

Information Content of PE Ratio, Price-to-book Ratio and Firm Size in Predicting Equity Returns

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Abstract. The concept of market efficiency is central to finance. Various anomalies have been documented in the last two decades that contradicts to the efficient market hypothesis. Despite the extensive evidence of market anomalous from the U.S market, empirical studies on the Australian equity market are limited. This study investigates a number of anomalous including PE ratios, Price-to-book ratios and the firm size effect in an Australia context. The preliminary results suggest that PE ratios and firm size do not have power in predicting stock returns. However, significant returns are found to be associated with low Price-to-book ratios.

Keywords: Market efficiency, market anomaly, PE ratio, Price-to-book ratio, firm size

1. Introduction

The efficient market hypothesis (EMH) suggests that at any given time period, stock prices fully, immediately reflect all relevant available information. Fama (1970) argued that it is impossible for an individual to beat the market consistently in an active market because the stock price already reflected all available information. Roll (1983) revealed a systematic difference in returns by months of the year. The further challenges come from the market anomalies such as the firm size effect, the January effect, the PE ratio effect, and the book-to-market effect etc. These evidences on the market anomalies provide empirical results that deviate from orthodox theories of asset-pricing behavior. Pradhuman (2000) argued that small-cap stocks have underperformed large-cap stocks in roughly one out of every four years in the past 50 years. Bodie (1999) suggested that value investing may earn excess returns over long periods; growth investing has outperformed value investing over five-year periods during the past three decades. Most previous studies focused on U.S. markets whereas the Australian markets haven't been explored yet. This study investigates the predictive ability of the PE ratio, price-to-book ratio and firm size. The test results based on PE ratios present some explanatory power over 5-year holding period—as PE increased, excess returns has decreased, which is consistent to that of Fama and French (1989) and Trevino and Robertson (2002) who suggested that PE ratio is useful in predicting long term returns but poor for subsequent short turn horizons. Price-to-book ratios tend to show some predicting power especially in long term investment horizon. The finding also indicates that firm size is of little help in predicting excess returns both in short and long term. The rest of the paper is organized as follows. Section 2 provides a review of literature. Section 3 develops the research design and describes the data. Section 4 presents the empirical results. Section 5 concludes the paper.

2. Literature Review

The EMH suggests that stock prices already reflect all public information and therefore have no predictive power for future stock returns. However, the opponent of the EMH argues that it is possible to predict future excess returns, stock market anomalies are the cases. Poterba and Summers (1988) and Fama

