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Australian Evidence Regarding the Value-Relevance of Technical Information

by
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Abstract:

This paper employs an unconstrained version of Ohlson's (1995) residual income valuation model to evaluate the value-relevance of technical information in Australia. Specifically, we employ the methodology of Bettman, Sault and Welch (2006) to investigate whether models that incorporate both fundamental and technical measures are superior to models that consider either fundamental or technical information in isolation. Preliminary testing confirms the positive dependence of contemporaneous price with the fundamental factors commonly employed in modelling, namely book value per share, earnings per share and consensus earnings forecasts. Supplementation of fundamental models with three technical variables sees all technical factors being significant in explaining contemporaneous share prices, consistent with US evidence provided by Bettman, Sault and Welch (2006). Overall, our results provide further evidence that augmenting fundamental valuation models with technical information yields models with greater explanatory power than those that only consider fundamental or technical information in isolation.

Keywords:

EQUITY VALUATION MODELS; FUNDAMENTAL INFORMATION; TECHNICAL INFORMATION.

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1. Introduction and Literature Review

Numerous empirical studies provide evidence on the significance of firm-specific characteristics in explaining contemporaneous share prices, or their 'value relevance' (e.g. Amir & Lev 1996; Barth, Beaver and Landsman 1996; Francis & Schipper 1999). In providing this evidence, these papers commonly test a constrained or unconstrained version of Ohlson's (1995) residual income model, which fits price to a linear function of fundamental factors, including earnings and book value of equity. Ohlson (1995) argues these factors to be value-relevant given their role in the prediction of future dividends which, in turn, provide the theoretical basis for determining a firm's market price. Empirical testing of an unconstrained version of Ohlson's (1995) model confirms the predictions, with testing revealing the positive statistical dependence of contemporaneous price on both book value of equity and earnings (e.g. Collins, Maydew & Weiss 1997; Ely & Waymire 1999).

In addition to being dependent on book value per share and earnings per share, Ohlson (1995) argues that price is also a function of an undefined vector of 'other' value-relevant information not captured in current financial statements. Subsequent research seeks to identify variables forming part of this vector, with valuation models often supplemented to include forecast earnings per share (e.g. Dechow, Hutton & Sloan 1999; Morel 2003). Results of fitting this expanded model reveal the existence of a significant positive relationship between price and earnings forecasts (Dechow, Hutton & Sloan 1999). However, the inclusion of this variable in the model sees contemporaneous earnings per share no longer significant in explaining share price. In providing intuition for this finding, Dechow, Hutton and Sloan (1999) argue that earnings forecasts 'subsume the value relevant information in current earnings' (Dechow, Hutton & Sloan 1999, p. 26). Other studies consider the value relevance of a suite of accounting variables including: Post-retirement benefit disclosures (Amir 1993); Non-financial indicators (Amir & Lev 1996); and Long-term debt disclosures (Barth, Beaver & Landsman 1996). A comprehensive summary of these and other value-relevance studies provided is by Holthausen and Watts (2001).

Despite the effort invested in identifying variables significant in explaining contemporaneous firm share price, most studies focus solely on fundamental factors. However, the use of technical information to predict future equity values dates back to a series of editorials published by Charles Dow in the *Wall Street Journal* between 1900 and 1902. Subsequent research has incorporated various technical strategies and trading rules (e.g. Brock, Lakonishok & LeBaron 1992; Jegadeesh & Titman 1993; Allen & Karjalainen 1999), in an attempt to predict future prices, however no study attempts to incorporate technical information into the value-relevance literature. In this context, Bettman, Sault and Welch (2006) consider the value relevance of technical information in explaining share prices and incorporate three measures of historical price movements into model fitting, namely, lagged price and two dummy variables representing extreme movements in past price performance ('momentum'). The selection of these three measures stems from the ability of past prices to forecast future returns (e.g. Lo & MacKinlay 1988, 1999), and the robustness of momentum profits to critiques of data-snooping biases (e.g. Jegadeesh & Titman 2001; Grundy & Martin 2001) and economic insignificance (e.g. Korajczyk & Sadka 2004). Further, Bettman, Sault and Welch

(2006) note while past price and momentum have survived the various criticisms levelled at them, other technical information measures have not. Specifically, the ability of various trading rules to generate superior profits (e.g. Brock, Lakonishok & LeBaron 1992; Allen & Karjalainen 1999), are called into question due to their potential to be explained by data-snooping biases (e.g. Jensen & Bennington 1970), and are no longer viable given the increased efficiency of equity markets (e.g. Sullivan, Timmermann & White 1999). This argument is supported by Ready (2002), who documents the inability of either Brock, Lakonishok and LeBaron (1992) or Allen and Karjalainen's (1999) trading rules to consistently outperform a buy-and-hold strategy in recent times.

