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This paper examines whether the relevance of accounting information for valuation and systematic risk assessment has declined in Australian during the last thirty years. Motivated by professional and analyst concerns that the relevance of accounting earnings and (possibly) balance sheets have continuously declined over time, a number of recent research papers appear to confirm this contention. In contrast, we find the value relevance of accounting earnings has not declined over time. Rather the nature of the relationship with stock prices has changed such that a linear model does not fully abstract the association. Once, the transitory components within the earnings stream are controlled, the relationship becomes as stable as the book value relationship. Moreover, the long-term risk relevance of accounting information has remained relatively stable over the last thirty years. We also find evidence of firm size and leverage effects.

Key Words: Value Relevance, Long-Term, Non-linear, Risk Relevance.

1.0 INTRODUCTION

A research trend in accounting that emerged in the mid 1990's is the literature that examines the long-term trend in the value relevance of financial statement information. The research has been primarily motivated by concerns in the professional literature that current accounting information is inadequate for decision making by modern organisations and investment analysts. This is proposed to be due to a variety of institutional, technological and macro economic changes that had occurred over the last thirty years.

These include: (1) the changing business environment which is radically different to the one that existed when generally accepted accounting principles (GAAP) were developed; (2) changes in the sources and levels of risk and a general increase in the volatility of asset returns; (3) that GAAP does not take account of the significant increase in the potential sources of future economic benefits including a number of non-monetary assets, or increased exposure to currency, commodity, and interest rate volatility; (4) the proliferation of technological development; and (5) the increased sophistication and information requirements of investors. (see Rimerman 1990, Sever and Boisclair 1990, Elliott and Jacobson 1991, Jenkins 1994).

It is argued that such issues have led investors to increasingly turn to other sources of information to meet their needs and, consequently, decrease the relative importance of financial statements to pricing in capital markets. Such concerns were framed by an overriding concern that the negative trend is detrimental to the role of the accounting profession as providers of value relevant financial information.

Moreover, the academic accounting community also has a number of detractors of the value relevance of financial statements. The review article of Lev (1989) points out that accounting earnings consistently explain only 5-10% of stock returns in the cross-section. Lev's (1989) believes that the "quality" of accounting earnings numbers is low, other financial information is required, and accountants garble the figures. Other studies conclude the increased incidence of negative earnings and non-recurring items has also adversely affected the value relevance of earnings in recent times (Hayn 1995, Basu 1997). Shina and Watts (2001) further argue that even with additional alternate sources of information, the decline in the relevance of financial reports leads to a loss in economic efficiency.

In order to alleviate these issues, Rimerman (1990), Elliott and Jacobson (1991) and Jenkins (1994) suggest a series of steps that the profession may consider taking. These include; (1) modifying the reporting process so it better falls in line with the needs of the changing business climate, (2) the examination of alternative models, (3) identify other forms of competing information and determining if financial statements can be expanded to incorporate them, (4) developing a standard setting policy that requires aggressive maintenance of the standards, (5) sponsoring review committees to investigate the relevance of financial reporting, and (6) developing communication between practitioners, academics, government, and standard setters to promote relevant research into standard setting issues.

The empirical evidence generally concludes that earnings have lost their value relevance (Berger, Ofek and Swary 1996, Collins, Maydew and Weiss 1997, Francis and Shipper 1999, Lev and Zarowin 1999, Brown, Lo and Lys 1999). In contrast,

Landsman and Maydew (2002) using event methodology, found no evidence of a decline in the value relevance of earnings (even suggesting some increase). Balance sheet relevance is more contentious. The Collins, Maydew and Weiss (1997) and Francis and Shipper (1999) studies find increasing relevance for balance sheet items that offset the decline in earnings, whilst Brown, Lo and Lys (1999) and Lev and Zarowin (1999) find the opposite. Francis and Shipper (1999) contend that this is caused by a shift in focus from the income to a balance sheet valuation focus.[1]

Clearly this is an issue of some importance to the accounting profession, financial analysts, investors in general, and the accounting standard setting community. Hence, this paper addresses these issues by examining whether accounting information has lost its value relevance in Australia over the last thirty years. In addition, we make use of methodological improvements suggested by Freeman and Tse (1992) regarding the non-linear relationship between earnings and price; and Brown, Lo and Lys (1999) who demonstrate that R^2 is positively correlated with the coefficient of variation of the scale factor. Furthermore, we control for firm size and leverage factors that affect the earnings response coefficient (ERC) over time, and examine the time varying behaviour of both price and risk as measured by a multivariate GARCH (M-GARCH) model.

The remainder of the paper now proceeds as follows. Section two outlines the data and research design applied, section three reports the results and the conclusion is contained in section four. Briefly we find the value relevance of accounting earnings

[1] Other studies by these authors examine different aspects of the value relevance of accounting information such as whether analyst's reports are gaining relevance at the expense of earnings Francis, Schipper and Vincent (2001a) or whether alternative accounting-based financial and non-financial performance metrics are increasing in value relevance such as EBITDA or industry specific performance measures (Francis, Schipper and Vincent (2001c).

has not declined over time. Rather the nature of the relationship with stock prices has changed such that a linear model does not fully abstract the association. Once, the transitory components within the earnings stream are controlled, the relationship becomes as stable as the book value relationship, with accounting earnings explaining an average of 21% of the variation in stock prices. Moreover, the long-term risk relevance of accounting information has remained relatively stable over the last thirty years.

2.0 DATA AND METHOD

2.1 Data

Datastream, Connect 4, and microfiche for Australian listed equities were utilised to gather relevant financial data over the period 1973 to 2001. Firms were included in the sample if all the required accounting and market variables over a minimum five-year duration[2] were available. Financial organisations were excluded. All market information and accounting information from 1983-2001 was obtained from Datastream and Connect 4 whilst accounting information for the period 1973 to 1982 was hand collected from microfiche. This resulted in a sample of 3563 firm years across 274 firms that were distributed across industrial groups as described in table 1.

