The Size and Book to Market Effects in New Zealand

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Abstract

This paper finds that both size and book to market ratios are strong explanatory variables of returns in the New Zealand share market. When the size and book to market variables are combined in certain ways even stronger relationships with returns exist. These findings contradict earlier predictions that beta was the only variable with the ability to explain returns. The size effect can be said to be a proxy for the market risk, in that portfolios of small companies have high volatility of return. Thus the size effect is explained without destroying the EMH. Findings on Book to Market confirm those of others. Support is given to the arguments of Fama and French to reject beta as a one factor explanatory variable for returns and include factors for size and book to market equity.
The Size and Book to Market Effects in New Zealand

1. INTRODUCTION

For nearly three decades the Capital Asset Pricing Model developed by Sharpe, Lintner and Black has been the mainstay of Corporate Finance theory. The CAPM predicts a linear, single factor (beta), positively sloped relationship between expected stock return and beta.

The usefulness of the CAPM has, however, attracted much recent criticism. Size and the book to market ratio have emerged as the two prominent variables that are in fact related to stock returns, while the usefulness of beta has been rejected. Fama and French [1992] (FF) find that stock returns are negatively related to size and positively related to book to market ratios. What’s more, FF find that the relationship between stock returns and beta is not statistically significant.

The FF study follows from earlier research that reveal strong relationships among stock returns, size and book to market ratios. Banz [1981] and Reinganum [1981] are among the first to document evidence of a significant negative relationship between abnormal returns and the market value of common equity. Banz [1981] found further evidence that the smallest firms have on average very large unexplained mean returns. Doubts about the validity of beta are not new as many have questioned it before e.g. Roll (1977), Reinganum (1982), Lakonishok and Shapiro (1986), and Ritter and Chopra(1989).

FF divide the set of theories within which the empirical results can be viewed into two contexts. In one context, the results can be seen as rational valuation, and the other as overreaction. The essence of the rational valuation theory is that size and book to market are indicators of risk, through their relationship with the economic prospects of companies. The essence of overreaction, as described by De Bondt and Thaler [1985] is that investors overreact to recent stock returns, thereby causing the stocks of
the losers to become undervalued and the stocks of the winners to become overvalued.

In New Zealand, it has already been shown that beta is a poor predictor of future returns (see Vos (1994), Vos (1995), Burke, Lont, McGregor (1996) and Vos (1997)). This study, therefore, focuses on the Fama & French suggestion that size and the book to market ratio are good predictors of subsequent returns and attempts to confirm their results for the New Zealand market. In the next section of this report, the literature surrounding the variables affecting stock market returns will be discussed. Evidence will then be provided that beta is not the only variable that can explain returns, and that book to market ratios and firm size are strongly related to returns. Results of empirical tests will show that positive abnormal returns can be made when investing on the basis of BE/ME and size, especially when following specific ranking techniques. An explanation for this positive relationship between the BE/ME ratio and returns, and the negative relationship between a firm’s size and its returns will then be attempted. The implications of this explanation on the efficiency of the NZ market will then be examined.

2. THE LITERATURE

The starting point in this discussion of the predictors of stock returns is Fama and French’s 1992 article: The Cross-Section Of Expected Returns. Their objective was to explain the roles of beta, book to market equity, size, E/P, and leverage, on stock return. Fama and French made the following conclusions:

- There is no relation between beta and average stock returns - the primary prediction of the CAPM - that average stock returns are positively related to beta is false.
- The relationship between size (ME) and average return is significant, with a t-stat of 2.58. This size factor takes the place of much of the relationship with average return that was previously thought to belong to beta.
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• There is a positive relationship between book equity/market equity and average return. This relationship is strong, with a t-stat of 5.71.

Rolf W Banz (1981) was among the first to document the size effect. He found that the relationship between size and return is not linear. The main excess return effect occurs for very small firms. The smallest firms have on average very large unexplained mean returns. There is not much difference in return between the middle and upper firms. The difference in return terms is about .4% per month.

