to total assets corrects for the earnings retention phenomenon. However, it is important to bear in mind that historical cost valuation of assets in balance sheets can bias this profitability measure upward during periods of inflation.

The second measure of performance indicates the profitability of the firm for the suppliers of ordinary capital. If profitability is increased (and the increase was not expected), all other things equal, share prices are likely to increase because of expectations regarding higher levels of dividend payments. This measure will usually differ from the market yield on the common stocks. The market yield measure is defined as the ratio of dividends plus capital gains to the

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6. Changes in the number of shares resulting from issue of bonus shares and/or stock splits require an adjustment to a common base (constant number of shares) if an EPS series is to be examined. Further, considerable controversy surrounds the appropriate adjustments when convertible notes, convertible preference shares and options are outstanding.

beginning-of-period price of the stock:

$$i_{kt} = (d_{kt} + P_{k,t+1} - P_{k,t})/P_{k,t}$$

where i_{kt} = the market yield of firm k;

d_{kt} = dividend received for the period;

$P_{k,t}$ = price of share at the beginning of the period;

$P_{k,t+1}$ = Price of share at the end of the period.

The market yield measure corresponds to the definition of a one period security return used to estimate α and β in market model regression. The two measures differ in that the market yield reflects the expectations of investors regarding future economic conditions (through adjustment in stock prices) whereas the accounting measure does not capture investor expectations. The market measure is likely to be influenced by the release of accounting earnings number (the subject of interest in this study) to the extent that the earnings report alters shareholders' perceptions about future economic conditions.

CHAPTER 4

RESEARCH METHOD AND DATA

4.1 OVERVIEW

The main interest of this study is to investigate the relationship between unsystematic security returns and earnings forecast errors. The derivations of the security return and earnings forecast error metrics are discussed in section 4.2 and 4.3 respectively. The data employed in the subsequent analysis are then described in section 4.4.

4.2 UNSYSTEMATIC SECURITY RETURNS

The 'market' model is adopted to estimate unsystematic returns. This model assumes that returns on security i are linearly related to returns on a 'market' portfolio or market index. More precisely, the returns on security i are described by:

$$\tilde{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} + \hat{u}_{it} \qquad (4.1)$$

where,

$E(\hat{u}_{it}) = 0$

$\sigma(\tilde{R}_{mt}, \hat{u}_{it}) = 0$

$\sigma(\hat{u}_{it}, \hat{u}_{jt}) = 0$

$\tilde{R}_{it}$ = returns on security i in period t,

$\tilde{R}_{mt}$ = returns on market portfolio in period t,

$\hat{u}_{it}$ = a residual or disturbance term reflecting that portion of security i's return which varies independently of $\tilde{R}_{mt}$,

$\hat{\alpha}_i, \hat{\beta}_i$ = estimated intercept and slope coefficients associated with the linear relationship.

Within this model, the stochastic process by which security returns are generated can be viewed as consisting of two components, a systematic component ($\hat{\beta}_i\tilde{R}_{Mt}$), and an unsystematic component represented by $\hat{u}_{it}$. Events that have an economy-wide impact are assumed to be reflected in the market index. In contrast, the disturbance or residual ($\hat{u}_{it}$) arises from events that have impact at the individual security level. Such firm-specific events include, for example, the release of the annual report. Other less regular firm-specific events include events like strikes. Note however, that over time and across securities, it is reasonable to assume that disturbances captured in the residual, arising from extraneous factors (e.g., strikes are extraneous to a study of earnings reports), are cancelled out when residual are cumulated around a known (earnings) announcement date. Providing these extraneous factors occur at random (i.e., they are not systematically related to the release of the information being studied) the residual term can an average be attributed to the event under study.

Empirical estimation of unsystematic returns can be obtained from a time series, least-squares regression of the form in (4.1). An OLS regression model was employed to estimate $\hat{\alpha}_i$ and $\hat{\beta}_i$ using monthly security and market returns for a sixty-month period prior to the investigation period. The investigation period is the twelve-month interval ending the fourth month after the end of the financial year (e.g., April 1965 for a firm with a financial year ending 31 December 1964). The reasons for assuming a four-month lag are given in section 4.5. The fourth month subsequent to the end of the financial year is denoted as month 0, (i.e., the assumed earnings announcement date). Using the estimated $\hat{\alpha}_i$ and $\hat{\beta}_i$ values, the monthly unsystematic returns for a twelve-month period ($t = -11, -10, \ldots, -1, 0$) are calculated by taking the difference between the actual return (R_{it}) and the predicted return (R_{it}) for each month via (4.2).

$$\hat{u}_{it} = \tilde{R}_{it} - \hat{R}_{it} \qquad (4.2)$$

where,

$$\hat{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i \hat{R}_{mt}$$

The monthly unsystematic returns are then cumulated for security i for month -11 through month 0 via (4.3).

$$C\hat{R}_{it} = \sum_{t=-11}^{0} \hat{u}_{it} \qquad (4.3)$$

4.3 EARNINGS FORECAST MODELS

Two earnings forecast models are used, a martingale and a sub-martingale model. Earnings are operationalised by the use of two accounting variables: (i) return on total assets; and (ii) return on ordinary shareholders' funds. The return on total assets is calculated by dividing reported profit for each year by total assets at the end of that year. Return on ordinary shareholders' funds is defined as the profit (adjusted for preference share dividends and minority interests) divided by total ordinary shareholders funds (i.e., total shareholders funds less issued preference shares and minority interests).