[2] Required for beta risk calculations.

Table 1: Industry Membership of Sample Firms

Industry Sector	No of Firms	Industry Sector	No of Firms
Mining	51	Medical/Biotechnology/ Pharmaceuticals	12
Property/Real Estate	27	Transport	11
Diversified Services	26	Construction/Building	11
Oil/Gas/Exploration	19	Leisure/Gaming	11
Retail/Clothing/Textiles	18	IT/Computing	9
Diversified Industrials	18	Telecommunications	6
Food/ Food Processing	16	Chemicals	5
Engineering/Electricity	14	Agricultural	3
Media/Publishing	13	Other	3

This table presents the sample split by industry sectors according to Datastream industry codes.

Table 2: Descriptive Statistics

Panel A: General Descriptive Statistics

			Percentiles		
Variable	**N**	**Mean**	**25**	**50**	**75**
Return (R_{it})	3563	0.276	-0.100	0.120	0.450
Price (P_{it})	3563	1.197	0.850	1.070	1.410
Earnings ($Earn_{it}$)	3563	0.008	0.017	0.059	0.093
Change in Earnings ($\Delta Earn_{it}$)	3289	0.009	-0.031	-.001	0.025
Book Value (BV_{it})	3563	0.956	0.444	0.719	1.113
Size ($Size_{it}$)	3563	0.523	0.377	0.526	0.680
Financial Leverage ($FLev_{it}$)	3563	0.329	0.021	0.143	0.383
β_{it}	2467	0.793	0.439	0.755	1.076
Accounting Beta ($AccBeta_{it}$)	2467	1.040	-0.128	0.240	3.460
Earnings Variance (EV_{it})	2467	0.066	0.350	0.074	0.185
Operating Leverage ($OpLev_{it}$)	2467	0.099	0.030	0.060	0.130
Liquidity (Liq_{it})	2467	0.159	0.110	0.149	0.218
Growth ($Grth_{it}$)	2467	0.105	-0.003	0.075	0.189

Panel B: Sample Distribution per Year

Year	No of Firms	Year	No of Firms	Year	No of Firms	Year	No of Firms
1973	42	1981	52	1989	142	1997	244
1974	42	1982	55	1990	153	1998	260
1975	45	1983	57	1991	159	1999	270
1976	47	1984	60	1992	163	2000	265
1977	49	1985	74	1993	165	2001	252
1978	50	1986	76	1994	165		
1979	51	1987	82	1995	186		
1980	51	1988	95	1996	211		

This table presents descriptive statistics for the pooled sample for the period 1973 to 2001 inclusive. All market variables are obtained from Datastream. Accounting variables for the period 1983-2001 are also collected from Datastream and Connect 4 with the remaining (1973-1982) collected from AGSM microfiche. Panel A presents standard descriptive statistics for all accounting variables included in the study where R_{it} is the t period simple return, P_{it} is opening stock price, $Earn_{it}$ is accounting earnings to ordinary shareholders, $\Delta Earn_{it}$ is the yearly change in $Earn_{it}$, BV_{it} is opening accounting book value, $Size_{it}$ is the log of opening market capitalisation, $Flev_{it}$ is the ratio of total assets to total liabilities, $AccBeta_{it}$ is the degree of co-variability of a firm's earnings and the earnings of the market, EV_{it} is the standard deviation t-period $Earn_{it}$, $OpLev_{it}$ is absolute ratio of operating profit to sales, Liq_{it} is ratio of current assets to total assets, and $Grth_{it}$ is the log change in total assets. Panel B presents the number of firms sampled in each yearly interval. All accounting variables are scaled by market value as per Brown Lo and Lys (1999).

Descriptive statistics on the collected data are presented in panel A, table 2 and provides standard statistics on each of the variables whilst panel B provides details of the sample size for each firm year. The descriptive statistics generally reveal no problems in the data set in terms of distributions with most means approximating the fifty-percentile range and spread evenly across the percentiles. The only exception is the financial leverage variable which is skewed towards the high end, indicating a majority of firms in the sample have scaled leverage ratios in the upper bound of the sample. The M-GARCH beta has a mean of 0.793, lower than the average market, and is 0.748 over the last 10 years. Panel B illustrates the number of firms in each yearly sub sample and, as expected, this grows over time from forty-two in 1973 to two hundred and fifty-two in 2001.

2.2 Initial Regressions

The analysis is undertaken in two parts. The first part addresses the proposition that financial statements have lost their value relevance as asserted by the recent evidence in the US (Collins, Maydew, and Weiss, 1997; Francis and Shipper (1999). This utilises three sets of models; (1) earnings models; (2) balance sheet models; and (3) Ohlson (1995) style earnings and balance sheet models to determine whether accounting information has lost it's overall relevance.

The second set of models examine the impact of controlling for firm size, leverage, transitory items as measured by non-linear regression, and the risk relevance of accounting information. Finally, the above tests are repeated using the arctan non-linear modelling.

2.2.1 Earnings Models

The first model (1) examines the relationship between stock prices and earnings per share and change in earnings per share in an annual regression model.[3] Therefore, this model examines the value relevance of earnings for each year in the sample period, utilising price as a proxy for firm value under the assumption that it represents the market consensus view of firm value (Barth, Beaver and Landsman, 2001). The model is defined as:

$$P_{it} = \alpha_0 + \alpha_1 Earn_{it} + \alpha_2 \Delta Earn_{it} + \varepsilon_{it} \qquad (1)$$

where:

P_{it} = share price of firm *i* at the end of year *t*, lagged 3 months,

$Earn_{it}$ = earnings per share[4] of firm *i* at the end of year *t,*

$\Delta Earn_{it}$ = change in earnings per share of firm *i* at the end of year *t,*

ε_{it} = other value-relevant information of firm *i* at the end of year *t*, independent of earnings.