Shefrin and Statman (1995) offer an explanation for the size and BM effects. They propose a behaviour based approach to security valuation. The essence of their null hypothesis is that investors make decisions based on the wrong criteria when they choose stocks, and that this is what causes the size and book to market effect. The results further show a significant negative relationship between standard deviation and value as a long term investment, but no significant relation between beta and long term investment. Shefrin and Statman conclude:

1. The respondents tend to rank stocks as if they believe that good stocks come from good companies, and good companies are large, and have low B/M ratios.
2. Respondents rank stocks as if they are indifferent to Beta.
3. Noise traders dominate the market, and arbitrage by information traders is unlikely to nullify the effects of noise traders on stock prices.

Kothari, Shanken, and Sloan (1995) (KKS) formulate an attack on the 1992 finding by Fama and French that beta is no longer a significant predictor of stock returns and that size and BM are the new predictors. On size KSS conclude that the “incremental contribution of size, while not unimportant, is not large either.” KSS examine the relationship between B/M and stock returns and explore the possibility of selection biases.
KSS doubt that any positive relations between B/M and stock returns would be robust to longer periods. Overall, KSS argue that B/M results found by previous academics are influenced by a combination of survivorship bias affecting the high B/M stock’s performance, and period specific performance of both low and high B/M stocks, past winner and loser stocks. KSS do admit that there are valid economic arguments for B/M to be related to expected return beyond beta, but argue that the B/M ratio is not as important as has been suggested by the previous literature. They conclude:

1. The power of the B/M as an explanatory variable is low.
2. Research on the B/M subject is biased and may be period specific.
3. Size is highly correlated to beta, explaining only a small proportion of the market return.

Roll (1983) sought to explain the turn of the year effect for small firms which consistently give greater returns. Roll indicated that for efficient market theory to survive this size effect anomaly then one must ascribe the phenomenon to a non-exploitable cause. Since Roll could find no explanation he concluded that the market was not removing a seasonal irregularity - thus wasn’t efficient. Roll explains this anomaly by saying that high transaction costs of small firms (small firms often have low prices and low price means high transaction costs) and low liquidity of small firms may prevent arbitragers from taking advantage of the premium, therefore, the return seasonality is not eliminated.

Keim (1983) finds further evidence of a negative relationship between size and abnormal returns. Keim finds periods where the size effects is reversed (69-73). Jaffe, Keim and Westerfield provide evidence, however, that the size effect is significant only in January.

Kim (1985) eliminates the EIV (error in variables) problems, and the true explanatory power of beta and size is revealed. Under his technique the significance of betas increase and the significance of size decreases. While his results show beta to be
significant, it still shows size to be significant, and thus a mis-specification of the CAPM.

Chan and Chen (1991) show that it is the marginal firm characteristics and not size that explain the difference in return behaviour of small and large stocks. They go about proving this by constructing two indices mimicking the return behaviour of marginal firms that have cut their dividends dramatically and the behaviour of firms with high financial leverage. Small firms on the NYSE tend to be firms that have not been doing well and consequently they tend to be firms that are less efficiently run and have higher financial leverage. As a result of the differences in production efficiency, difference in leverage, and perhaps resultant difference in accessibility to external financing small firms tend to be riskier than large firms. The time series of return differences between small and large firms can be captured by the responses of high leverage firms and marginal firms to economic news.

The literature in this area of finance is contradictory. However, there is enough evidence regarding the explanatory power of both firm size and book to market ratios to warrant a thorough investigation of this topic based on the New Zealand market. Since it has been shown by FF that beta is not useful, and since those results have been substantially confirmed in New Zealand (Vos (1997)), this study focuses only on the question: do size and book to market ratios assist in predicting future returns?

3. DATA

The main consideration when selecting the data for this research was to obtain a sample size large enough so that one could be confident of the results. Another consideration, however, was the availability of data which could be used for such a study. It is because of this (and also so as to avoid the crash period between 1986 and 1989 in New Zealand) that the period used was from January 1991 until December 1995. The data was obtained from two places:
• The DATEX service which lists information about stocks traded on the New Zealand Stock Exchange was used to collect book data for the shares, including the value of book equity and the number of shares outstanding.

• The School of Management, University of Waikato, computer system was used to obtain share prices and fully adjusted return indices for all stocks on the New Zealand Stock Exchange.