As such, Bettman, Sault and Welch (2006) examine the incremental value relevance of this suite of technical factors (past price and momentum), in the United States (US), also assessing the overall performance of valuation models which consider both fundamental and technical factors ('hybrid models') relative to models utilising either fundamental or technical variables in isolation. Results of testing undertaken by Bettman, Sault and Welch (2006) reveal that models incorporating both fundamental and technical factors are superior to models only considering fundamental or technical measures. Furthermore, the significance of supplementing valuation models with technical measures results in a doubling of adjusted R^2 values, as well as a marked drop in Akaike Information Criterion (AIC) values.

We commence testing by considering models that only incorporate fundamental factors. Specifically, we first model contemporaneous price as a function of book value per share and current earnings per share, in line with the work of Collins, Maydew and Weiss (1997) and Bettman, Sault and Welch (2006). Testing yields results similar to the aforementioned studies, with a significant positive relationship documented between price and the two fundamental explanators. The introduction of forecast earnings per share into modelling also yields findings congruent with earlier research, with price exhibiting a significant positive dependence on book value per share and forecast earnings per share. Similar to the findings of Dechow, Hutton and Sloan (1999) and Bettman, Sault and Welch (2006), the inclusion of forecast earnings sees contemporaneous earnings become insignificant in explaining price.

Thereafter, we supplement the fundamental valuation models with the technical factors proposed by Bettman, Sault and Welch (2006). Testing these 'hybrid' models reveals the incremental importance of the technical measures in explaining contemporaneous price. Unsurprisingly, past share price is positively dependent on contemporaneous price. Yet, more interestingly, the momentum dummy variables are also highly significant in explaining price. Specifically, we find that shares exhibiting positive (negative) past return performance will continue to experience similar positive (negative) performance in the subsequent period. This results in higher (lower) prices for these particular firms at the time we model price, and is consistent with Jegadeesh and Titman (1993) and Demir, Muthuswamy & Walter (2004), among others.

Overall, consistent with Bettman, Sault and Welch (2006), our findings highlight the value-relevance of technical measures in an Australian context. Specifically, the inclusion of both fundamental and technical factors within the valuation framework yields a model of greater explanatory power in comparison to

models that only consider fundamental or technical measures in isolation, evidenced by the significant increase (decrease) in R^2 (AIC) values in our hybrid models.

The remainder of this paper is structured as follows: section 2 outlines the methodology employed in assessing the value relevance of both fundamental and technical factors; section 3 details the methods employed in collecting the dataset utilised in testing; section 4 discusses the main findings pertaining to model fitting; and section 5 concludes.

2. Model Design

Whilst the central focus of this paper is to assess the value-relevance of technical information, we commence by fitting valuation models solely comprising of fundamental factors. Specifically, we first fit a two-factor model that relates price to book value per share and contemporaneous earnings per share (e.g. Collins, Maydew & Weiss 1997; Bettman, Sault & Welch 2006). This model is formally presented below, with variables as defined in table 1:

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t \quad (1)$$

Table 1
Variable Definition and Measurement

Variable	Definition	Data Source
P_{t+1}	The firm's end-of-month share price in the month forecast earnings for the coming fiscal year are announced. This share price is adjusted for capitalisation changes.	DataStream International
P_{t-5}	The firm's end-of-month share price six months prior to that denoted by P_{t+1} . This share price is adjusted for capitalisation changes.	DataStream International
$BVPS_t$	The book value per share of the firm calculated as at the end of the most recent fiscal year relative to month t .	DataStream International
EPS_t	The earnings per share of the firm calculated at the end of the most recent fiscal year relative to month t and announced to the market in month t .	DataStream International
$FEPS_{t+1}$	The consensus forecast earnings per share for the firm, as forecast in the month following the release of actual earnings per share figures for the most recent fiscal year. Forecast earnings are adjusted for capitalisation changes and are announced in the middle of the month, though the exact date varies slightly.	I/B/E/S
D_{Up}	A dummy variable equal to 1 if the stock holding period return in the six month period commencing one year prior to the measurement of P_{t+1} placed it in the highest performance decile, else 0.	DataStream International
D_{Down}	A dummy variable equal to 1 if the stock holding period return in the six month period commencing one year prior to the measurement of P_{t+1} placed it in the lowest performance decile, else 0.	DataStream International

Prior empirical testing of this model invariably finds price to be highly positively dependent on book value per share (e.g. Collins, Maydew & Weiss 1997; Ely & Waymire 1999; Bettman, Sault & Welch 2006), with two reasons advanced for this finding: Book value per share represents the resources a firm can devote to generating earnings in the future; and, Book value per share represents the liquidation or adaptation of the firm's assets (see Berger, Ofek & Swary 1996; Burgstahler & Dichev 1997 respectively).

The extant literature also documents a positive relationship between current earnings per share and share price (e.g. Easton 1985; Collins, Maydew & Weiss 1997; Ely & Waymire 1999; Bettman, Sault & Welch 2006). The main reason cited for this finding is that contemporaneous earnings per share is a proxy for the current value of the firm, as opposed to book value per share, which represents its exit value (Barth, Beaver & Landsman 1996). As such, the inclusion of these variables in model fitting is incrementally important in explaining the firm's value, or share price.

More recent research supplements models similar to (1) with consensus forecast earnings per share (e.g. Dechow, Hutton & Sloan 1999), arguing that it represents the best proxy of the other value-relevant information variable included in Ohlson's (1995) residual income model. In light of this, to provide evidence regarding the importance of forecast earnings per share in the Australian context, we fit Model (2), with variables as defined in table 1:

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 FEPS_{t+1} \quad (2)$$

Studies fitting models similar to (2) find that price exhibits a positive statistical dependence on both book value per share and consensus earnings forecasts per share (e.g. Bettman, Sault & Welch 2006). However, once forecast earnings per share is included in modelling, current earnings per share ceases to be a significant explanator of share price. This finding suggests that consensus earnings forecasts subsumes the information contained in the contemporaneous earnings figures, also offering information about the future prospects of the company over and above that contained in earnings per share (Dechow, Hutton & Sloan 1999).

Whilst there is voluminous international evidence in the value relevance of fundamental factors, Bettman, Sault and Welch (2006) provide the first examination of the incremental value relevance of technical information. Specifically, they augment fundamental models similar to (1) and (2) with a suite of three technical factors capturing past price and extreme movements therein. Consistent with their workings, we fit Models (3) and (4) below to an Australian dataset, with variables defined in table 1:

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 P_{t-5} + \beta_4 D_{Up} + \beta_5 D_{Down} \quad (3)$$

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 FEPS_{t+1} + \beta_4 P_{t-5} + \beta_5 D_{Up} + \beta_6 D_{Down} \quad (4)$$

Models (3) and (4) incorporate the suite of technical factors advanced by Bettman, Sault and Welch (2006), which reflect past price levels and changes therein.

Specifically, one factor reflects lagged price, with the other two factors representing dummy variables. Specifically, these dummy variables are based on Jegadeesh and Titman's (1993, 2001) momentum methodology. Moreover, we calculate buy and hold returns on shares over the six month period commencing exactly one year prior to the time we model price. The calculation of share returns over this period is equivalent to calculating Jegadeesh and Titman's (1993) formation period return. Following the calculation of these six monthly returns, we rank the shares and place them into performance deciles. Any share within the top (bottom) deciles is allocated a D_{Up} (D_{Down}) dummy equal to one in order to reflect their extreme positive (negative) performance over the period. All shares within the remaining deciles are assigned momentum dummies equal to zero. If the performance of these shares within the top (bottom) decile does persist over the ensuing six months, a timeframe equivalent to Jegadeesh and Titman's (1993) performance period, we expect to see D_{Up} (D_{Down}) to have a significantly positive (negative) relationship with contemporaneous price in both Models (3) and (4).