A second earnings model (2) examines the earnings-returns association over the sample period.[5] This is employed in line with the research of Barth, Beaver and Landsman (2001) that suggests both returns and price regression should be estimated to assess value-relevance of earnings. The returns regression is defined as:

[3] All variables are scaled by price to allow for any positive correlation with the coefficient of variation of the scale factor as per Brown, Lo and Lys (1999).
[4] The earnings level per share item is orthogonal to the earnings change per share variable to control for correlation between the two.
[5] This is similar to the model used by Lev and Zarowin (1999).

$$R_{it} = \rho_0 + \rho_1 Earn_{it} + \rho_2 \Delta Earn_{it} + \varepsilon_{it} \quad (2)$$

where $Earn_{it}$, $\Delta Earn_{it}$ and ε_{it} are defined as per model (8.1) above and R_{it} is defined as:

$$R_{tt} = \frac{P_{tt} - P_{tt-1} + D_{it}}{P_{it-1}} \quad (3)$$

where:

P_{it} = stock price of firm *i* at the end of period *t*, lagged 3 months,

P_{it-1} = stock price of firm *i* at the beginning of period *t*,

D_{it} = dividends of firm *i* for the period *t*.

2.2.2 Balance Sheet Models

The second set of models examines the value relevance of accounting book values with both price and returns models estimated. These are defined as:

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \varepsilon_{it} \quad (4)$$

$$R_{it} = \rho_0 + \rho_1 BV_{it} + \varepsilon_{it} \quad (5)$$

where BV_{it} is the accounting book value per share for firm *i* in period *t* scaled by opening price.

2.2.3 Ohlson Models

The third group of models examines the combined impact of earnings and book value in an Ohlson (1995) style regression model as per the specifications employed by Lev and Zarowin (1999), Collins, Maydew and Weiss (1997) and Francis and Shipper (1999).[6] Both price and return regressions are estimated once again and all variables are defined as above and the models are defined as:

$$P_{it} = \alpha_0 + \alpha_1 Earn_{it} + \alpha_2 BV_{it} + \varepsilon_{it} \quad (6)$$

$$R_{it} = \alpha_0 + \alpha_1 Earn_{it} + \alpha_2 BV_{it} + \varepsilon_{it} \quad (7)$$

2.2.4 Time Trend Models

To statistically test for any upward or downward trend in the value relevance of the accounting variables over time a further regression is estimated for the outputs of each of the above models. The regressions relate to the yearly explanatory power (R^2) and the earnings response coefficients (ERC) as follows:

$$\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it} \quad (8)$$

and

$$ERC_t = \phi_0 + \phi_1 TIME + \varepsilon_{it} \quad (9)$$

All regressions apply the White (1980) consistent covariance matrix adjustment for heteroskedasticity and Cook's distance statistics are examined in order to ensure that no individual observation is significantly influencing the regression results. Durbin

[6] This terminology is used in accordance with the prior literature, however, strictly speaking the Ohlson model regresses prices on book values and excess earnings.

Watson statistics are also examined to test for serial correlation within the regression residuals.

2.2.5 Extensions

Size

Prior research indicates that firm size is a key factor that influences the earnings returns relationship (Freeman 1987, Ataise 1985, Hodgson and Stevenson-Clarke 2000). This is related to a number of issues such as lower levels of analysts following small firms relative to large firms, lower levels of information disclosure by small firms, greater numbers of start-up firms in the small firm category, and the greater propensity of small firms to report losses (Hayn, 1995).

Size is operationalised by splitting the yearly samples into small and large firm subsets determined by the median value of opening market capitalisation. Regressions 1 through 9 are then re-estimated for the size sub-samples and compared. This approach is selected, rather than a dummy variables approach, as it provides two independent series of R^2 statistics for use with the time trend regression (model 8), thus permitting the examination of the long term trends for both small and large firms.

Leverage

There are several competing theories relating to the impact of financial leverage on firm value.[7] Empirical support for leverage having a significant impact on firm value is provided by Kim, Chen and Nance (1992) and Hodgson and Stevenson-Clarke

[7] These are known as the default theorem (Dhaliwal and Reynolds, 1989 and Dhaliwal, Lee and Fargher, 1991), the maximum debt theorem (Modigliani and Miller, 1963 and Ross, 1977), the optimal leverage theorem and the irrelevance theorem (Modigliani and Miller, 1958). See Hodgson and Stevenson-Clarke (2000b) for and explanation of these.

(2000b) which evidence that the level of leverage influences both actual and expected earnings and the degree to which earnings are permanent or transitory. The sample split is implemented as per the size regressions by splitting the sample at the median value of financial leverage[8] for each yearly interval and then re-estimating regressions 1-9 for each sub-sample.

Non-Linear Modelling

The third extension models the earnings-returns relationship using a non-linear (inverse) arctan model specification as employed in Freeman and Tse (1992), Das and Lev (1994) and Hodgson and Stevenson-Clarke (2000). These studies argue that a linear regression based on the constant marginal response of the dependant variable to the independent variable fails to fully capture the earnings-returns relation. This is due to the likelihood of factors such as earnings persistence, firm size, and systematic risk being correlated with the magnitude of the unexpected component of earnings. If this is the case then the market to earnings relationship will be connected to the magnitude of earnings, thus creating non-linearity in the marginal responsiveness of price. Hence, a non-linear model should more fully reflect the functional relationship between earnings and price (returns).[9]

This is examined by estimating non-linear arctan (inverse tangent) models as follows:

$$P_{it} = \gamma_0 + \gamma_1 . \arctan(\gamma_2 Earn_{it} + \gamma_3 \Delta Earn_{it}) + \varepsilon_{it} \quad (10)$$

$$P_{it} = \gamma_0 + \gamma_1 . \arctan(\gamma_2 BV_{it}) + \varepsilon_{it} \quad (11)$$

$$P_{it} = \gamma_0 + \gamma_1 . \arctan(\gamma_2 Earn_{it}) + \gamma_3 . \arctan(\gamma_4 BV_{it}) + \varepsilon_{it} \quad (12)$$

[8] Measured using a debt to equity ratio.