The selection criteria for the data was simply that the share must have been continuously listed on the New Zealand Stock Exchange for the entire 5 year period. This criteria drastically reduced the number of shares that were to be included, leaving only 70 shares for the sample. It was necessary to impose this criteria so that a constant sample size could be obtained, in order to be able to carry out statistical analysis of the sample. (See section 7 for a more complete discussion of the limitations of this report including a discussion of the period selected and a survivorship bias.)

Monthly returns were calculated for each of the 70 shares for the 5 year period. These were to become the dependent variable of the research. The two main independent variables were firm size and its book to market ratio (BM). The firm size was calculated at the beginning of each month as the natural log of the total number of shares outstanding multiplied by the closing share price of the previous day’s trading. It is important to note, however, that De Bondt and Thaler believe that firm size measured by assets gives a more permanent measure of size.\(^1\) This study has followed Fama and French’s 1992 study\(^2\) in using market capitalisation data as the measure of size as a stronger measure of firm size than assets. The book to market ratio is calculated by dividing the natural log of book equity by the natural log of market equity. Book equity has been assumed to be constant over the financial year, due to limitations in data availability.

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For a small number of shares which were missing data in the above sources values were obtained from the National Business Review, NBR Personal Investor or the company’s financial reports. Overall, this investigation covers five years and seventy stocks. While this sample size is significantly smaller than that of Fama and French (1992), bearing in mind the size of the New Zealand market, with approximately 135 listed companies in 1995, this is a sufficiently large sample size to justify any results or conclusions which may be found.

4. METHODOLOGY

The methodology employed was designed to test the hypothesis that size and BM are both significant predictors of stock returns in the New Zealand equity market. First, portfolios on which stock returns could be measured were formed. Each of the 70 stocks were ranked into 10 hypothetical portfolios at the beginning of every portfolio holding period. All of these portfolios are equal weighted, rather than value weighted, as recommended by Kothari, Shanken, and Sloan. Each of these portfolios contained 7 stocks. The methods of ranking included:

- by size;
- by BM factor.

Once the stocks were ranked, and the portfolios formed, the portfolios were held for 6 months. The 6 monthly return for the stock was then calculated using a geometric mean. These portfolios were formed every three months starting 1 January 1991, with the last portfolio formed on the 1 June 1995. Effectively, this means that 19 portfolios were formed, each containing 70 stocks, thus giving a total number of observations of 1310. The ex-ante semi-annual returns were then compared with the variables: size and BM. Thus at this stage there were 10 portfolios, formed on the basis of size and BM, comprising of 7 stocks each. When portfolios were formed on the basis of size, Portfolio 1 was comprised of the 7 smallest capitalisation shares of the 70, and Portfolio 10 was comprised of the 7 largest capitalisation shares of the 70. When the
portfolios were formed on the basis of BM a Portfolio 1 contained the 7 lowest BM stocks, and Portfolio 10 contained the highest 7 BM stocks.

A table was then produced to show the average returns, and the standard deviations of each of the 19 Portfolios 1 through 10. This table was then used as a data source for ordinary least squares regressions. The data that was regressed at this stage was the average returns for each of the portfolios (the dependent variable), and the portfolio number (1-10) assigned to each of the portfolios (the independent variable). Using an index number instead of the actual size, or BM ratio, helps to promote homoscedasticity, and reduce the long run variance from the trend line (heteroscedasticity). In some cases the standard deviation of returns over the 19 periods in each of the 10 classes of portfolios was also regressed as a dependent variable against the number assigned to the portfolio as the independent variable. This regression served to describe the relationship, and its significance, between the average returns and the independent variable (size or BM).

Next the 7 shares within each of the 10 portfolios were ranked by either the size or BM variable. Thus this produced portfolios ranked:

- by size first, then ranking within each of the 10 portfolios by BM;
- by BM first, then ranking within each of the 10 portfolios by size.

This was done to test for a significant premium for either size or BM within each of the 10 portfolios. The premium within each portfolio was defined as the difference between the average return of the top three and of the bottom three shares, ranked by either BM or size within each portfolio. In essence, this step tested for one variable while controlling for the other. For example, when ranking by size first, then ranking within each of the 10 portfolios by BM we can control for the size effect when testing for the BM effect. Then, further regressions of the relationship between the risk premium for either size or BM within the 10 portfolios were undertaken, and the number assigned to the portfolio. The results of this regression show the trend of the premium through the different portfolios.
In order to ascertain whether the above portfolio selection technique was significant in achieving the results, it was necessary to carry out further tests on the data, for a more simple relationship between BM and size, and stock returns. Thus, multi-variable, and OLS regressions were carried out on the variables (BM and size) and 6 monthly returns of all of the stocks (unranked) within each of the portfolio periods.