When fitting Models (3) and (4), Bettman, Sault and Welch (2006) find all fundamental and technical factors to be significant in explaining contemporaneous share price. In relation to the technical factors, price is positively dependent on lagged price, with the dummy variables, D_{Up} (D_{Down}), having a positive (negative) relationship with contemporaneous price.

For completeness, we conclude with an examination of the value relevance of technical factors in isolation: Given the preceding testing sees us examining the importance of fundamental factors alone and, thereafter, a combination of fundamental and technical factors, consideration of the value relevance of technical information alone is a natural extension. Furthermore, such an analysis allows us to draw inferences regarding the value relevance of each type of factor, as well as determining whether models solely fitting fundamental or technical information perform materially better than hybrid models. Previous research fitting Model (5) finds all variables to be significant in explaining contemporaneous share prices, with the momentum dummy variables being significant in their expected directions (Bettman, Sault & Welch 2006). Thus, we fit Model (5), which is formally stated below, where variables are as defined in table 1:

$$P_{t+1} = \alpha + \beta_1 P_{t-5} + \beta_2 D_{Up} + \beta_3 D_{Down} \quad (5)$$

Lastly, to compare the explanatory power of Models (1) to (5), we calculate three goodness of fit measures, namely adjusted R^2 , AIC values and likelihood ratios. This allows for the selection of the model which best explains contemporaneous share prices. Results pertaining to the abovementioned testing are provided in Section 4.

3. Data and Variable Measurement

We fit Models (1) to (5) to a dataset comprising all Australian firms for which information is available over the period from January 1990 to December 2004 inclusive. We obtain the required accounting and adjusted price information from DataStream International, collecting analysts' earnings forecasts information from I/B/E/S. Specifically, we ascertain the date a company releases their end of year

financial statements for a given year to the market from I/B/E/S. We then obtain accounting values released at this time from DataStream International, namely their book value per share and earnings per share. Thereafter, we obtain the consensus analysts' earnings per share forecast in the month following the release of the accounting information. This ensures that the analysts have incorporated the accounting information into their forecasts, as well as mitigating any possibility of stale forecasts. Further, for comparability of the I/B/E/S earnings forecasts with the reported DataStream International earnings, we make sure all earnings figures are reported in a diluted form. Lastly, we merge the dependent price variable at the end of the month that the earnings forecasts are made, which ensures the market has incorporated the analysts' forecast information into the price.

After merging the sample, we apply several filters to our dataset to ensure comparability with previous research. Specifically, consistent with previous literature (e.g. Collins, Maydew & Weiss 1997; Morel 2003; Bettman, Sault & Welch 2006), we remove any observation relating to a company with a book value per share equal to or less than zero. Further, as per the Corporations Act, companies are required to release their annual reports within three months of their fiscal year end, and, consistent with this, we remove any firm from the sample which fails to meet this requirement. Finally, we perform diagnostic tests including Cook's Distance, DfBeta and DfFit to identify any influential data points. These points are removed from the dataset, yielding a final pooled cross-sectional sample of 1,772 firm-year observations.

Tables 2 and 3 present the sample descriptive statistics and correlations for the final dataset. Examination of these tables reveals no issues pertaining to multicollinearity. Finally, concerns regarding non-stationarity are eliminated via the undertaking of an Augmented Dickey-Fuller test, which confirms that the series are, indeed, stationary.

4. Empirical Results

We commence testing by modelling price solely as a function of the fundamental factors. Specifically, to provide Australian evidence on the value relevance of fundamental information, and to allow comparison of our findings with those reported in the extant literature, we fit Models (1) and (2), with results presented in table 4. The results pertaining to the fitting of Model (1) confirm that price is highly positively dependent on both book value per share and earnings per share. In regards to the former, the highly significant book value is consistent with the clean surplus framework proposed by Ohlson (1995), and provides further evidence that book value per share represents the liquidation or adaptation value of the firm's assets (Burgstahler & Dichev 1997). The positive statistical dependence of current earnings per share supports the argument that contemporaneous earnings per share is a proxy for the current value of the firm (Barth, Beaver & Landsman 1996). Overall, our findings for Australian companies are consistent with the results of empirical testing performed on US datasets (e.g. Collins, Maydew & Weiss 1997; Dechow, Hutton & Sloan 1999; Bettman, Sault & Welch 2006). The model is highly significant, and has an adjusted R^2 of 55.16%.