[9] A key factor is earnings persistence where large changes in (unexpected) earnings are not likely to be sustained in future periods. Freeman and Tse (1992) argue that this results in the tails of the earnings distribution consisting primarily of transitory items.

where $Earn_{it}$, $\Delta Earn_{it}$, P_{it} and ε_{it} are defined as per model (1) above.

Risk

The final extension examines whether the long term association between market risk and accounting information has changed over time. To examine this the following model is estimated:

$$\beta_{it} = \alpha_1 + \alpha_2 Accbeta_{it} + \alpha_3 EV_{it} + \alpha_2 ES_{it} + \alpha_4 Grth_{it} + \alpha_5 Flev_{it} + \alpha_6 Size_{it} + \alpha_7 Oplev_{it} + \alpha_8 Liq_{it} \quad (13)$$

where β_{it} is estimated using a constant correlation multivariate GARCH (M-GARCH) model where the variance equation is defined as:[10]

$$\sigma_{it}^2 = c_1 + a_{11}\varepsilon_{it-1}^2 + b_{11}\sigma_{it-1}^2 \quad (14)$$

and the accounting beta is:

$$accbeta = \frac{\sum_{t=1}^{T}(E_t / P_{t-1} - [E^{'}/P])(M_t - M^{'})}{\sum_{t=1}^{T}(M_t - M^{'})(M_t - M^{'})} \quad (15)$$

where E_t is earnings for ordinary shareholders for the period, P_{t-1} is opening market value of common equity for the t period, $(E^{'}/P)$ is average earnings scaled by opening market value, M_t

[10] For further discussion of the econometric specification of this model see Faff, Hodgson and Saudagaran (2002), and McKenzie and Brooks (1999).

is average accounting earnings for all firms in the market in year t[11] and M' is average accounting earnings for all firms in the market in a sub period.

This is implemented in a similar fashion to an association test with a five year moving estimation period for the beta calculation and then regressed against the accounting data of the final year of the estimation period. For example, the five-year estimation period of 1973-1977 is used to estimate the GARCH beta (the dependant variable) while the accounting variables (the independent variables) are those for the 1977 year. This association approach is analogous to the above earnings and book values models (1-9), and the M-GARCH model is appropriate because it will pick up and incorporate last observation shocks and changes in volatility. Once again a time trend regression (8) is estimated using the R^2 and ERC of the yearly regressions.

Due to the research design, the first four years of the sample (1973-1976) are lost plus the first four years of observations for any firm that commenced during a later year in the date set. Once the initial estimation period for each firm is taken into account the data set is reduced to 2467 firm year observations with a GARCH beta estimated for each of these.

3.0 RESULTS

The results section is presented in seven sections. Results for the initial earnings, book values and Ohlson models are presented in the first three sections followed by separate sections for size effects, leverage effects, the effect of transitory items, and long term risk relevance. In each table Panel A presents the adjusted explanatory

[11] Where earnings are scaled by opening market value and the market earnings is proxied by the full sample of firms.

power (R^2) for each model on a yearly basis and Panel B presents the time trend regression results. The returns regressions (models 1b, 2b and 3b) are not reported as they are similar to those of their equivalent price models.

3.1 The Linear Earnings Relation

Table 3 presents the R^2 and ERCs for each yearly regression in the sample (1973-2001)[12] for model 1[13] in panel A and the associated time trend regression results (models 8 and 9) in panel B.

Table 3: The Long Term Association Between Earnings and Stock Returns

Panel A: Model: $P_{it} = \alpha_0 + \alpha_1 E_{it} + \alpha_2 \Delta E_{it} + \varepsilon_{it}$

Year	R^2	ERC	Year	R^2	ERC
1974	.31	4.173	1988	.17	4.875
1975	.06	4.714	1989	.10	1.581
1976	.20	1.589	1990	.14	0.287
1977	.24	0.736	1991	.06	0.225
1978	.19	2.379	1992	.16	0.190
1979	.15	-0.021	1993	.17	0.829
1980	.08	0.493	1994	.04	1.077
1981	.29	4.745	1995	.12	1.438
1982	.18	0.300	1996	.07	0.680
1983	.16	1.970	1997	.13	1.652
1984	.17	1.728	1998	.13	0.615
1985	.12	2.782	1999	.05	0.750
1986	.20	7.104	2000	.06	0.146
1987	.06	2.762	2001	.18	0.855

Panel B: Time Regressions

Model	Alpha	Time	R^2
$\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it}$	8.135^{***}	-0.004^{***}	.22
$ERC_t = \phi_0 + \phi_1 TIME + \varepsilon_{it}$	16.806^{***}	-0.084^{***}	.11

This table presents summary yearly regression results for models 1, 8 and 9 over the period 1974 to 2001. Statistics reported are adjusted R^2 regression statistics. P_{it} is closing price, $Earn_{it}$ is the earnings per share and is orthogonal to $\Delta Earn_{it}$, $\Delta Earn_{it}$ is change in earnings per share, and BV_{it} is book value per share all of which are scaled by opening market price. The ERC is calculated as the sum of the regression coefficients of $Earn_{it}$ and $\Delta Earn_{it.}$ *** indicates significance at the 5% level.

[12] The 1973 year is lost due to the differencing of the earnings change variable.

[13] The results of all return regressions (model 2, 5 and 7) are not reported as they are generally similar to those of their equivalent price regressions. Furthermore, use of price regressions is consistent with the prior literature (Collins, Maydew and Weiss, 1991, Francis and Shipper, 1999).