Correlation tests were also carried out on each of the stocks, comparing its variables with the 6 monthly return figures over the whole of the sample period. These tests show the relationship between the variables, and the variables and the returns.

5. RESULTS

5.1 SIZE

When the 70 stocks were sorted into 10 portfolios based on their market capitalisations, it became evident that the portfolios made up of smaller capitalisation shares had significantly higher returns than the portfolios made up of larger capitalisation shares. The results of the ranking, in Table 1, show that the portfolio with the smallest 7 stocks (Portfolio 1) of the 70 in the sample, on average, gave a 6 monthly return of 12.29% (26.09% p.a.), while the portfolio of the largest 7 stocks (Portfolio 10) gave a 6 monthly average return of 3.30% (6.71% p.a.). Of further interest is the standard deviation of the returns of Portfolio 1, and Portfolio 10 over the 19 periods. The portfolio of the smallest stocks has a standard deviation of 20.81% while the portfolio made up of the largest stocks has a standard deviation of 7.05%. Both the size-return relationship, and the size-standard deviation relationship are significant with t-stats of -2.47 and -6.50, respectively. Since the absolute values of the t-stats are both greater than 1.94, size is an important variable in determining returns and standard deviation. The R squared statistics for size as a explanatory variable also indicate that there is a strong relationship between size and return, and size and standard deviation. (The F-observed value for both of these is also substantially greater than the F-critical value of 4.53).
The regression equation implies that if an investor increases the size of share capitalisation to invest in by one portfolio, they will sacrifice .76% return (semi-annual) but drop 1.51% standard deviation. Thus small stocks mean higher returns but more risk. Graph 1 illustrates this well.
The 6 monthly returns of the portfolios sorted on the basis of BM show evidence of a higher return for companies with high book equity to market equity ratios. The results are important, but not to the degree of importance as size alone. The portfolio with the highest BM stocks (those stocks that the market has valued lower than is listed in the accounting statements) gave an average 6 monthly return of 12.32% (26.16% p.a.) where the lowest BM portfolio gave an average return of 8.23% (17.15% p.a.). The t-stat of this relationship indicates that the relationship is important, but not statistically significant at the 95% level of confidence.

### TABLE 2

<table>
<thead>
<tr>
<th>REGRESSION (RETURN AGAINST BM)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X COEFFICIENT</td>
<td>0.56%</td>
</tr>
<tr>
<td>T STAT</td>
<td>1.60</td>
</tr>
<tr>
<td>Y INTERCEPT</td>
<td>5.21%</td>
</tr>
</tbody>
</table>
An interesting feature of Graph 2 is the relationship between the average return of BM ranked portfolios and the standard deviation of the returns of those portfolios. The standard deviation seems to be highest at the extremes of BM. There is high risk both with the lowest BM companies, and with the highest BM companies. There is, however, no relationship between standard deviation and the BM ranking. The R squared of the relationship between standard deviation of return and BM is .000037, the t-stat .02 and the x coefficient is .0009%.

**GRAPH 2**
5.3 **Ranking by Size and then by Book to Market**

In comparing the returns of high and low BM companies within the size ranked portfolio, it is evident that there is a premium return for high BM companies over low BM companies. The highest three BM stocks in the smallest size portfolio gave an average 6 month return of 14.60% (31.35%p.a.). Furthermore, it seems that there is a trend that there is a higher BM return premium in smaller firms than in larger firms. This relationship is backed up by a t-stat of -1.68 which is on the verge of statistical significance at the 95% level of confidence. The trend can be seen in Graph 3.