No attempt is made to adapt the BCW 'Model B' here. This model requires calculating the average accounting returns, for year t, of all firms represented in the sample. This average is then used as a proxy for a market index of earnings. Firms used in this paper have varying financial year ends (the characteristics of the distribution of financial year ends is provided in section 4.4), thus difficulties (both conceptual and computational) were expected to be encountered in calculating a market index of earnings. One problem would be an appropriate adjustment to account for different inflationary expectations when adding together the accounting rates of return for firms with different year-ends. Similar problems exist for structural changes in economic conditions.

The earnings forecast error (e_{it}) for the accounting rates of return (hereafter ARR) can be defined as follows:

$$e_{it} = ARR_{it} - f[ARR_{it}] \qquad (4.4)$$

where,

ARR_{it} = the observed accounting rate of return for firm i in financial year t,

$f[ARR_{it}]$ = a forecast of the accounting rate of return for firm i in financial year t.

This forecast $f[ARR_{it}]$ is derived from both martingale and sub-martingale models.

For the martingale model,

$$f[ARR_{it}] = ARR \qquad (4.5)$$

For the sub-martingale model,

$$f[ARR_{it}] = ARR + d \qquad (4.6)$$

where d represent a drift factor.

A five-year drift factor was used and is defined as

$$d = 1/5(ARR_{i,t-1} - ARR_{i,t-6}) \qquad (4.7)$$

The two types of earnings forecast errors (rate of return on ordinary shareholders' funds and rate of return on assets) from each model (martingale and sub-martingale model) are then standardised to arrive at a standardised forecast e_{sit}, as follows:

$$e_{sit} = \frac{e_{it}}{\hat{\sigma}(e_{it})}$$

where,

$$\sigma^2(e_{it}) = \frac{1}{8}\sum_{t=1}^{9}[e_{it} - \bar{e}_i]^2, \text{ and}$$

$$\bar{e}_i = \frac{1}{9}\sum_{t=1}^{9} e_{it}$$

4.4 DATA

The Brown file[1] was used to develop the sample of firms used in this study. This file contains available monthly rates of return for 909 firms from 1958 to 1973. Because 60 monthly rates of return are required to estimate (4.1) prior to the investigation period, the analysis in this paper is confined to firms with financial years ending between 1964 and 1972, a nine year period. Recall that month 0 is defined to be 4 months after the end of the financial year and thus the 1973 year ends are excluded on data availability grounds.

Data availability in the other major file employed in this study, the Australian Graduate School of Management Annual Report file (AGSM file), also limits the investigation period to 1964-1972. Two models are employed in this paper to isolate unexpected earnings changes. These are a martingale and sub-martingale and were described in section 4.3. Here too, however, prior data observations are required to estimate the drift.

Different stages in data development occurred. Initially, attention was focused on the 'Brown' file when choosing the firms to include in the sample. At first, a strict requirement that firms selected should have continuous trading (defined as the case where the complete monthly returns were available in the Brown file) was imposed. It turned out that only 106 firms met this requirement. Given the second requirement that the annual reports of the firms selected exist in the AGSM file and that there should be no change in a firm's accounting year end, only 82 firms were obtained. Because of the small initial sample size, the first requirement was relaxed. Firms that were 'actively' traded (those firms where 95 percent or more of the monthly returns were available in the Brown file in the

1. This file was described in Ball, Brown and Officer [1976; footnote 9].

period studied), and which also met the second (AGSM file) requirement, were included. This increased the sample size to 107 firms. The final stage involved searching the Faculty of Commerce, University of New South Wales 'Price Relative' file to further increase the sample size. This produced another 14 firms which met the 'actively' traded and accounting information availability requirements. One of these 14 firms, one had to be excluded because an annual report of this firm in the AGSM file was in error.[2] The final sample was 120 firms.[3] For each of these, there are nine earnings forecasts available, thus 1080 observations of earnings forecast errors are studied.

Consideration was given to extending the forecast period by making use of the AGSM merged 'Price Relative' file which contained monthly returns of firms over a longer period than the Brown file. This was rejected for two reasons. Firstly, if the study were to be extended over a longer period, some of the 120 firms selected would drop out because of a change in accounting year on takeover. Secondly, in view of the inflationary trend which began to develop in the early 1970s, it was thought that the expectation models employed would be inadequate.[4]

Two thirds of the firms in the final sample have financial years ending on 30 June. The distribution of financial year ends is shown

2. The financial year end of this firm was wrongly coded.

3. The name of these are listed in Appendix 1.

4. This expectation proved correct when the results (see Chapter 5) were examined.

in Table 4.1.

Table 4.1

Financial Year End Distribution

Month ending	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
No. of Firms	1	0	8	3	4	81	7	0	9	0	0	7

In summary, the firms selected can be described as meeting the following criteria:

(i) The firms were continuously listed on an exchange for the period 1958 to 1973;

(ii) monthly rates of returns (adjusted for dividends and other capitalisation changes) were available for at least 95 percent of possible observations;

(iii) accounting data were available between 1958 and 1972;

(iv) the companies did not change their financial year ends.

The final sample reflects the usual firm 'survivorship' characteristics.