Table 2
Descriptive Statistics

Table 2 presents the descriptive statistics for the sample utilised in testing ($n = 1,772$). Notation employed in this table is as follows: P_{t+1} is the firm's end-of-month share price in the month forecast earnings for the coming fiscal year are announced. This share price is adjusted for capitalisation changes; P_{t-5} is the firm's end-of-month share price six months prior to that denoted by P_{t+1} . This share price is adjusted for capitalisation changes; $BVPS_t$ is the book value per share of the firm's equity, calculated as at the end of the most recent fiscal year and adjusted for capitalisation changes; EPS_t is the earnings per share of the firm, calculated at the end of the most recent fiscal year, announced to the market in month t and adjusted for capitalisation changes; and, $FEPS_{t+1}$ is the consensus forecast earnings per share for the firm, as forecasted in the month following the release of actual earnings per share figures for the most recent fiscal year. Forecast earnings are adjusted for capitalisation changes and are announced in the middle of the month, though the exact date varies slightly.

Variable	Mean	Standard Deviation	Minimum	Maximum	25 th Percentile	Median	75 th Percentile
P_{t+1}	4.4274	4.9240	0.0680	38.1200	1.4485	2.9400	5.2018
P_{t-5}	4.4716	5.4916	0.0600	49.5640	1.4538	2.8500	5.0948
$BVPS_t$	2.1537	1.9268	0.0090	14.9920	0.8290	1.6085	2.8345
EPS_t	0.1726	0.6037	-4.7870	2.9100	0.0728	0.1660	0.3133
$FEPS_{t+1}$	0.1773	0.3128	-1.9470	1.9670	0.1080	0.2055	0.3540

Table 3
Correlation Matrices

Table 3 presents the correlation matrices for the sample utilised in testing ($n = 1,772$). Notation employed in this table is as follows: P_{t+1} is the firm's end-of-month share price in the month forecast earnings for the coming fiscal year are announced. This share price is adjusted for capitalisation changes; P_{t-5} is the firm's end-of-month share price six months prior to that denoted by P_{t+1} . This share price is adjusted for capitalisation changes; $BVPS_t$ is the book value per share of the firm's equity, calculated as at the end of the most recent fiscal year and adjusted for capitalisation changes; EPS_t is the earnings per share of the firm, calculated at the end of the most recent fiscal year, announced to the market in month t and adjusted for capitalisation changes; and, $FEPS_{t+1}$ is the consensus forecast earnings per share for the firm, as forecasted in the month following the release of actual earnings per share figures for the most recent fiscal year. Forecast earnings are adjusted for capitalisation changes and are announced in the middle of the month, though the exact date varies slightly.

	P_{t+1}	P_{t-5}	$BVPS_t$	EPS_t	$FEPS_{t+1}$
P_{t+1}	1.0000				
P_{t-5}	0.8741	1.0000			
$BVPS_t$	0.7254	0.6618	1.0000		
EPS_t	0.3952	0.3320	0.3358	1.0000	
$FEPS_{t+1}$	0.6971	0.6150	0.6586	0.4106	1.0000

Table 4
Results of Fitting Fundamental Models

Table 4 presents the results of fitting models (1) and (2), below, utilising the unfiltered sample. T-statistics are included in parentheses, and are heteroscedasticity and autocorrelation consistent.

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t \quad (1)$$

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 FEPS_{t+1} \quad (2)$$

Notation employed in this table is as follows: P_{t+1} is the firm's end-of-month share price in the month forecast earnings for the coming fiscal year are announced. This share price is adjusted for capitalisation changes; $BVPS_t$ is the book value per share of the firm's equity, calculated as at the end of the most recent fiscal year and adjusted for capitalisation changes; EPS_t is the earnings per share of the firm, calculated at the end of the most recent fiscal year, announced to the market in month t and adjusted for capitalisation changes; and, $FEPS_{t+1}$ is the consensus forecast earnings per share for the firm, as forecasted in the month following the release of actual earnings per share figures for the most recent fiscal year. Forecast earnings are adjusted for capitalisation changes and are announced in the middle of the month, though the exact date varies slightly.