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and French (1988) found the mean reversion in returns on stocks with 3-5 years investment horizons, which implied that a long period of low return stocks tended to reverse and generate above-average returns in the future. Campbell et al (1997) found 12% of the variance in the NYSE daily stock price index could be predicted based on the previous day's return. Banz (1981) and Reinganum (1981) observed that small-capitalization firms on the New York Stock Exchange gained substantial high returns than fair value predicted by CAPM. Banz (1981) defined the phenomenon of small firm usually having higher average returns than larger firms as the "Small Firm Effect". Elfakhani and Bishara (1991) found the evidence in Canadian stock market that shows an inverse relationship between risk-adjusted excess returns and firm size. In UK, Dimson and Marsh (1986) found the annual returns on small stocks exceeded large stocks by 6% per annum over 1955-1984. Chan et al. (1991) reported a 5% small firm premium in Japanese stocks markets between 1971 and 1988. Roll (1983) hypothesized that US investors might sell small cap stocks by the end of the year since small cap stocks usually experience substantial short-term capital losses which could be used to offset investors' income tax. Banz (1981), Keim (1983), Reinganum (1983), Blume and Robert (1983), Ritter and Chopra (1989), Leleux et al. (1995) demonstrated it would be appropriate to refer the earlier finding as "Small Firm January Effect". Nicholson (1960) found that low PE stocks on average generated higher return than high PE stocks. Basu (1977) further tested the PE ratios and suggested that stocks with low PE ratio tended to earn higher returns than those with higher PE ratio. Bleiberg (1989) and Good (1991) also investigated the PE effect and found that PE ratios and market returns were inversely correlated. Basu (1983) suggests distinguishing the PE ratio effect from the small firm effect which tends to have higher returns even after controlling the PE ratio. Banz and Breen (1986) and Goodman and Peavy (1986) extended argued that the PE ratio effect acts as a proxy for the firm size. Using a Canadian sample, Elfakhani and Bishara (1991) provided further evidence on PE ratios. April (1991) investigated Institutional Brokers Estimate System and found that firms with the lowest PE ratios and lowest expected EPS tend to present a negative October effect as a result of downward revisions in analysts' forecasts. Fama and French (1998) demonstrated that the predictive ability of PE was more effective within four-year investment horizons. Nevertheless, Trevino and Robertson (2002) reexamined the S&P500 Composite Index between 1949 and 1997, found the relationship between the PE ratio and subsequent returns and found the average stock return was affected by the PE ratio if the holding period was greater than five years. Faff (2004) found Australian evidence that low PE strategy is only appropriate during certain phases of the economic cycle. Portfolio managers object to buy stocks with low PE ratio at the peak of the business cycle because low PE stocks tend to be more dependent on the economic cycle. Rosenberg et al. (1985) found that the average returns on U.S stocks are positively related to the firms' book-to-market value. Chan et al (1991) found similar results from Japanese market, but emphasizing the explanatory power of B/M was stronger in the cross section average returns. Fama and French (1998) observed that firms in the lowest B/M class earned an average monthly return of 0.3%, whereas firms in the highest B/M class earned an average return of 1.83%. Beechey et al. (2000) summarized the previous evidences and concluded that on balance the hypothesis of "stock price follows a random walk" was at least approximately true, and thus no one could predict future returns by analyzing past stocks price.

3. Research Design and Data

Data were collected from Aspect FinAnalysis during the period from 1995 to 2004. The final sample arranged across all ten GICS industrial sectors including 54 observations of 153 stocks for the period of 1995 to 2004 (Table 1). Firm size is measured by market capitalization. The Price-to-book ratio is measured as the reciprocal of the book-to-market ratio. The actual stock return is measured as the geometric returns of discrete return for each year.

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

Where P is stock price and D is dividend. The capital assets pricing model is used to measure stocks expected return $Er = Rf + \beta(Em - Rf)$, where the risk free rate is the weighted-average yield of Treasury bonds in a particular year and obtained from the Reserve Bank of Australia. The return on the market is based on five years' historical average return on the S&P/ASX200 index with dividends reinvested. The

forming of portfolio is consistent with Aswath (2002) and yields nine different groups. The actual returns on each portfolio are the average of the actual returns on individual stocks. Holding-period mean returns are generated by compounding subsequent annual returns over the holding period. The excess returns on each portfolio are the average of the excess returns on individual stocks. The excess returns on individual stocks are the difference between the actual returns and expected returns. Regressions are used to test whether the difference across portfolios is statistically significant. The null hypothesis is that PE ratios, price-to-book ratios and firm size (market capitalizations) are not associated with portfolio's return. A rejection of the null hypothesis implies that the examined sample would realize anomalous excess returns and therefore the current Australian stock market is inefficient.

$$ER_{it} = \alpha_{it} + \beta_1(PE_{it}) + \beta_2(MC_{it}) + \beta_3(PB_{it}) + \varepsilon_{it} \quad (2)$$

Table1. Sample Selection

GICS	Industry	Firms listed	Sample firms	% of sample firms
1010	Energy	16	6	37.5%
1510	Material	58	30	53.4%
1510	Industry	45	26	62.2%
2010-2030	Consumer Discretionary	38	22	60.5%
2510-2550	Consumer Staples	15	13	87%
3010-3030	Financials	59	36	64%
3510-3520	Healthcare	27	10	37%
4510-4530	Information Technology	18	5	28%
5010	Telecommunication	3	2	67%
5510	Utilities	8	3	37.5%
	Total	287	153	53%