4.5 ANNOUNCEMENT DATE

The fourth month following the financial year end of each firm is used as the month in which the earnings signal is publicly available, i.e., the announcement month. A four-month lag is selected on the basis of earlier Australian studies by Dyer and McHugh [1975] and Whittred [1980]. In the former study, covering the period 1965 to 1971, it was found that both the preliminary and total lag were stable over the period studied, except for 1971, where the total lag increased from 102 to 118 days. Preliminary lag was defined as the interval in days from the year-end to the receipt of a preliminary final statement by the Sydney Stock Exchange. Total lag was defined as the interval in days from the year-end to receipt of the published annual report by the Exchange. In the latter study, Whittred found the average total lag for the period 1972-1977 was approximately 106 days. Twenty-five percent of firms (also the case in the earlier study) did not report within the prescribed four-month[5] period after the end of the financial year.

Despite the fact that 25 percent of the firms were not able to submit the final report to the Exchange by the end of the four-month period, this is not expected to greatly effect the present study. Firstly, as reported by Brown [1970], only about 20-25 percent of the total share price adjustment for the year takes place in the announcement month. Secondly, some of these late reporters would have announced their preliminary final figures within the four-month period. Further, it is likely that signals from information systems other than accounting provide clues as to the income number. For example, Whittred and Zimmer [1984] suggest that late reporting is, of itself, a signal relevant to a prediction of 'poor' performance. Thus, an assumed four-month lag seems acceptable for the purposes of this study. Recall also, that prices are employed to predict earnings in an extension to the BCW method.

4.6 MARKET INDEX

The market index was calculated by taking the average of the returns of all the securities in the Brown file. The index is unweighted.

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5. The AASE listing requirement [Section 3c(1)] provides that from 1972, the interval between the close of the financial year of the company and the issuing of accounts shall not exceed four months.

4.7 HYPOTHESIS TESTING

Investors and analysts spend considerable effort in trying to forecast future corporate earnings. Their forecasts are (by definition in an uncertain world) not accurate. The release of a profit report replaces forecasts with realisations and resolves uncertainty. Differences between announced profits and previously expected profits are assumed to have information content if investor expectations and stock prices are altered. If accounting income numbers have information content, a relationship is expected between the earnings forecast error and unsystematic security returns. The null and alternative hypotheses are tested:

$$H^{o} = \rho_s(\tilde{\varepsilon}_{it}, \tilde{e}_{sit}) = 0$$

$$H^{a} = \rho_s(\tilde{\varepsilon}_{it}, \tilde{e}_{sit}) > 0$$

where ρ_s is the population (Spearman) rank correlation coefficient. The relationship between unsystematic returns and forecast errors is observed by forming 12 portfolios where the portfolios are grouped on the basis of (i) the relative magnitude of the standardised earnings forecast error (in the spirit of BCW) and (ii) the relative magnitude of the residuals (following BLM). In each year t, there are 12 portfolios (denoted by P) i.e., $P_{1t}, P_{2t}, \ldots, P_{12t}$. For the overall results (i.e., the nine-year period $_T$) P_{1T} is formed by adding $P_{1t}, P_{1,t+1}, \ldots, P_{1,t+8}$ together. Portfolios $P_{2T}, \ldots, P_{12T}$ are formed in a similar manner.

Rank order correlations between the earnings forecast errors and unsystematic security returns are calculated, at both the individual security level and the portfolio level, for each year and for the whole nine-year period. The results are reported in the next chapter.

CHAPTER 5

RESULTS

5.1 OVERVIEW

Results are presented in four sections. Sections 5.2 and 5.3 contain the results which parallel the BCW method. Here, standardised earnings forecast errors are used for rankings. Portfolio results are described in section 5.2; individual security results in section 5.3. Results in section 5.4 rank on security residuals in the spirit of BLM. Forecast errors for earnings are related to estimated systematic risk (β) in section 5.5.

Some summary descriptive statistics for the standardised earnings forecast errors are presented in Table 5.1.1. Both accounting rate of return definitions produce essentially the same distributions for the sub-martingale model. The mean forecast error for rate of return on assets of 0.062 is very close to the 0.061 for the alternate return definition. So too are the decile cut-offs. Martingale model results are very similar for the absolute value of the errors $|e_{it}|$, The distribution for forecast errors for return on assets (martingale model) suggests smaller mean errors than the sub-martingale model (the means are 0.022 and 0.062 respectively). This interpretation is, however, not warranted as the errors across the two models have been standardised by a denominator that is model-specific.

Figure 5.1.2 presents a quartile distribution for estimated systematic risk. These estimates were derived using the 60 monthly rates of return prior to the investigation period. The results are consistent with previous Australian evidence.