The results in table 3 agree with the prior literature in terms of documenting a decline in the value relevance of accounting earnings, with the two time trend regressions (Panel B) illustrating a statistically significant decline over time in both the predictive power of earnings (R^2) and the explanatory power (ERC). The average statistics for the two halves of the sample illustrate the point with R^2 declining from 0.17 to 0.11 and ERCs from 2.53 to 1.09. This preliminary evidence may indicate that investors increasingly relied upon alternative information sources over time, to the detriment of accounting earnings.

In summary, the evidence presented suggests that there has been a deterioration in the usefulness of accounting earnings information to investors in the Australian markets as per the evidence in the US (Collins, Maydew and Weiss, 1997; Francis and Schipper, 1999; Lev and Zarowin, 1999; Brown, Lo and Lys, 1999).

3.2 The Balance Sheet Relation

The second model examines the association between stock prices and book values. Table 4 presents the results of regression model 4, which indicate that the value-relevance of book values has remained stable over the period 1974-2001 in Australia.[14] Also of noted is that the strength of the association, as measured by the R^2, is lower than those of earnings and to those reported for the balance sheet in the US studies.

[14] Average are 0.10 for the period 1974-1987 and 0.08 for the period 1988-2001.

Table 4: The Long Term Association Between Stock Prices and Book Values

Panel A: Model: $P_{it} = \alpha_0 + \alpha_1 BV_{it} + \varepsilon_{it}$

Year	R^2	Year	R^2
1974	.11	1988	.04
1975	.07	1989	.06
1976	.16	1990	.13
1977	.18	1991	.13
1978	.14	1992	.06
1979	.06	1993	.06
1980	.06	1994	.05
1981	.26	1995	.05
1982	.13	1996	.07
1983	.08	1997	.08
1984	.03	1998	.16
1985	.04	1999	.07
1986	.05	2000	.10
1987	.06	2001	.10

Panel B: Time Regression

Model	Alpha	Time	R^2
$\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it}$	3.166	-0.001	.02

This table presents summary yearly regression results for model 4 over the period 1974 to 2001. Statistics reported are adjusted R^2 regression statistics. P_{it} is closing price and BV_{it} is book value per share both of which are scaled by opening market price. *** indicates significance at the 5% level.

Unlike the earnings models, there has been some difference in the empirical results for the balance sheet models in prior studies. Collins, Maydew and Weiss (1997) and Francis and Schipper (1999)[15] both evidence a small increase in the value relevance of book value over time, whilst Brown, Lo and Lys (1999) who correct for the scale effects, show a decline in the relationship.[16] Hence, the results presented in table 4 which control for the scale effect fall somewhat in-between the results presented in the prior literature and suggest a relatively stable, albeit weak, price-book value relationship over time in Australia.

[15] This study uses total assets and total liabilities as separate regression variables rather than one book value variable.

[16] Lev and Zarowin (1999) do not estimate a balance sheet model.

3.3 The Ohlson Relation

The combined earnings-book value model provides evidence of a decline in the value relevance of accounting information over time as indicated by the yearly and time trend regression results presented in table 5. The time trend results are similar to those of the earnings models, indicating that the addition of book value as an additional explanatory variable does not contain the decline in usefulness of earnings. In terms of the previous literature, this falls in line with the results of Lev and Zarowin (1999) and Brown, Lo and Lys (1999).

Table 5: The Long Term Association Between Stock Prices and Book Values plus Earnings

Panel A: Model: $P_{it} = \alpha_0 + \alpha_1 E_{it} + \alpha_2 BV_{it} + \varepsilon_{it}$

Year	R^2	Year	R^2
1974	.25	1988	.03
1975	.10	1989	.14
1976	.24	1990	.18
1977	.28	1991	.13
1978	.42	1992	.11
1979	.10	1993	.08
1980	.10	1994	.09
1981	.31	1995	.10
1982	.15	1996	.05
1983	.21	1997	.12
1984	.16	1998	.18
1985	.21	1999	.09
1986	.11	2000	.11
1987	.14	2001	.19

Panel B: Time Regression

Model	Alpha	Time	R^2
$\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it}$	10.154***	-0.005***	.21

This table presents summary yearly regression results for model 6 over the period 1974 to 2001. Statistics reported are adjusted R^2 regression statistics. P_{it} is closing price, $Earn_{it}$ is the earnings per share, $\Delta Earn_{it}$ is change in earnings per share, and BV_{it} is book value per share all of which are scaled by opening market price. *** indicates significance at the 1% level.

Overall, these findings and those of the recent US studies suggest that accounting information is becoming less relevant for investors in the traditional linear

relationship sense. Therefore, a key issue is what are the causal factors behind the evidenced decline. For example, has this decline been less/more prevalent for firms with specific characteristics? The following sections examine some of these issues.

3.4 Size Effects

The first of these issues to be examined is the impact of firm size which builds on the rich literature investigating the importance of firm size developed by Ataise (1985), Freeman (1987) and Collins and Kothari (1989). In this section models 1, 3 and 6 are re-estimated for small and large firms separately. In terms of the earnings model, the evidence for both small and large firms illustrates a long term decline in the linear explanatory power (R^2) and in the earnings response coefficients. The strength of the results, however, is far stronger for small firms with the size of the negative coefficients always higher for small firms with higher time R^2. Hence, there is a size effect in terms of the long-term change in the relationship between accounting earnings and stock returns in so far as small firms appear to have been more severely affected.

The results for the book value model show a significant decline for small firms, but not for large firms. The results of the combined earnings-book value model are similar to the earnings model in terms of both the small and large firms having a statistically significant decline in the association over time. Once again, the small firm model is more strongly affected with a stronger negative coefficient and higher R^2 (27% versus 11% for large firms). The small firm model coefficient is significantly negative at the 1% level whilst the large firm coefficient is negative at the 5% level.