	(1)	(2)
Intercept	0.5104 (2.9773***)	0.2137 (1.9023)
$BVPS_t$	1.7070 (15.9036***)	1.1736 (4.9231***)
EPS_t	1.3940 (2.0205**)	0.7747 (1.2020)
$FEPS_{t+1}$		5.5981 (3.1112***)
Sample	1,772	1,772
Adjusted R^2	0.5516	0.6179
Akaike Info Criterion	5.2258	5.0663
F-Statistic	1,090***	955.7***
Log Likelihood	-4,627	-4,485

Note: ** Denotes significance at the 5% level; and,

*** Denotes significance at the 1% level.

Results pertaining to the fitting of Model (2) provide further evidence of price being positively statistically dependent on book value per share. Further, the model highlights the significant positive relationship between forecast earnings per share and share price. This finding is consistent with US-based studies (e.g. Dechow, Hutton & Sloan 1999; Bettman, Sault & Welch 2006), suggesting that earnings forecasts contain important information about the future prospects of the firm. It is interesting to note, however, that the inclusion of forecast earnings per share in the model sees contemporaneous earnings per share become an insignificant explanator of share price. This finding is consistent with prior studies and supports the

argument that forecast earnings per share subsume current earnings figures, as well as offering incremental information about the future value of the firm (Dechow, Hutton & Sloan 1999). Again, similar to Model (1), Model (2) is highly significant, and has an adjusted R^2 of 61.79%.

The results of fitting our hybrid models, namely, Models (3) and (4), are presented in table 5. Findings pertaining to Model (3) provide further evidence of the importance of book value per share in explaining contemporaneous share price. However, including the technical measures sees contemporaneous earnings become an insignificant explanator of share price. In regards to the technical factors, the findings of Model (3) highlight the importance of past share price in explaining contemporaneous price. In addition, both momentum dummies are highly significant in explaining price, and are significant in the expected direction. Specifically, shares exhibiting return performance over the six month formation period placing them in the top (bottom) performance decile continue to experience similar positive (negative) performance in the subsequent six months. This performance persistence results in higher (lower) prices for these particular firms at the time we model price, that is at the end of the twelve-month testing period, and is consistent with the momentum literature (e.g. Jegadeesh & Titman 1993, 2001).

Further, the inclusion of the three technical measures provides incremental explanatory power to the overall valuation model. Specifically, Model (3) is highly significant and has an adjusted R^2 of 82.07%. This dramatic increase in R^2 from 55.16% in Model (1) to 82.07% in Model (3) provides support for the inclusion of both fundamental and technical information in valuation models.

Our findings are further verified by fitting Model (4), which confirms the results of testing Model (2) and provides additional support for the incremental importance of technical information in valuation models. Results further highlight the value relevance of both book value per share and forecast earnings per share in explaining contemporaneous share price, but sees current earnings per share remain insignificant. Similar to Model (3), the technical factors are all highly significant, with the coefficients on the dummy variables being in the expected direction. Overall, Model (4) is highly statistically significant and has an adjusted R^2 of 83.28%. It is also evident that the inclusion of the technical factors has seen a substantial increase in the model's R^2 , from 61.79% in Model (2) to 83.28% in Model (4).

To compare the power of the models overall, we initially compare the adjusted R^2 values. As all models have the same dependent variable, comparing the adjusted R^2 values is meaningful. However, to further confirm our findings, we also examine the models' AIC estimates, which we argue are more robust due to the large sample size. It is evident from the values of the adjusted R^2 and AIC that Models (1) through (4) are of increasingly good fit. Specifically, the R^2 values increase from 55.16% in Model (1) to 83.28% in Model (4). This marked increase in the power of the overall models is further confirmed by the examination of AIC values, which decreases considerably through Models (1) to (4) from 5.2258 in Model (1) to 4.2413 in Model (4).