TABLE 5.1.1

Frequency Distribution Characteristics For Standardised Forecast Errors

Forecast Errors For Return On Assets

	Mean	Std.Dev	Deciles 0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
Martingale Model											
e_{it}	0.022	0.991	-1.392	-0.795	-0.427	-0.165	0.019	0.214	0.492	0.83	1.417
$\lvert e_{it}\rvert$	0.762	0.634	0.082	0.181	0.297	0.446	0.622	0.803	1.013	1.320	1.797
Sub-Martingale											
e_{it}	0.062	0.973	-1.315	-0.725	-0.381	-0.141	0.049	0.249	0.500	0.861	1.458
$\lvert e_{it}\rvert$	0.750	0.662	0.092	0.187	0.301	0.433	0.578	0.762	0.010	0.663	1.772

Forecast Errors For Return On Equity

	Mean	Std.Dev	Deciles 0.10	0.20	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Martingale Model											
e_{it}	0.065	0.980	-1.355	-0.738	-0.358	-0.106	0.076	0.271	0.532	0.884	1.434
$\lvert e_{it}\rvert$	0.756	0.627	0.084	0.179	0.295	0.441	0.600	0.789	1.034	1.330	1.767
Sub-Martingale											
e_{it}	0.061	0.969	-1.332	-0.737	-0.383	0.128	0.072	0.275	0.526	0.864	1.420
$\lvert e_{it}\rvert$	0.753	0.613	0.094	0.198	0.315	0.448	0.599	0.780	1.010	1.300	1.749

TABLE 5.1.2

Distribution Of Estimated Systematic Risk

	Mean	Std.Dev	Quartiles 0.25	0.50	0.75
Beta	1.026	0.431	0.710	0.996	1.342

5.2 RELATIONSHIP BETWEEN UNSYSTEMATIC RETURNS AND FORECAST ERRORS

Tables 5.2.1 to 5.2.4 report the unsystematic security returns and earnings forecast errors for return on total assets (Tables 5.2.1 and 5.2.2) and return on common equity (Tables 5.2.3 and 5.2.4). The tables contain results for the martingale and sub-martingale models for these accounting return definitions. The Spearman rank correlation[1] for each set of results is high, ranging from 0.923 to 0.986. Corresponding t-values range from 7.589 to 18.709. These results are significant at at least the 0.0005 level. The sub-martingale model gives a slightly higher rank-order correlation for both accounting measures (0.986 in both cases with corresponding t-values of about 18.7). Table 5.2.5, which contains the results for portfolio formation by years, provides a clue for the sub-martingale model's superiority. Recall that the martingale model assumes the world does not change, whereas the sub-martingale assumes change by a drift, calculated over the five previous yearly observations. Yet it is known (with hindsight) that the world changed dramatically in 1972. The Australian economy encountered a severe structural change with rapid increases in inflation.[2] While neither model was capable of

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1. The correlation is calculated using the formula

$$r_s = 1 - \frac{6\sum_{i=1}^{N} d_i^2}{N^3 - N}$$

where d_i stands for the differences between the rank of the corresponding x's and y's and N refers to the sample size.

When N is 10 or larger, the significance of an obtained rs under the null hypothesis may be tested by:

$$t = rs\sqrt{\frac{N-2}{1-r_s^2}}$$

For further reference, see Siegel (1956).

2. Appendix 2 shows the percentage change in CPI index over the period 1958 to 1980. These are realised inflation rates. Security pricing, of course, is related to expected inflation rates. Expectations have been shown to predate realised inflation rates.

capturing this, the sub-martingale performs better because it, at least, partially adjusts by the addition of a drift. Comparatively the four results produce weaker rankings in 1972; the simple expectation models are no longer adequate for predicting earnings in the face of such dramatic economic shocks. Over all years, however, the correlations are still highly significant.

TABLE 5.2.1

Unsystematic Security Returns and Forecast Errors:

Martingle Model - Return of Total Assets

Portfolio	Mean ε_p	Mean e_p	Mean $\hat{\beta}_p$
1	-0.163	-1.814	1.007
2	-0.106	-1.159	0.996
3	-0.119	-0.735	1.047
4	-0.025	-0.442	1.002
5	-0.066	-0.213	0.985
6	-0.034	-0.048	1.053
7	-0.043	0.085	0.941
8	0.032	0.261	1.014
9	0.087	0.524	1.024
10	0.041	0.785	1.071
11	0.085	1.127	1.127
12	0.129	1.868	1.016

Spearman Rank Correlation between mean ε_p and e_p : 0.923

t-value : 7.589

TABLE 5.2.2

Unsystematic Security Returns and Forecast Errors:

Sub-martingale Model - Return on Total Assets

Portfolio	Mean ε_p	Mean e_p	Mean $\hat{\beta}_p$
1	-0.163	-1.724	1.038
2	-0.114	-1.064	1.018
3	-0.142	-0.649	1.031
4	-0.065	-0.381	0.976
5	-0.018	-0.190	1.015
6	-0.010	-0.017	1.007
7	0.003	0.133	1.061
8	0.014	0.331	0.992
9	0.033	0.524	1.057
10	0.076	0.835	1.055
11	0.070	1.207	0.979
12	0.137	1.854	1.060

Spearman Rank Correlation between mean ε_p and e_p : 0.986

t value : 18.709

TABLE 5.2.3

Unsystematic Security Returns and Forecast Errors:

Martingale Model - Return on Common Equity

Portfolio	Mean ε_p	Mean e_p	Mean $\hat{\beta}_p$
1	-0.156	-1.789	1.048
2	-0.150	-1.107	1.006
3	-0.087	-0.648	0.997
4	-0.044	-0.376	0.992
5	-0.089	-0.159	1.039
6	0.006	0.004	1.035
7	0.018	0.157	0.955
8	0.014	0.341	1.006
9	0.015	0.548	1.060
10	0.088	0.812	1.089
11	0.067	1.181	1.051
12	0.150	1.820	1.037