Table 6: The Long Term Association Between Accounting Information and Stock Prices: The Impact of Firm Size

Year	Model 8.1 ERC - Small	Small R^2	ERC - Large	Large R^2	Model 8.4 Small R^2	Large R^2	Model 8.6 Small R^2	Large R^2
1974	5.482	.54	4.567	.16	.09	.45	.58	.51
1975	5.023	.69	9.613	.18	.17	.00	.11	.32
1976	1.736	.17	3.510	.28	.23	.12	.32	.17
1977	3.547	.30	6.440	.16	.24	.08	.32	.30
1978	3.494	.19	3.908	.63	.09	.09	.65	.19
1979	5.080	.40	4.326	.08	.08	.14	.12	.08
1980	4.490	.06	11.696	.22	.29	.04	.21	.32
1981	7.249	.52	6.405	.14	.44	.12	.53	.10
1982	5.828	.32	4.412	.08	.10	.05	.17	.06
1983	1.975	.38	2.702	.17	.31	.21	.51	.09
1984	8.255	.36	4.385	.15	.02	.17	.25	.45
1985	4.147	.21	4.120	.23	.02	.17	.17	.31
1986	5.221	.05	7.610	.26	.05	.09	.00	.21
1987	8.609	.31	6.493	.19	.22	.05	.14	.14
1988	3.727	.09	7.852	.25	.12	.04	.19	.19
1989	1.769	.24	2.644	.05	.01	.09	.21	.12
1990	0.246	.11	0.601	.13	.22	.16	.20	.13
1991	0.266	.07	2.415	.18	.12	.20	.14	.39
1992	0.205	.19	0.950	.00	.11	.00	.20	.01
1993	0.885	.16	6.321	.21	.08	.00	.11	.11
1994	1.030	.04	1.400	.07	.04	.05	.09	.11
1995	1.636	.17	2.232	.02	.09	.01	.12	.06
1996	1.433	.08	4.087	.07	.07	.04	.05	.10
1997	1.755	.13	4.020	.18	.08	.05	.10	.24
1998	0.544	.09	4.590	.05	.16	.16	.19	.24
1999	1.135	.05	1.238	.01	.07	.13	.08	.12
2000	0.367	.07	0.903	.00	.09	.21	.11	.20
2001	0.969	.19	0.638	.10	.07	.13	.23	.08

Panel B: Time Regression

Eq (8): $\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it}$

Eq (9): $ERC_t = \phi_0 + \phi_1 TIME + \varepsilon_{it}$

Equation	Model	Alpha	Time	R^2
8 – Small Firms	1	2.684^{***}	-0.013^{***}	.41
8 – Large Firms	1	1.551^{***}	-0.008^{***}	.23
9 – Small Firms	1	38.099^{***}	$-.190^{***}$	.36
9 – Large Firms	1	36.523^{***}	$-.182^{***}$	.27
8 – Small Firms	4	9.378^{**}	-0.005^{**}	.11
8 – Large Firms	4	4.237	-0.002	.00
8 – Small Firms	6	2.186^{***}	-0.011^{***}	.27
8 – Large Firms	6	1.117^{**}	-0.006^{**}	.11

This table presents summary yearly regression results for models 1, 4, 6, over the period 1974 to 2001 where each yearly sample has been split into small and large firms based on median open market capitalisation. Statistics reported are adjusted R^2 regression statistics. P_{it} is closing price, $Earn_{it}$ is the earnings per share, $\Delta Earn_{it}$ is change in earnings per share, and BV_{it} is book value per share all of which are scaled by opening market price. *** indicates significance at the 1% level, ** indicates significance at the 5% level.

Overall, the evidence presented in this section illustrates that firm size is an important factor in the long term relationship between accounting information and stock returns in the Australian environment over the period 1974-2001. The decline in value relevance is stronger for small firms when compared to large firms. The next section explores the influence of financial leverage.

3.5 Leverage Effects

The next factor examined is financial leverage. The results presented in table 7 once again confirm the decline in the linear association between accounting earnings and stock prices. Models for both low and high leverage firms and their respective response coefficient equations all evidence a statistically significant decline in this relationship. The trend appears slightly stronger for highly levered firms but the decline is fairly uniform across the two categories.

The book value model provides only weak evidence of deterioration of the relationship over time. The time trend variable for high leverage firms is insignificant, while for low leverage firms it is significant at only the 10% level. The combined earnings-book value model once again falls between the two individual models in terms of explanatory power and levels of significance. The results, however, indicate the association has significantly declined over time (at the 5% level). Overall, there does not appear to be a leverage effect with the decline more uniform across high and low leverage firms. The following section examines the importance of the functional form of the relationship using an alternative non-linear regression technique.

Table 7: The Long Term Association Between Accounting Information and Stock Prices: The Impact of Firm Leverage