Table 5
Results of Fitting Models Including Technical Factors

Table 5 presents the results of fitting models (3) through (5), below, with t-statistics included in parentheses and are heteroscedasticity and autocorrelation consistent.

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 P_{t-5} + \beta_4 D_{Up} + \beta_5 D_{Down} \quad (3)$$

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 FEPS_{t+1} + \beta_4 P_{t-5} + \beta_5 D_{Up} + \beta_6 D_{Down} \quad (4)$$

$$P_{t+1} = \alpha + \beta_1 P_{t-5} + \beta_2 D_{Up} + \beta_3 D_{Down} \quad (5)$$

Notation employed in this table is as follows: P_{t+1} is the firm's end-of-month share price in the month forecast earnings for the coming fiscal year are announced. This share price is adjusted for capitalisation changes; P_{t-5} is the firm's end-of-month share price six months prior to that denoted by P_{t+1} . This share price is adjusted for capitalisation changes; $BVPS_t$ is the book value per share of the firm's equity, calculated as at the end of the most recent fiscal year and adjusted for capitalisation changes; EPS_t is the earnings per share of the firm, calculated at the end of the most recent fiscal year, announced to the market in month t and adjusted for capitalisation changes; $FEPS_{t+1}$ is the consensus forecast earnings per share for the firm, as forecasted in the month following the release of actual earnings per share figures for the most recent fiscal year. Forecast earnings are adjusted for capitalisation changes and are announced in the middle of the month, though the exact date varies slightly; D_{Up} is a dummy variable equal to 1 if the stock performed in the top decile in the six month period commencing one year prior to the measurement of P_{t+1} , else 0; and, D_{Down} is a dummy variable equal to 1 if the stock performed in the lowest decile in the six month period commencing one year prior to the measurement of P_{t+1} , else 0.

	(3)	(4)	(5)
Intercept	0.1833 (2.1613**)	0.0599 (0.8182)	0.9744 (5.4759***)
$BVPS_t$	0.6314 (5.2364***)	0.4656 (3.4207***)	
EPS_t	0.4737 (1.6343)	0.2662 (0.9342)	
$FEPS_{t+1}$		2.5083 (2.0625**)	
P_{t-5}	0.6174 (9.4853***)	0.5757 (8.5304***)	0.7815 (17.9774***)
D_{Up}	1.5962 (5.5882***)	1.5667 (4.6510***)	1.2722 (4.3879***)
D_{Down}	-1.3996 (-3.9728***)	-1.2396 (-3.7863***)	-2.3515 (-4.7107***)
Sample	1,772	1,772	1,772
Adjusted R^2	0.8207	0.8328	0.7825
Akaike Info Criterion	4.3107	4.2413	4.5026
F-Statistic	1,623***	1,472***	2,125***
Log Likelihood	-3,813	-3,751	-3,985

Note: ** Denotes significance at the 5% level; and

*** Denotes significance at the 1% level.

Despite the above findings, the important question, not answered by examining R^2 or AIC values, is whether the fitting of a hybrid model, one that includes both fundamental and technical measures, sees a statistically significant improvement in the ability to explain contemporaneous share prices relative to models only comprising fundamental factors. We present an answer to this question by providing likelihood ratios in table 6. Overall, in comparing these ratios we confirm that the hybrid models provide a statistically significant increase in explanatory power relative to fundamental models. This finding is consistent with Bettman, Sault and Welch's (2006) US study, and presents further evidence that the inclusion of both fundamental and technical measures provides the superior valuation model.

Finally, consistent with Bettman, Sault and Welch (2006), we fit a model where contemporaneous share price is solely a function of these factors, namely Model (5). This testing will determine whether the technical measures subsume the fundamental factors advanced by previous research. Results of this modelling, presented in table 5, reveal that, even in the absence of fundamental factors, models solely considering technical information are nearly as powerful as those comprising a combination of fundamental and technical factors. In particular, all technical measures are highly significant in explaining contemporaneous share price, with the overall model being highly significant, with an adjusted R^2 of 78.25% and an AIC value of 4.5026.