**TABLE 3**

<table>
<thead>
<tr>
<th>REGRESSION RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM RETURN PREMIUM AGAINST SIZE</td>
</tr>
<tr>
<td>X COEFFICIENT: -0.62%</td>
</tr>
<tr>
<td>T STAT: -1.68</td>
</tr>
<tr>
<td>R SQUARED: 0.26</td>
</tr>
<tr>
<td>Y INTERCEPT: 5.73%</td>
</tr>
</tbody>
</table>

**SMALLEST SIZE PORTFOLIO**
### AVERAGE 6 MONTH RETURN

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW BM</td>
<td>5.46%</td>
</tr>
<tr>
<td>HIGH BM</td>
<td>14.61%</td>
</tr>
</tbody>
</table>

### THE BM PREMIUM IN ALL SIZE PORTFOLIOS

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RETURN</td>
<td>STD DEV</td>
<td></td>
</tr>
<tr>
<td>SMALL MV -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9.15%</td>
<td>19.51%</td>
</tr>
<tr>
<td>2</td>
<td>0.51%</td>
<td>37.05%</td>
</tr>
<tr>
<td>3</td>
<td>2.00%</td>
<td>37.82%</td>
</tr>
<tr>
<td>4</td>
<td>2.19%</td>
<td>24.04%</td>
</tr>
<tr>
<td>5</td>
<td>5.04%</td>
<td>29.59%</td>
</tr>
<tr>
<td>6</td>
<td>4.91%</td>
<td>18.62%</td>
</tr>
<tr>
<td>7</td>
<td>0.45%</td>
<td>14.25%</td>
</tr>
<tr>
<td>8</td>
<td>-4.14%</td>
<td>11.76%</td>
</tr>
<tr>
<td>9</td>
<td>3.93%</td>
<td>13.42%</td>
</tr>
<tr>
<td>LARGE MV -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>-0.86%</td>
<td>10.52%</td>
</tr>
</tbody>
</table>
These results show that there is a significant BM premium even when size is controlled for. As seen in Graph 3, there is also a trend that larger companies have a lower standard deviation of the risk premium for BM. This trend is backed up by a strong $R^2$ squared of .57.

### 5.4 Ranking by Book to Market and then by Size

There is clear evidence in this section that there is a large size premium in firms with high BM ratios. As is seen in Table 4, for the highest BM portfolio, the smallest three stocks gave an average return of 16.34% per 6 months (32.95% p.a.). The largest three stocks of this high BM portfolio gave a semi annual average return of 10.07% (21.15% p.a.) - hence the premium of 6.27% per 6 months. There is a highly significant t-stat of 2.27, with an $x$ coefficient of .90%. This means that Portfolio 2 can be expected to have .9% higher BM premium than Portfolio 1 (see Graph 4). The standard deviation of the premium return of small stocks with the BM formed portfolios is greater in high BM portfolios than in small BM portfolios, with a $R^2$ of .30.
### Regression Results

**Size Return Premium Against BM**

<table>
<thead>
<tr>
<th>X Coefficient</th>
<th>0.90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>T Stat</td>
<td>2.27</td>
</tr>
<tr>
<td>R Squared</td>
<td>0.39</td>
</tr>
<tr>
<td>Y Intercept</td>
<td>-1.31%</td>
</tr>
</tbody>
</table>

### Largest BM Portfolio

**Average 6 Month Return**

<table>
<thead>
<tr>
<th>Small MV</th>
<th>16.34%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large MV</td>
<td>10.07%</td>
</tr>
</tbody>
</table>

### The Size Premium in All BM Portfolios

<table>
<thead>
<tr>
<th></th>
<th>Return</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low BM -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-0.01%</td>
<td>26.01%</td>
</tr>
<tr>
<td>2</td>
<td>-2.26%</td>
<td>15.57%</td>
</tr>
<tr>
<td>3</td>
<td>2.02%</td>
<td>19.87%</td>
</tr>
<tr>
<td>4</td>
<td>-0.34%</td>
<td>21.05%</td>
</tr>
<tr>
<td>5</td>
<td>7.67%</td>
<td>21.80%</td>
</tr>
<tr>
<td>6</td>
<td>9.02%</td>
<td>22.34%</td>
</tr>
<tr>
<td>7</td>
<td>-0.86%</td>
<td>18.75%</td>
</tr>
<tr>
<td>8</td>
<td>8.49%</td>
<td>32.85%</td>
</tr>
<tr>
<td>9</td>
<td>6.18%</td>
<td>24.97%</td>
</tr>
<tr>
<td>High BM -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>6.27%</td>
<td>29.11%</td>
</tr>
</tbody>
</table>