Spearman Rank Correlation between mean ε_p and e_p : 0.951

t value : 9.732

TABLE 5.2.4

Unsystematic Security Returns and Forecast Errors:

Sub-martingale Model - Return on Common Equity

Portfolio	Mean ε_p	Mean e_p	Mean $\hat{\beta}_p$
1	-0.152	-1.741	1.028
2	-0.142	-1.091	0.981
3	-0.144	-0.672	1.100
4	-0.054	-0.366	0.974
5	-0.080	-0.177	1.058
6	-0.022	-0.018	1.014
7	0.000	0.151	1.002
8	0.041	0.326	1.014
9	0.045	0.545	1.050
10	0.052	0.807	1.017
11	0.085	1.147	0.988
12	0.132	1.816	1.094

Spearman Rank Correlation between mean ε_p and e_p : 0.986

t value : 18.699

TABLE 5.2.5

Spearman Rank Correlation between Mean Forecast Errors

and Unsystematic Returns (Portfolio Level)*

	Martingale Model		Sub-martingale Model	
Forecast (Fiscal) Year	Return on Total Assets	Return on Common Equity	Return on Total Assets	Return on Common Equity
1964	0.902	0.951	0.801	0.944
1965	0.678	0.874	0.958	0.776
1966	0.769	0.888	0.895	0.902
1967	0.762	0.762	0.860	0.916
1968	0.524	0.517	0.762	0.657
1969	0.545	0.664	0.395	0.462
1970	0.696	0.685	0.587	0.657
1971	0.930	0.832	0.888	0.832
1972	0.615	0.238	0.636	0.483
Mean r_s**	0.713	0.712	0.754	0.737
t-value	14.976	9.593	12.453	12.127

*Based on twelve portfolio per year

**Mean Spearman Rank Correlation

As noted earlier, Beaver [1981] commented that previous U.S. evidence showed a less than one-to-one relationship, with the percentage change in price being smaller than the percentage change in earnings, especially for the extreme portfolios. The present results also show a less than one-to-one relationship with the percentage change in price smaller than the percentage change in earnings in almost every case. Taken together the five tables discussed in this section produced very similar results to the BCW study which motivates this thesis.

5.3 RELATIONSHIP BETWEEN UNSYSTEMATIC RETURNS AND FORECAST ERRORS: INDIVIDUAL SECURITY LEVEL

Table 5.3.1 reports the Spearman rank correlations for forecast errors and unsystematic returns at the individual security level for forecast years 1964 to 1972. The mean correlation ranges from 0.3353 to 0.3524, with t-values that are significant at at least the 0.0005 percent level. This result also corresponds to that obtained by BCW. The effect of the portfolio aggregation [i.e., Table 5.2.5] is to increase the correlation coefficients, an effect expected to occur (see Beaver and Manegold [1975]) because errors are averaged in the portfolio formation process. It is interesting to note that the rank correlations for forecast year 1972 again stand out. This result was also found in the BCW study (the U.S. economy also experienced rapid increases in inflationin 1972) where the rank correlation for forecast year 1972 was the lowest among the years 1965 to 1974.

TABLE 5.3.1

Spearman Rank Correlation between Forecast Errors and

Unsystematic Returns (Individual Security Level)*

Forecast Year	Martingale Model: Return on Total Assets	Martingale Model: Return on Common Equity	Sub-martingale Model: Return on Total Assets	Sub-martingale Model: Return on Common Equity
1964	0.4340	0.5191	0.3597	0.4679
1965	0.2929	0.3647	0.3056	0.3000
1966	0.4848	0.4621	0.5149	0.4339
1967	0.4241	0.5064	0.4114	0.4794
1968	0.1666	0.1946	0.2367	0.2103
1969	0.2496	0.2561	0.2306	0.2447
1970	0.3665	0.3613	0.3217	0.3300
1971	0.4848	0.4464	0.4999	0.4522
1972	0.1141	0.0612	0.1517	0.1268
Mean r_s	0.3353	0.3542	0.3369	0.3384
t-value	7.349	6.833	8.213	7.956

*Based on 120 observations per year

5.4 RELATIONSHIP BETWEEN UNSYSTEMATIC RETURNS AND FORECAST ERRORS: PORTFOLIO FORMED ACCORDING TO RANKING OF RESIDUALS

Table 5.4.1 shows the relationship between unsystematic security returns and forecast errors, but in this case, the portfolios are formed by ranking of residuals. This approach was first suggested by BLM, who argued,

> In general, the assessed distribution of future earnings conditional upon past earnings will differ from the assessed distribution of future earnings conditional upon past earnings and past prices. This will occur if prices convey information about future earnings that is not conveyed by the past earnings. [p.4].

Futher, if earnings signals are seen to comprise a permanent component (relevant for pricing) and a transitory component, (irrelevant for pricing) the information in prices (providing market participants can properly assess these two components) should be capable of producing a stronger (i.e., closer to one-to-one) relationship. If however, markets are mechanistic in adjusting (i.e., functionally fixated), the correspondence in section 5.2 should be more nearly one-to-one. Additionally, according to functional fixation arguments, the results should be similar irrespective of whether portfolios are formed according to ranking of earnings forecast errors or return residuals.