4. Empirical Results

Table 2 shows the overall model is statistically significant at 5% level for 3-year and 5-year holding period, in short term, only 2002 has F-value 2.97, significant at 5%. However, the problem is the explanatory power is low with R^2 18% which mean only 18% of the variability in excess returns is explained by PE, price-to-book and market cap effect. Since the overall model disguises the frequency of the sign and the significance of the relationship between the predicting variable and the performance measure. In Table 3, the negative coefficients indicate that as the PE ratio decrease, higher returns are obtained, which is true for all three-year and five-year holding periods and subsequent one-year holding period of 2000, 2002, 2003 and 2004. When the factors of price-to-book ratio and market capitalization have been discarded, the regression analysis with only PE ratios as explanatory variable shows the t-value is -2.05, significant at the 5% level for the five-year holding period. Similar evidence has fund for three-year holding period 2002-2004 with t-value -2.21% and ρ value 0.028 significant at 5% level as well. Although the excess returns tend to be higher when the PE ratios are lower, the explanatory power is not high with R^2 of 3%.

Table 2. Regression result-test the association between excess returns and PE ratio, price-to-book and market capitalizations.

Holding Period	(β_1)	(β_2)	(β_3)	t-statistics PE	t-statistics MC	t-statistics PB	F-Value	Adj R^2
1-year								
2000	-0.05	0.0001	-2.16	-0.35 (0.72)	0.26 (0.79)	-1.56 (0.12)	1.00 (0.39)	0.02
2001	0.06	-0.0006	-4.03	0.26 (0.79)	-1.08 (0.28)	-2.20* (0.029)	2.28 (0.08)	0.04
2002	-0.38	-0.0012	-6.16	-0.86 (0.38)	-1.38 (0.17)	-2.09* (0.037)	2.97* (0.033)	0.06

2003	-0.05	-0.0004	-2.67	-0.26 (0.79)	-1.25 (0.21)	-2.12* (0.035)	2.38 (0.072)	0.05
2004	-0.03	-0.0005	-0.67	-0.12 (0.89)	-1.15 (0.25)	-0.39 (0.69)	0.53 (0.67)	0.01
3-year								
2000-2002	-0.05	-0.0003	-3.43	-0.54 (0.59)	-1.18 (0.23)	-4.37** (0.00002)	8.17** (0.0005)	0.14
2001-2003	-0.11	-0.0003	-3.51	-1.08 (0.27)	-1.50 (0.13)	-4.27** (0.00003)	8.69** (0.0002)	0.15
2002-2004	-0.17	-0.0005	-3.02	-1.32 (0.18)	-1.91* (0.05)	-3.55** (0.0005)	7.56** (0.0009)	0.13
5-year								
2000-2004	-0.06	-0.0003	-2.75	-0.96 (0.34)	-1.38 (0.16)	-4.99** (0.0000)	11.21** (0.0000)	0.18

Both multiple regression (Table 2) and simple regression on market cap (Table 5) reveal no support for the small firm size effect. The only evidence found is in 3-year holding period, in particular 2001-2003 which appear in both multiple and simple regressions; T-value is -1.91 significant at 5% level. The explanatory power is account for 3%. This suggests that the size effect does not apply to the Australian stock market. Nevertheless, the coefficients of market capitalizations is extremely low, indicate the proportion of unexplained variability is extremely high. The ASX200 consists of about the top 200 shares and therefore is unlikely to be truly representative of a large of small firm portfolio. Although in Australia small companies outperformed for a number of periods, they were beaten by large companies over the whole period. In practice it is difficult to obtain portfolios of large and small shares in which both short and long positions can be held and trades can be executed quickly. The major finding is that there exists statistical support for the price-to-book effect hypothesis. In the multiple regression (Table 2), except 2000 and 2004, the rest groups all present significant level, in particular, the R^2 values of 3-year and 5-year holding period are extremely low significant at 1% level (Table 4). However, the adjusted R^2 is 17% in 5-year holding period in explaining the relationship between price-to-book ratio and returns. Fama and French (1992) argued that firms with prices well below book value are more likely to be in trouble and go out of business. Investors therefore have to evaluate whether the excess returns made by such firms justify the additional risk taken on by investing in them. It is important to emphasize that these significant statistics of price-to-book ratios do not necessarily imply that the stock market is inefficient and that investors can easily "time" the market for excess returns. The results suggest there may be some degree in the PE and price-to-book effect, small firm effect that relates to certain holding period especially longer horizon, but the results are mixed and do not display consistent evidence of a differential one-year performance effect. Brailsford and Heaney (1998) stated that it is likely that markets are neither truly efficient nor truly inefficient. To summarize, for Australian stocks, the regression results suggest that beginning PE ratios have no predictive power when looking at subsequent short-term one-year excess returns. Over short periods, excess returns appear to be unrelated to PE ratios. Over longer holding periods (three years or five years), there is a tendency for low PE groups to obtain higher excess returns especially in the regression has PE ratio as the only variable. There also exhibits a relative proof that the lower price-to-book ratio, the higher mean return premiums in long run. However, it fails to reject the size effect.