However, the likelihood ratio tests in table 6 demonstrate that our hybrid models significantly outperform the technical model represented here by Model (5). Thus, our overall findings suggest, consistent with Bettman, Sault and Welch (2006), that a valuation model that supplements fundamental factors with technical measures yields a model with markedly greater explanatory power than models incorporating either fundamental or technical information in isolation.

5. Concluding Remarks

This study presents the first examination of the value-relevance of technical information in Australia. Specifically, this study employs an unconstrained version of Ohlson's (1995) residual income valuation model in an attempt to determine whether technical measures provide incremental value-relevance in explaining contemporaneous share prices in Australia. Following the methodology of Bettman, Sault and Welch (2006) we investigate the value-relevance of three technical measures, with one factor reflecting lagged price, and the two remaining accounting for extremes in past price performance.

We commence testing by modelling price solely as a function of fundamental factors, namely book value per share and current earnings per share. Results pertaining to this model fitting are consistent with earlier studies, documenting the strong positive relationship between contemporaneous price and both book value per share and current earnings per share (e.g. Collins, Maydew & Weiss 1997; Dechow, Hutton & Sloan 1999). However, consistent with Dechow, Hutton and Sloan (2006) and Bettman, Sault and Welch (2006), we find that the inclusion of forecast earnings per share in model fitting sees contemporaneous earnings per share ceasing to be a significant explainer of price.

Table 6
Likelihood Ratios

Table 6 presents the likelihood ratios calculated to compare the strength of unrestricted models tested in this paper relative to restricted models. Specifically, ratios are calculated as 2 (log likelihood of the unrestricted model – log likelihood of the restricted model), and resultant ratios compared to critical χ^2 values with degrees of freedom equal to the number of parameters by which the restricted model differs from the unrestricted model. For ease of reference, the list of all models considered in the paper and included in calculations of likelihood ratios is as follows:

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t \quad (1)$$

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 FEPS_{t+1} \quad (2)$$

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 P_{t-5} + \beta_4 D_{Up} + \beta_5 D_{Down} \quad (3)$$

$$P_{t+1} = \alpha + \beta_1 BVPS_t + \beta_2 EPS_t + \beta_3 FEPS_{t+1} + \beta_4 P_{t-5} + \beta_5 D_{Up} + \beta_6 D_{Down} \quad (4)$$

$$P_{t+1} = \alpha + \beta_1 P_{t-5} + \beta_2 D_{Up} + \beta_3 D_{Down} \quad (5)$$

Notation employed in equations (1) to (5) is as follows: P_{t+1} is the firm's end-of-month share price in the month forecast earnings for the coming fiscal year are announced. This share price is adjusted for capitalisation changes; P_{t-5} is the firm's end-of-month share price six months prior to that denoted by P_{t+1} . This share price is adjusted for capitalisation changes; $BVPS_t$ is the book value per share of the firm's equity, calculated as at the end of the most recent fiscal year and adjusted for capitalisation changes; EPS_t is the earnings per share of the firm, calculated at the end of the most recent fiscal year, announced to the market in month t and adjusted for capitalisation changes; $FEPS_{t+1}$ is the consensus forecast earnings per share for the firm, as forecasted in the month following the release of actual earnings per share figures for the most recent fiscal year. Forecast earnings are adjusted for capitalisation changes and are announced in the middle of the month, though the exact date varies slightly; D_{Up} is a dummy variable equal to 1 if the stock performed in the top decile in the six month period commencing one year prior to the measurement of P_{t+1} , else 0; and, D_{Down} is a dummy variable equal to 1 if the stock performed in the lowest decile in the six month period commencing one year prior to the measurement of P_{t+1} , else 0.

	Restricted Model	Unrestricted Model	
	(2)	(3)	(4)
(1)	284.7***	1,468***	1,753***
(2)			1,468***
(3)			124.9***
(5)		469.1***	469.1***

Note: *** Denotes significance at the 1% level.

Following this, we supplement these valuation models with the suite of technical measures proposed by Bettman, Sault and Welch (2006), with testing revealing the incremental importance of these technical measures in explaining contemporaneous price. Furthermore, we provide further evidence that valuation models which include both fundamental and technical factors result in a model with greater explanatory power relative to those models only considering either fundamental or technical information in isolation.

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