*Graph 4*
5.5 Further Regressions

Multi variable regression was done on all of the unranked stocks in each of the 19 portfolio formation, and holding periods. The dependent variable was returns, and the two independent variables used were size and the BM ratio. The averages of the values of the x-coefficients, and the averages of the absolute values of the t-stats were calculated from each of the multi variable regressions. The results are consistent with the above findings, other than that they are statistically not significant. Neither of the variables has a t-stat of greater than 1.94, as seen in Table 5. Table 6 shows that similar results were found when separate OLS regressions were done on each variable, on all stocks in unranked form, for all of the 19 portfolio periods, rather than the multi variable regressions.
### MULTI VARIABLE REGRESSION

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE - RETURN</th>
<th>X Coefficient</th>
<th>T Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>-1.46%</td>
<td>1.25</td>
</tr>
<tr>
<td>BM</td>
<td>15.18%</td>
<td>1.30</td>
</tr>
</tbody>
</table>

**TABLE 6**

### OLS REGRESSION

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE - RETURNS</th>
<th>X Coefficient</th>
<th>T Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>-1.41%</td>
<td>1.23</td>
</tr>
<tr>
<td>BM</td>
<td>16.26%</td>
<td>1.30</td>
</tr>
</tbody>
</table>

**5.6 SIMPLE CORRELATIONS**

The relationship between BM and size is relatively strong, at -73.90%, which is logical considering that size is one of the variables in the BM equation. It is for this reason that it was important above in 6.3 and in 6.4 to control for one of the variables while testing the other. Even though there is this positive relationship between size and BM (see Table 7), both of the variables are still significant when controlling for the other. A simple correlation also finds a significant relationship between BM and return, and size and return.

**TABLE 7**

<table>
<thead>
<tr>
<th>CORRELATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BM - SIZE</td>
<td>-73.90%</td>
</tr>
<tr>
<td>SIZE - RETURN</td>
<td>-32.02%</td>
</tr>
<tr>
<td>BM - RETURN</td>
<td>24.43%</td>
</tr>
</tbody>
</table>
6. CONCLUSIONS

6.1 THE SIZE EFFECT

There are two ways that the size effect can be interpreted. It can be interpreted either in support of the Efficient Market Hypothesis (EMH), or as rejecting the EMH.

6.1.1 The Size Effect As An Anomaly

The excess returns that can be made by investing in the smallest companies can give up to 12.5% per 6 months or 26.5% p.a. This could amount to an anomaly which provides evidence contrary to the Efficient Market Hypothesis, and an opportunity for arbitrage. This can be seen as contrary to the EMH because an investors may use publicly available information (market capitalisation) to generate excess returns. This provides evidence against weak form efficiency.

Shefrin and Statman stated that there is a general misconception that good stocks belong to good companies and it is this misconception that underlies the superior performance of small equity stocks and stocks with high B/M. There is a strong distinction between people who trade on the idea that a good stock comes from a good company, and people who trade on empirically proven investment rules, such as B/M and size. In short, the cognitive error which makes noise traders prefer large stocks allows information traders to make extraordinary returns from the underpriced stocks of small companies that the noise traders pass up. Shefrin and Statman are essentially saying that the size and B/M effects are created by the subconscious misjudgments of investors. Such misjudgments are made when the investor chooses stocks on the basis of the company being large. Because of this misjudgment firms with low market capitalisations. It is in this way that cross sectional return anomalies are created.

Roll explains this anomaly by saying that high transaction costs of small firms (small firms often have low prices and low price means high transaction costs) and low liquidity of small firms may prevent arbitragers from taking advantage of the premium, therefore, the return seasonality is not eliminated.
6.1.2 The Size Effect As A Measure of Risk

Roll (1983) suggests that for efficient market theory to survive this size effect anomaly then we must ascribe the phenomenon to a non-exploitable cause. The empirical results for the size effect in New Zealand suggest that size is indeed an accurate measure of risk. Size is correlated to standard deviation at 92%, and to return at 66%. The smallest companies have a standard deviation of around 21%, while large companies have a standard deviation of around 7%. The market can be seen as compensating for the standard deviation which Shefrin and Statman (1995) have shown investors to avoid. Thus, it is clearly established that small companies represent high risk, high return investments. Without wanting to detract from that conclusion it should be noted that, as described by Kothari, Shanken and Sloan (1995), statistical studies of small companies are especially prone to a survivorship bias, which reduces the standard deviation of the average small company’s return, and increases small company’s average return. The question is now ‘why are small companies so much more risky than large companies?’