Table 3. Regression results-test the association between excess returns and PE ratio.

Holding Period	Intercept	Coefficient	T-Statistics	p-Value	Adj R2
1-year					
2000	3.99	-0.11	-0.75	0.45	0.003
2001	14.09	-0.03	-0.11	0.91	0.00008
2002	38.83	-0.63	-1.44	0.15	0.014
2003	6.69	-0.18	-0.88	0.37	0.005
2004	28.21	-0.06	-0.23	0.81	0.0004
3-year					
2000-2002	6.96	-0.14	-1.54	0.12	0.02
2001-2003	9.29	-0.18	-1.69	0.09	0.02
2002-2004	17.25	-0.29	-2.21*	0.02*	0.03

5-year					
2000-2004	7.68	-0.13	-2.05*	0.04*	0.03

Table 4. Regression results-test the association between excess returns and price-to-book.

Holding Period	Intercept	Coefficient	T-Statistics	p-Value	Adj R2
1-year					
2000	7.04	-2.24	-1.69	0.09	0.02
2001	24.15	-4.24	-2.38	0.02*	0.04
2002	43.14	-7.09	-2.49	0.01**	0.04
2003	9.77	-2.86	-2.35	0.02*	0.04
2004	28.97	-0.81	-0.49	0.62	0.002
3-year					
2000-2002	12.79	-3.63	-4.79	4.02E-06**	0.13
2001-2003	15.08	-3.83	-4.73	5.14E-06**	0.13
2002-2004	19.62	-3.42	-4.10	6.67E-05**	0.10
5-year					
2000-2004	12.02	-2.96	-5.54	1.31E-07**	0.17

Table 5. Regression results-test the association between excess returns and market capitalizations.

Holding Period	Intercept	Coefficient	T-Statistics	p-Value	Adj R2
1-year					
2000	1.47	0.00005	0.09	0.92	6.26
2001	15.85	-0.0007	-1.39	0.16	0.01
2002	30.45	-0.0014	-1.57	0.12	0.02
2003	4.87	-0.0005	-1.39	0.16	0.01
2004	29.23	-0.0006	-0.18	0.24	0.009
3-year					
2000-2002	5.17	-0.0004	-1.56	0.12	0.02
2001-2003	7.15	-0.0005	-2.08	0.04*	0.03
2002-2004	13.15	-0.0006	-2.14	0.03*	0.03
5-year					
2000-2004	5.82	-0.0004	-1.77	0.07	0.02

5. Summary

This paper examined how the holding period returns are influenced by the PE ratios, firm size, and price-to-book ratios. The results of this study present some explanatory power over 5-year holding period—as PE increased, excess returns has decreased, which is most nearly comparable to that of Fama and French (1989), Trevino and Robertson (2002) in terms of PE ratio is useful in predicting long term (above five years) returns but poor for subsequent short turn horizons. Price-to-book ratios tend to show some predicting power especially in long term investment horizon. The finding also indicates that firm size is of little help in predicting excess returns both in short and long term. The sample includes banks, insurance companies, government-operated companies and other heavily regulated industries. This may result in the test of PE ratio, Price-to-book ratio and size effect less detectable because heavy regulation.

6. References

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