Year	Model 1 ERC - Low	Model 1 Low R^2	Model 1 ERC - High	Model 1 High R^2	Model 4 Low R^2	Model 4 High R^2	Model 6 Low R^2	Model 6 High R^2
1974	4.249	.28	6.139	.52	.34	.11	.33	.59
1975	4.877	.27	1.011	.09	.00	.19	.14	.16
1976	3.272	.42	5.144	.17	.13	.05	.38	.21
1977	1.788	.27	3.956	.59	.31	.04	.39	.44
1978	2.310	.14	3.485	.44	.18	.14	.38	.53
1979	4.753	.26	5.341	.22	.18	.04	.17	.12
1980	2.377	.21	3.969	.10	.00	.22	.17	.16
1981	6.896	.27	7.165	.41	.25	.24	.08	.50
1982	4.399	.11	7.320	.46	.07	.16	.22	.15
1983	1.951	.06	2.581	.35	.17	.10	.06	.39
1984	3.786	.19	9.194	.32	.04	.19	.26	.10
1985	8.855	.10	3.444	.17	.01	.09	.22	.19
1986	6.139	.24	1.948	.04	.15	.22	.17	.32
1987	8.879	.20	3.572	.35	.19	.13	.13	.09
1988	7.567	.35	6.746	.18	.10	.04	.20	.14
1989	2.471	.30	3.098	.18	.03	.10	.39	.10
1990	0.313	.13	0.340	.18	.09	.33	.14	.43
1991	0.470	.10	1.675	.17	.11	.19	.10	.27
1992	0.198	.11	0.686	.16	.08	.04	.10	.13
1993	1.742	.20	0.290	.02	.07	.04	.12	.05
1994	1.003	.07	1.700	.04	.04	.06	.17	.03
1995	1.727	.16	2.437	.14	.13	.13	.16	.12
1996	2.468	.11	2.706	.04	.12	.02	.06	.07
1997	2.041	.09	2.028	.23	.08	.04	.05	.27
1998	0.667	.16	0.676	.10	.21	.19	.22	.30
1999	1.233	.05	0.831	.02	.06	.10	.12	.15
2000	0.435	.06	1.092	.03	.06	.14	.09	.16
2001	0.851	.22	0.877	.12	.11	.09	.24	.19

Panel B: Time Regression

Eq (8.8): $\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it}$

Eq (8.9): $ERC_t = \phi_0 + \phi_1 TIME + \varepsilon_{it}$

Equation	Model	Alpha	Time	R^2
8 – Low Firms	8.1	1.283^{***}	-0.006^{***}	.27
8 – High Firms	8.1	2.447^{***}	-0.012^{***}	.37
9 – Low Firms	8.1	28.967^{**}	$-.144^{**}$	.18
9 – High Firms	8.1	34.614^{***}	$-.173^{***}$	.32
8 – Low Firms	8.4	6.912^{*}	-0.003^{*}	.07
8 – High Firms	8.4	2.586	-0.001	.00
8 – Low Firms	8.6	12.089^{**}	-0.006^{**}	.19
8 – High Firms	8.6	16.153^{**}	-0.008^{**}	.15

This table presents summary yearly regression results for models 1, 4, 6 over the period 1974 to 2001 where each yearly sample has been split into low leverage and high leverage firms based on median financial leverage. Statistics reported are adjusted R^2 regression statistics. P_{it} is closing price, $Earn_{it}$ is the earnings per share, $\Delta Earn_{it}$ is change in earnings per share, and BV_{it} is book value per share all of which are scaled by opening market price. *** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 1% level.

3.6 The Effect of Transitory Items

Non-linear modelling has been used in several recent value-relevance studies usually aimed at controlling for the temporary and permanent components of earnings (Freeman and Tse, 1992, Das and Lev, 1994; Hodgson and Stevenson-Clarke, 2000). The results presented in table 8 are estimated from the non-linear inverse tangent (arctan) model. They indicate that controlling for the transitory components in the earnings stream eliminates the statistically significant decline in the long-term association between accounting earnings and stock prices. The average yearly R^2 also improves from 14% in the linear models to 21%. Furthermore, a comparison with the linear results (refer to table 3) shows an increase non-linearity over time within the association.[17] Hence, over time the earnings stream has become less permanent and therefore incorporates a higher level of transitory components. This result also explains why we observed a much larger negative decline for small firms. Small firms have a larger component of temporary items in their earnings stream because of their undiversified operating lines. However, rather than concluding that accounting information (in particular earnings) has lost its relevance, the results presented here suggest that the functional form the of the relationship has changed but the importance of earnings has not.

[17] This refers to the increasing difference between the linear and non-linear R^2 over time

Table 8: The Long Term Non-Linear Association Between Accounting Information and Stock Prices.

Year	Model 10 R^2	Model 10 ERC	Model 11 R^2	Model 12 R^2
1974	.35	4.472	.13	.29
1975	.15**	6.455	.08	.19
1976	.24***	1.993	.18**	.19
1977	.28***	0.889	.20***	.20**
1978	.23	2.899	.17	.47*
1979	.19***	0.141	.10	.10
1980	.15	0.461	.08*	.10
1981	.32***	4.764	.27***	.50***
1982	.21***	0.346	.16	.29***
1983	.22***	2.053	.10	.25
1984	.22*	2.010	.05	.29*
1985	.18	3.447	.09	.26
1986	.25***	8.290	.10	.18**
1987	.13***	2.588	.08**	.17
1988	.28***	7.193	.07	.11*
1989	.20***	6.943	.07	.23***
1990	.18**	0.461	.18***	.22***
1991	.16***	1.885	.14	.21***
1992	.22**	0.251	.07	.17**
1993	.31**	1.213	.12***	.23***
1994	.10***	1.371	.08*	.28***
1995	.22***	2.827	.11***	.16***
1996	.12*	3.195	.11**	.10**
1997	.23***	6.682	.08	.25***
1998	.26***	1.427	.24***	.36***
1999	.14*	0.989	.18***	.21***
2000	.18**	0.969	.13***	.19***
2001	.27***	3.012	.12**	.26***

Panel B: Time Regression

Eq (8): $\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it}$

Eq (9): $ERC_t = \phi_0 + \phi_1 TIME + \varepsilon_{it}$

Equation	Model	Alpha	Time	R^2
8	10	3.722	-0.002	.02
9	10	5.459	-0.026	.03
8	11	0.924	-0.000	.00
8	12	3.048	-0.001	.00

This table presents summary yearly non-linear regression results for the following models:

$$P_{it} = \gamma_0 + \gamma_1 . \arctan(\gamma_2 Earn_{it} + \gamma_3 \Delta Earn_{it}) + \varepsilon_{it} \quad (10)$$

$$P_{it} = \gamma_0 + \gamma_1 . \arctan(\gamma_2 BV_{it}) + \varepsilon_{it} \quad (11)$$

$$P_{it} = \gamma_0 + \gamma_1 . \arctan(\gamma_2 Earn_{it}) + \gamma_3 . \arctan(\gamma_4 BV_{it}) + \varepsilon_{it} \quad (12)$$

where P_{it} is closing price, $Earn_{it}$ is the earnings per share, $\Delta Earn_{it}$ is change in earnings per share, and BV_{it} is book value per share all of which are scaled by opening market price. The ERC is calculated as the total impact on price: $\gamma_1(\gamma_2+\gamma_3)$. Statistics reported are adjusted R^2 regression statistics. Non-nested alternative model specification J-Tests are conducted to determine whether the non-linear model is superior to its linear equivalent (models 1, 4 and 6 respectively) where * indicates the non-linear model is superior at the 10% level, ** at the 5% level and *** at the 1% level.