It is recognised that the market's information set, which includes key variables relevant to the estimation of future cash flows, can never be observed. The best that can be achieved is to posit some proxy and test to see if prices behave consistently with the proxy. The proxy employed here argues that earnings can be viewed as comprising both information and noise.

For the 'negative residuals' portfolios, the results obtained strongly confirm the above expectations. That is, a one-to-one relationship where rankings on residuals are used is more nearly obtained than when rankings on earnings are used. For example, for Portfolio P_1, the mean ε_p is -0.483, and the mean e_p's are -0.514, -0.519, -0.457 and -0.506 depending on the models and accounting measures used. Again, for Portfolio P_4, the mean ε_p is -0.133, and the mean e_p's are -0.130, -0.149, -0.104 and -0.136.

These results indicate that for the extreme negative portfolios (defined here as consisting of portfolio P_1 to P_4), investors behave as if the current adverse profit performance (negative forecast errors) has a permanent effect on expected future earnings, and discount the share prices accordingly. It is also interesting to note that for the extreme negative portfolios, the order of ranking for 3 of the 4 models/definitions is identical. Only one inconsistency occurs in the other case.

For the extreme positive portfolios (defined as referring to portfolio P_9 to P_{12}), the ranking of the forecast errors in relation to the residuals is perfect, with the forecast errors increasing in a perfectly monotonic fashion with the residuals for all four cases. However, it seems that investors tend to discount positive forecast errors, resulting in a smaller change in price for a given change in forecast errors. These results are however still closer to the one-to-one relationship that an efficient capital market pricing of securities suggests.

In the case of the moderate portfolios (portfolios P_5 to P_8), inconsistencies in rankings occur. Apparently, investors are less able to understand the effects of moderate forecast errors on expected future earnings. That is, investors react only to the 'permanent' component of the forecast errors, but an ambiguous signal arises when the permanent and transitory components do not have the same sign.

Overall, high rank correlations between unsystematic returns and forecast errors are obtained, the r_s value ranges from 0.937 to 0.979, and the t-values from 8.487 to 15.194, all significant at least the 0.0005 level. Again, yearly results in Table 5.4.2 are significant. The mean Spearman rank correlations range from 0.660 to 0.717, associated t-values from 7.316 to 9.435. Taken together, these results are consistent with, and at least as strong as, the U.S. BLM findings.

TABLE 5.4.1

Unsystematic Security Returns and Forecast Errors:

Portfolio formed according to Ranking of Unsystematic Security Returns

		Mean e_p				
		Martingale Model		Sub Martingale Model		
Portfolio	Mean ε_p	Return on Total Assets	Return on Equity	Return on Total Assets	Return on Equity	$\hat{\beta}_p$
1	-0.483	-0.514	-0.519	-0.457	-0.506	1.198
2	-0.276	-0.443	-0.347	-0.382	-0.332	1.130
3	-0.197	-0.415	-0.364	-0.350	-0.321	1.063
4	-0.133	-0.130	-0.149	-0.104	-0.126	0.930
5	-0.090	0.032	0.057	0.103	0.053	0.990
6	-0.042	0.143	0.163	0.172	0.191	0.971
7	0.002	-0.039	0.035	0.055	0.068	1.044
8	0.041	-0.045	0.073	0.001	0.090	0.979
9	0.088	0.168	0.264	0.241	0.266	0.925
10	0.152	0.436	0.416	0.402	0.313	0.999
11	0.241	0.510	0.555	0.562	0.536	0.987
12	0.518	0.576	0.617	0.618	0.619	1.075
r_s*		0.937	0.958	0.937	0.979	
t-value		8.487	10.570	8.487	15.194	

*Spearman Rank Correlation between mean ε_p and e_p

TABLE 5.4.2

Spearman Rank Correlation between Mean Forecast Errors and Unsystematic Returns: Portfolio formed according to Ranking of Unsystematic Security Returns

	Martingale Model		Sub-martingale Model	
Forecast Year	Return on Total Assets	Return on Equity	Return on Total Assets	Return on Equity
1964	0.748	0.888	0.727	0.832
1965	0.696	0.724	0.818	0.608
1966	0.951	0.902	0.965	0.867
1967	0.776	0.832	0.818	0.853
1968	0.245	0.343	0.413	0.357
1969	0.580	0.531	0.587	0.559
1970	0.895	0.888	0.895	0.944
1971	0.846	0.853	0.909	0.846
1972	0.203	0.140	0.322	0.238
Mean r_s	0.660	0.678	0.717	0.678
t-value	7.325	7.316	9.435	8.100

5.5 SYSTEMATIC RISK AND EARNINGS FORECAST ERRORS

This section tests the association between forecast errors and systematic risk. BCW argue that:

> One set of sufficient conditions for the relationship would be: (1) Securities with extreme forecast errors have a greater variance in earnings forecast errors. (2) Securities with greater variances in earnings forecast errors have greater variance in unsystematic returns. (3) Securities with greater variance in unsystematic returns have a higher systematic risk. [p.333].

Tables 5.4.1 and 5.4.2 report correlations between beta and the two (models) by two (error return definitions) empirical design of this thesis at both the portfolio and individual security levels.

Notice that betas are pre-event estimates. Notice also that no significance tests are conducted on these results as the year-by-year beta estimates are not independent. In fact, 80 percent of the observations used to estimate adjacent-year betas are common to both regressions. Finally, and relying on the arguments of BCW, the computed correlations are derived using the absolute value of the standardised earnings forecast errors.