One possible cause is the informational uncertainty, as described by Ritter (1984), where the market provides less information about small companies, and so the market will require a higher return on them. Klein and Bawa (1977) find that if insufficient information is held about a company then investors will not invest because of estimation risk. Due to the fact that less information is generated on small firms than on large ones it would appear that the returns may be a compensation for the increased risk involved with a less informationally abounded company.

Another reason for the riskiness of small firms comes from Chan and Chen (1991) who state that small firms on the NYSE tend to be firms that have not been doing well and consequently they tend to be firms that are less efficiently run and have higher financial leverage. As a result of the differences in production efficiency, difference in leverage, and perhaps resultant difference in accessibility to external financing small firms tend to be riskier than large firms. Therefore, are the higher returns just a
compensation for the higher risk borne in efficient market? A further reason why small companies may be more risky is because small companies are usually less well diversified than large companies, and thus are more susceptible to downturns in their sector of the economy.

6.2 The Book Equity to Market Equity Effect

The BM effect on its own is present but not quite statistically significant. It cannot be ignored simply because it only has a t-stat of 1.61. It is so close to being significant that it must be taken into account when considering, not only investment decisions, but also the efficacy of the EMH. In practice ranking stocks on BM alone is not advisable; BM should be used in combination with size.

The BM effect is not able to be explained as a proxy for market risk the way the size effect is. The R squared of the relationship between standard deviation of return and BM is .000037, the t-stat .02 and the x coefficient is .0009%. BM, therefore, cannot be a proxy for risk. The BM effect casts doubt on the EMH because it is able, to some extent, to use historical information to predict future returns. This is clearly contrary to weak form EMH. The BM effect is difficult to explain without drawing the EMH into doubt.

The BM effect can be said to capture the market’s expectation of future growth of a stock, and as such a company with high expected growth and earnings may have a low BM stock. A company with low earnings growth prospects should, therefore, be a high BM stock. Such a conclusion seems illogical, unless the market is not predicting future growth or earnings accurately, and even then the issue becomes one of asset mispricing by the market. Lakonishok, Shleifer, Vishny (1994) describe high BM stocks as value stocks and low BM stocks as glamour stocks. Fund managers are said to prefer ‘safe’ glamour stocks to appear ‘prudent’ in the eyes of their investors. This is not a rational investor’s behaviour; a rational investor chooses high return stocks over low return stocks, given the same level of risk.
Shefrin and Statman’s theory of cognitive pricing error applies here also. It is this misconception that underlies the superior performance of stocks with high B/M. In short, the cognitive error which makes noise traders prefer stocks with low B/M allows information traders to make extraordinary returns from the underpriced stocks of high B/M companies that the noise traders pass up.

6.3 A COMBINATION OF THE BM AND THE SIZE EFFECTS

When BM is combined with size effect, the result is extremely high returns. It seems a wise investment strategy to buy a portfolio of stocks ranked by size and BM. Such an investment strategy could return 30% p.a., although the investor would be faced with around 25% standard deviation of returns on the portfolio (depending on the correlations between the stocks chosen).

Fama and French found that portfolios with high book equity, relative to market equity, had higher returns than portfolios with low book equity, compared to market equity. The first portfolio mentioned above would therefore generally have low market value (small firm) and a relatively large book to market ratio. This is consistent with the findings of this report, where small firms with a large book to market ratio experience far greater returns than other book to market and size related firms.