In terms of the other two models, the results of the book value model (11) are marginally improved with the use of the non-linear model. The combined earnings, book value model (model 12) is strengthened and also does not significantly deteriorate in its association with stock returns over time. The model also remains the superior model in terms of explaining the cross sectional variation in stock prices with a yearly average of 23% (compared to 16% in the equivalent linear model).

Overall, the results presented here indicate that accounting earnings and book values have not declined in value relevance over the past three decades, rather the nature of the relationship between stock prices and these variables has changed such that the traditional linear regression model does not fully capture the association.

3.7 The Risk Relevance of Accounting Information

The final empirical test of the long-term value-relevance of accounting information examines the long-term risk relevance of accounting information. The results presented in table 9 below once again provide evidence in support of a continuously strong relationship between market risk and accounting information. This is evidenced by the relatively strong levels of explanatory power (R^2) averaging 41% over the period 1977-2001. More importantly, however, the evidence illustrates a long-term association between accounting risk variables and stock returns over the period 1977-2001 which has not statistically significantly improved or declined. Furthermore, the time trend variable explains only 6% of the yearly variation in the ability of the accounting risk variables to explain stock price movements in cross section.

This evidence offers further support, in conjunction with the non-linear evidence, for the argument that the value relevance of accounting information has not deteriorated over time, rather the functional form of the relationship and the specific variables that are risk relevant changes over time. However, in terms of the overall relevance of accounting information for both stock prices and risk, it has remained stable.

Table 9: The Long Term Association Between Accounting Risk Variables and Stock Prices

Panel A: Eq (8.13):

$$\beta_{it} = \alpha_1 + \alpha_2 Accbeta_{it} + \alpha_3 EV_{it} + \alpha_2 ES_{it} + \alpha_4 Grth_{it} + \alpha_5 Flev_{it} + \alpha_6 Size_{it} + \alpha_7 Oplev_{it} + \alpha_8 Liq_{it}$$

Year	R^2	Year	R^2
1977	.25	1990	.45
1978	.32	1991	.36
1979	.25	1992	.39
1980	.56	1993	.38
1981	.45	1994	.43
1982	.54	1995	.41
1983	.60	1996	.41
1984	.74	1997	.35
1985	.47	1998	.32
1986	.42	1999	.32
1987	.34	2000	.26
1988	.43	2001	.28
1989	.34		

Panel B: Time Regression, Eq (4): $\overline{R_t^2} = \phi_0 + \phi_1 TIME + \varepsilon_{it}$

Model	Alpha	Time	R^2
4	10.424*	-.005	.06

This table presents summary yearly regression results for models 13 over the period 1974 to 2001. Statistics reported are adjusted R^2 regression statistics. $Size_{it}$ is the log of opening market capitalisation, $Flev_{it}$ is the ratio of total assets to total liabilities, $AccBeta_{it}$ is the degree of co-variability of a firm's earnings and the earnings of the market, EV_{it} is the standard deviation t-period $Earn_{it}$, $OpLev_{it}$ is absolute ratio of operating profit to sales, Liq_{it} is ratio of current assets to total assets, and $Grth_{it}$ is the log change in total assets. Panel B presents the number of firms sampled in each yearly interval. All accounting variables are scaled by market value as per Brown Lo and Lys (1999).

4.0 CONCLUSIONS

This paper examined the long-term association between accounting earnings and book values with stock prices. The literature in this area is relatively new, motivated by concerns espoused in the professional accounting literature in the early 1990's

(Rimerman, 1990; Elliott and Jacobson, 1991; Jenkins, 1994), and generally concludes that accounting earnings has declined in value relevance. Whilst movements in the value relevance of book value is somewhat debatable depending on the sample period (Collins Maydew and Weiss, 1997; Francis and Shipper, 1999; Lev and Zarowin, 1999), Brown, Lo and Lys (1999) have called for methodological improvements when examining this issue. We do this by taking a sample outside the US, by examining the impacts of firm size and financial leverage, and by estimating the functional form of the relationship through the use of non-linear regression techniques. Finally, the risk relevance of accounting information over time was also examined.

The linear regression results establish a similar pattern to that found in the US studies, with the relationship between earnings and stock prices appearing to have deteriorated over time while book values remained fairly stable. Furthermore, a size effect was found but not a leverage effect.

The non-linear results indicated that the value relevance of accounting earnings has not declined over time, rather that the nature of its relationship with stock prices has changed such that a linear model does not fully capture the association. Once, the transitory components within the earnings stream are controlled for, the relationship appears stable as per the book values relationship. Further, accounting earnings explained an average of 21% of the yearly variation stock prices, as opposed to 14% in the linear associations which have been declining over the past three decades.

The last set of tests examined the long-term relationship between accounting variables and risk as a means of assessing another dimension of the usefulness of accounting information to investors and others. The results show that the risk relevance of accounting information has neither declined nor increased over the period 1977-2001. The long-term risk relevance of accounting information has remained relatively stable over this period. Therefore in Australia, at least, the long term decline in the relevance of accounting data for valuation and risk assessment purposes is greatly exaggerated and results driven by a statistical aberration.

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