TABLE 5.5.1

SPEARMAN CORRELATION OF THE ABSOLUTE VALUE OF FORECAST ERROR WITH β

(PORTFOLIO LEVEL)

	Martingale Model		Sub-Martingale Model	
Year	Return on Total Assets	Return on Common Equity	Return on Total Assets	Return on Common Equity
1964	0.1958	0.2727	0.4340	0.2168
1965	0.5874	0.4685	0.0000	0.2157
1966	-0.0559	-0.0559	0.0489	0.2273
1967	0.1259	0.0420	0.1118	-0.3357
1968	0.0804	0.0629	0.1329	0.0979
1969	0.0350	0.2797	-0.5559	-0.3916
1970	-0.3076	-0.1469	0.0559	-0.2517
1971	0.0559	0.0839	0.1049	0.1189
1972	0.4895	0.2517	0.3776	0.3077

TABLE 5.5.2

SPEARMAN CORRELATION OF THE ABSOLUTE VALUE OF FORECAST ERROR WITH β

(INDIVIDUAL SECURITY LEVEL)

Year	Martingale Model: Return on Total Assets	Martingale Model: Return on Common Equity	Sub-Martingale Model: Return on Total Assets	Sub-Martingale Model: Return on Common Equity
1964	0.0368	0.0212	0.0898	0.0461
1965	0.1639	0.1217	-0.0072	0.0337
1966	-0.0720	-0.0597	-0.0566	0.0161
1967	0.0391	0.0314	-0.0208	-0.0602
1968	-0.0243	-0.0396	0.0532	0.0602
1969	0.0448	-0.0099	-0.1173	-0.0961
1970	-0.0220	-0.0421	0.0457	-0.0645
1971	0.0157	0.0026	0.0276	0.0148
1972	0.0852	0.0395	0.1378	0.0786

The following conclusions emerge from Table 5.4.1 and 5.4.2. Portfolio association again are, as expected, higher than individual securities results. Most correlations, at both portfolio an individual security level, are positive (though lack of independence exists). Here again, results are consistent with BCW (see Table 10, p.335).

5.6 CONCLUSIONS

The significant associations between residuals and earnings forecast errors clearly support the hypothesis that accounting numbers have information content. This result is robust with respect to different definitions of accounting rates of return and different earnings expectation models. Further, the strength of this association can be improved by exploiting information (presumed to be contained) in security prices. The results are thus consistent with and at least as strong as the two U.S. papers that motivate this study.

CHAPTER 6

CONCLUSIONS

6.1 PURPOSE AND RESULTS

This thesis investigated the association between unsystematic security returns and the magnitude of earnings forecast errors. At both the portfolio and individual security levels these associations are found to be highly significant. Further, information presumed to be contained in price is exploited to assess whether the above relationships could be improved. They were. The results are thus consistent with an earnings process in which a change can be attributed to either permanent (relevant to pricing) and transitory (irrelevant to pricing) components. Markets are found to price securities efficiently given this two-component earnings process. The results are also consistent with major U.S. studies.

6.2 FUTURE RESEARCH

Brown, Finn and Hancock [1977] noted that about 98 percent of Australian companies announced dividends and profits simultaneously. They also found a positive reltaionship between the magnitude of share price adjustments and the amount of information conveyed by dividend and profit reports. It may be inadequate to merely observe the effect of share price reactions to earnings forecast errors. Future studies could incorporate a dividend change variable as well.

Further research could be conducted using different expectation models and accounting variables during the inflationary period 1973 to 1981. If adequate expectation models for this period can be developed, and strong associations are documented, further insight into the information content of accounting could be gained. This extension is currently being undertaken. Such an extension may have policy implications for the accounting profession's valuation debate.

APPENDIX A

List of Firms Included in Study

	AASE Code	Financial Year (mth ending)
APA Holdings Ltd	APA	September
A.R.C. Industries Ltd	ARC	June
Adams (William) and Co. Ltd	ADW	June
Advertiser Newspaper Ltd	AVT	December
Allen (Samuel) and Sons Ltd	ALS	June
Allen's Confectionary Ltd	ALL	June
Alliance Holdings Ltd	ALH	June
Amalgamated Wireless (A/Asia) Ltd	AWA	June
Ampol Petroleum Ltd	AMP	September
Ansett Transport Industries Ltd	ATI	June
Argo Investments Ltd	ARG	March
Associated Pulp & Paper Mills Ltd	APP	June
Associated Securities Ltd	ASL	June
Australian Foundation Investment Ltd	AFI	June
Australian Gas Light Company	AGL	December
Australian Guarantee Corp. Ltd	AGC	September
Australian Motor Industries Ltd	AMI	June
Australian Paper Manufacturers Ltd	APM	June
Ballarat Brewing Co. Ltd	BAB	May
Bank of Adeliade Ltd	BOA	September
Bank of New South Wales Ltd	BNS	September
Bellambi Coal Company Ltd	BEL	June
Boral Ltd	BOR	June
Borg-Warner (Australia) Ltd	BWA	December
Bradmill Industries Ltd	BML	June
Brambles Industries Ltd	BIL	June
Brick & Pipe Industries Ltd	BNP	March