6.4 PORTFOLIO FORMATION TECHNIQUES

A comparison of the results obtained in 5.5 with the results obtained in 5.1 - 5.4 leads to the conclusion that the portfolio formation technique - ranking the shares into deciles before calculating regressions of average returns - is significant in the determination that size is a statistically significant variable, and that BM is a variable to be considered. The results of the regressions of the raw returns against the variables, without ranking, produces interesting, but not statistically significant results. The ranking technique allows the size and BM effects to be concentrated.
7. SCOPE & LIMITATIONS

The year-start figures for market capitalisation and book value were the same throughout each year and that these figures only changed at the start of the next year. However, these figures remained relatively constant for most stocks and, therefore, the data used should not be limited by its accuracy to a large extent.

Casual observation of the relative performance of the small companies index in New Zealand compared to the NZSE10 returns show that small companies significantly outperformed the large ones in this period. If, however, this had been a time of economic decline it may have been the case that the small companies may not have weathered the decline as well. Thus, the limitation earlier mentioned by Keim (1983) is acknowledged: the results shown here may be period specific.

Finally, some studies use all companies currently traded whereas this study used only those companies who traded over the whole observation period. Kothari, Shanken & Sloan discuss this type of limitation with respect to COMPUSTAT and CRSP data. This survivorship bias is most likely responsible for the abnormally high average return over my entire sample. The average 6 month return for all 70 stocks over the 5 years is 8.28%, which is 17.26% p.a. This abnormally high return can be attributed to survivorship bias. This bias may have increased the average rate of return by removing from the study any firms which have gone bankrupt. In the process of going bankrupt or being delisted the companies would likely have had negative returns. Since these negative returns are excluded the average return of the sample is increased.

Another reason for the high average return for the sample is that the index created by the sample is equal weighted rather than value weighted. This technique places emphasis on the higher returns of smaller companies, but is considered to be a more accurate statistical technique than the value weighted index, which was criticised by Kothari, Shanken and Sloan (1995).
Trading costs of rebalancing the portfolio every six months were not taken into account when calculating the annual returns. Trading costs are likely to take off between 1.5-2% of the return each time the portfolio is rebalanced. Rebalancing every six months is thus likely to eliminate about 4% of returns each year.

8. SUMMARY

This study found that stock returns are negatively related to size and positively related to book to market ratios. The results contradict some earlier predictions that beta as used in the CAPM is the only variable with the ability to explain returns. It is evident from this study that these two measures have a significant effect upon returns in the New Zealand market.

It was found that size was the strongest predictor of returns and that the smaller the size the larger the return. These findings contradict earlier predictions that beta was the only variable with the ability to explain returns. The book to market data was not as conclusive as the size effect with only the highest few portfolios shining out in terms of return.

When the size and book to market variables were combined in certain ways, even stronger relationships with returns were found. Small firms with large book to market ratios have extremely high returns. A high correlation was found between the two measures. Therefore, it was necessary to attempt to control the effect that the measures have on each other. By controlling for size, the book to market rankings produced significant return premium, especially in the smallest size portfolio, and vice versa. This suggests that if one were to invest based on these measures it would be better to invest based on a combination of the two rather than on either of the measures alone.

The size effect can be explained as to be a proxy for the market risk, in that portfolios of small companies have high volatility of return. Thus the size effect is explained without destroying the EMH. The excess returns earned by smaller stocks is
compensation for the higher risk of the stocks. This paper cannot, however, identify a rational explanation for the BM effect. Several irrational reasons for the BM effect have been suggested. The fact that the BM effect cannot be explained rationally may mean that the BM effect should be considered an anomaly which draws doubt on the level of market efficiency in New Zealand.

The book to market ratio and size of a company are strongly related to performance in the form of share price returns. The combination of the two measures can lead to extremely high returns. This is one of the only studies of this nature based on the New Zealand Stock Exchange. It will be interesting to see if there is any complimentary or contradictory findings in the New Zealand market in the future.

9. FURTHER RESEARCH

- The robustness of the findings should be analysed in different time periods and under different portfolio selection techniques.
- An examination of the role of beta in the NZ market, when controlling for size, and BM, would make an interesting study.
- An examination of the size effect over time is desirable to discover whether there are periods when it is reversed (as in Keim 1983).
- What does this mean for portfolio managers: is is wise to strive for a strategic asset allocation based on a share’s beta relative to the portfolio?
- What are the implications of the BM effect on market efficiency in New Zealand.
10. BIBLIOGRAPHY