	AASE Code	Financial Year (mth ending)
Broken Hill Proprietary Co. Ltd	BHP	May
Bruck (Australia) Ltd	BRK	June
Buckley & Nunn Ltd	BNN	July
Castlemaine Perkins Ltd	CMP	July
Charlick (William) Ltd	CHW	June
Cleckheaton Ltd	CLK	June
Clyde Industries Ltd	CLY	June
Coles (G.J.) & Co. Ltd	COL	June
Comeng Holdings Ltd	CMG	June
Commercial Bank of Australia Ltd	CBA	June
Commercial Banking Co. of Sydney Ltd	CBC	June
Commonwealth Industrial Gases Ltd	CIG	September
Consolidated Press Holdings Ltd	CPH	June
Containers Ltd	CTN	June
Cooke (Sidney) Ltd	CKS	April
CSR Ltd	CSR	March
Cuming, Smith & Company Ltd	CSM	December
Davies Brothers Ltd	DBR	June
Denny, Lascelles Ltd	DLS	April
Ducan's Holdings Ltd	DCH	June
Dunlop Australia Ltd	DUN	June
E Z Industries Ltd	EZI	June
E.M.I. (Australia) Ltd	EMI	June
East African Coffee Plantations Ltd	EAC	May
Edwards Dunlop & Co. Ltd	EDL	April
Electrical Equipment Ltd	EEA	June
Email Ltd	EML	December
Fairfax (John) Ltd	FFX	June
Faulding (F.H.) & Co. Ltd	FHF	June

	AASE Code	Financial Year (mth ending)
Fire Fighting Enterprises Ltd	FFE	June
Gordon & Gotch (Australasia) Ltd	GNG	March
Hanimex Corporation Ltd	HMX	June
Hardie (James) Asbestos Ltd	HAH	March
Hardie Trading Ltd	HAT	June
Haughton (Wm.) & Co. Ltd	HAW	June
Henderson's Industries Ltd	HND	June
Herald & Weekly Times Ltd	HWT	June
Hills Industries Ltd	HIL	June
Hooker Corporation Ltd	HKR	June
Horwood Bagshaw Ltd	HWD	June
Humes Ltd	HUM	June
Huttons Ltd	HUT	June
ICI Australia Ltd	ICI	September
Jacques Ltd	JQS	June
Jennings Industries Ltd	JEN	June
Jones (David) Ltd	JOD	July
Kelvinator Australia Ltd	KLV	March
Lempriere (O.T.) & Co. Ltd	LEM	June
Lend Lease Corporation Ltd	LLC	June
Lifesavers (Australasia) Ltd	LSV	July
Luke (K.G.) Group Industries Ltd	LUK	June
Marrickville Holdings Ltd	MVH	June
Martin Bright Steel Ltd	MBR	June
Mayne Nickless Ltd	MAY	June
McDonald Industries Ltd	MDI	June
McIlwraith McEacharn Ltd	MWM	June
McKay (Ralph) Ltd	MKR	June
McPherson's Ltd	MCP	June

	AASE Code	Financial Year (mth ending)
Meggitt Ltd	MEG	May
Mercantile Credits Ltd	MER	June
Mercantile Mutual Insurance Co. Ltd	MMT	June
Michaelis Bayley Ltd	MBL	June
Morris (Philip) (Australia) Ltd	MPH	June
Mutual Acceptance Ltd	MUT	June
Myer Emporium Ltd	MYR	June
Mytton's Ltd	MYT	June
National Bank of Australasia Ltd	NBA	September
National Consolidated Ltd	NCL	June
News Ltd	NEW	June
Nilsen (Oliver J.) (Australia) Ltd	NIO	June
Nylex Corporation Ltd	NYL	December
Overseas Corporation (Australia) Ltd	OVR	June
Petersville Australia Ltd	PTV	June
Repco Ltd	REP	June
Rocla Industries Ltd	ROC	June
Selby (H.B.) Australia Ltd	SEH	June
Siddons Industries Ltd	SID	June
Sleigh (H.C.) Ltd	SLE	June
Smith (Howard) Ltd	SMI	December
Soul Pattinson (Washington H.) Ltd	SOL	July
Supertex Industries Ltd	SPX	June
Swan Brewery Company Ltd	SWB	March
Swift & Company Ltd	SWF	June
Symonds (Ralph) Ltd	SMR	June
Tasmanian Board Mills Ltd	TBM	June
Taubmans Industries Ltd	TAB	September
Tooheys Ltd	TOH	July

	AASE Code	Financial Year (mth ending)
Tooth & Co. Ltd	TTH	March
Waltons Ltd	WAL	July
Webb (H.H) & Co. Ltd	WEB	June
Wilcox Moffin Ltd	WCX	June
Woolworths Ltd	WLW	January
Wormald International Ltd	WOI	June

APPENDIX 2

Annual average change in Consumer Price Index

Year	Per Cent Change
1958	1.3
1959	1.8
1960	3.9
1961	2.5
1962	-0.4
1963	0.6
1964	2.2
1965	4.2
1966	2.8
1967	3.3
1968	2.5
1969	3.0
1970	3.9
1971	6.0
1972	6.0
1973	9.4
1974	15.1
1975	15.1
1976	13.5
1977	12.3
1978	7.9
1979	9.1
1980	9.3

Source: Australian Economics Statistics Published by Reserve Bank of Australia

Note : These CPI changes are for a January to December year.

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