The Usefulness of Financial Statement Information in Predicting Stock Returns: New Zealand Evidence

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Abstract

This study examines whether financial statement information can be used to implement an investment strategy in order to earn abnormal returns. Using financial statement information, we develop multiple logit models that predict either the year-ahead earnings changes (earnings-based approach) or the direction of stock returns (returns-based approach). The study labels the earnings-based approach as the 'indirect method' and the returns-based approach as the 'direct method'. The coefficient estimates of these models are used to generate *Pr* measures which are used to formulate investment strategies. Specifically, an investment strategy that involves buying stocks with high *Pr* values and selling stocks with low *Pr* values is examined. We find that both approaches generate positive returns for holding periods between six to eighteen months. However, when the influence of stock characteristics was analysed, only the *Pr* measures generated by the direct method demonstrated a significant influence on the stock returns. These findings remained unchanged across a number of sensitivity tests conducted.

Key words: Financial statement information; Logit Models; New Zealand market

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Introduction

According to the semi-strong form of the efficient market hypothesis (Fama 1970), publicly available information such as financial statement numbers cannot be used to detect mispriced securities; any investment strategy designed on the basis of published financial information therefore should not prove profitable. In contrast to this argument, fundamental analysts believe that the markets may misprice securities in the short run although the correct price will eventually be reached over a longer time frame; profits can be made by buying (selling) undervalued (overvalued) securities. Once the market realises its mistake and re-prices securities accordingly, the trading strategy will earn sizeable gains (Graham 2005; Graham, Dodd & Cottle 1962).

Many researchers have argued in favour of fundamental analysis suggesting that it is possible to make informed financial projections using financial statement information and to earn consistent excess returns (Abarbanell & Bushee 1997; Lewellen 2004). Research suggests that most analysts employ fundamental analysis when valuing company shares (e.g. Arnold & Moizer 1984; Arnold, Moizer & Noreen 1984; Barker 1998; Pike *et al*. 1993). Further, they attach a great deal of importance to income statement and balance sheet information when conducting this fundamental analysis.

In this study, we conduct a comprehensive financial analysis using financial statement information for New Zealand companies and build multiple logit models that predict the direction of one-year-ahead earnings or stock returns. The predictions generated by such models are then used to rank companies and to assign them to six portfolios; the profitability of an investment strategy of taking a long position in the stocks that were assigned to top two portfolios and a short position in the stocks that were assigned to the bottom two portfolios was examined across a number of time intervals up to 24 months. The remainder of the paper proceeds as follows: The second section provides a brief review of the relevant literature and highlights the contribution of the paper. The third section describes the analytical procedure. The logit models generated by the above analytical process and their prediction accuracies are then explained. The fifth section presents the results relating to the returns generated by the investment strategy. The last section offers the conclusion.

Literature Review

Ou and Penman (1989) conducted a pioneering study in which they performed an extensive analysis of company fundamentals in order to derive a summary measure that predicted the direction of future earnings changes of companies; the companies were then assigned to long and short positions on the basis of this calculated summary measure and the profitability of investing in a hedged portfolio was examined. Their approach reduced a large array of financial statement information into a scalar measure called *Pr*. They took long positions in companies with $Pr \geq 0.60$ and short positions in companies with $Pr \leq 0.40$; these positions were held for periods of 3, 6, 9, 12, 18, 24 and 36 months. The hedged position of this strategy generated a significant market adjusted return of 14.53 per cent over a 24-month holding period. Subsequent studies such as Ou (1990), Lev and Thiagarajan (1993) and Charitou and Panagiotides (1999) provided corroborative evidence to those reported by Ou and Penman (1989).

Holthausen and Larcker (1992) proposed an alternative approach. They predicted the association between stock returns and accounting information directly. Their investment strategies yielded annual excess returns that were smaller than those documented by Ou and Penman (1989) but still significantly different from zero; for a 12-month holding period, their

strategy generated an excess return that ranged between 4.26 per cent and 7.97 per cent depending on the excess return metric used. However, when they replicated the Ou and Penman (1989) approach, they found that the 24-month holding period return for this earnings-based strategy was much lower (between 2.23 per cent and 3.74 per cent) than that reported by Ou and Penman (1989) (i.e. 14.53 per cent).

Setiono and Strong (1998) employed both the Ou and Penman and the Holthausen and Larcker approaches in the UK market. Their results showed that a UK investor could earn a significant excess return of 17.38 percent for a 24-month holding period using Ou and Penman's strategy but an insignificant return using Holthausen and Larcker's direct approach. These results were consistent with an earlier study conducted by Bernard, Thomas and Wahlen (1997); they found that, even though the accounting-based stock price anomalies documented by Ou and Penman and Holthausen and Larcker generated significantly positive market-adjusted returns, the former strategy was able to outperform the latter strategy by a significant margin.

Researchers have also examined whether the profit generated by this investment strategy is influenced by various risk factors identified in the finance literature. Ou and Penman (1989) reported that the profits of their strategy cannot be attributable to return-based risk factors; their highest *Pr* portfolio and the lowest *Pr* portfolio reported higher beta values than the rest of the groups. Further, both Ou and Penman (1989) and Setiono and Strong (1998) report that, even though the abnormal returns decline when size differences among firms are taken into account, the profits based on market-value-adjusted returns remain significant for a 24-month holding period. Similarly, Holthausen and Larcker (1992) found that their investment strategy remained significantly profitable generating an annual excess return of between 6.0 per cent and 7.9 per cent even after controlling for the effect of these anomalies. However, Greig (1992), who examined whether the *Pr* measure of Ou and Penman (1989) proxied for the equity beta and firm size, found no evidence of abnormal returns after controlling for these two risk factors.

The existing US and UK studies do not provide conclusive evidence on the profitability of the above investment strategy, irrespective of whether the relationship between financial information and stock returns is predicted directly or indirectly via one-year ahead earnings. These two models seem to be sensitive to the market and the time period analysed. For example, Holthausen and Larcker (1992) reported that their strategy was more profitable in the 1978-1982 sub period than in the 1983-1988 sub period while the Ou and Penman strategy was profitable only in the first sub period. Also, they found that the latter strategy works well on NYSE/AMEX firms rather than OTC firms while their own strategy was equally successful in all exchanges. However, Setiono and Strong (1998) found that the Ou and Penman strategy worked well on their UK sample while the Holthausen and Larcker strategy proved to be unprofitable.

We investigate this anomaly for the New Zealand market employing both the Ou and Penman (1989) (referred to as the 'indirect method' in our study) and the Holthausen and Larcker (1992) (referred to as the 'direct method' in our study) approaches. We believe that applying fundamental analysis to a small market like New Zealand offers a valuable contribution to academic research for a number of reasons. First, market efficiency does not preclude the existence of abnormal returns in one market or in a particular time period. The existing US and UK evidence on this investment strategy seems to depend on the approach used (i.e. indirect versus direct), market analysed and the time period investigated. Therefore, more evidence across different countries and different time periods is necessary to come to a conclusion on the profitability of this trading strategy. Second, the New Zealand market is

smaller in size than its US and UK counterparts[3] and therefore, company financial statements may not be studied by a large number of expert individuals. An early study by Chang, Most and Brian (1983) found evidence in support of this argument. In their study, New Zealand investors rated newspapers, magazines and stockbrokers' advices as more important sources of information than corporate annual reports in their investment decisions compared to their US and UK counterparts. In such a situation, investment strategies based on fundamental analysis can be expected to be more profitable in this market than in the US and the UK markets. Finally, if this strategy works in the New Zealand market, it may be very useful to investment analysts in their portfolio decisions as very little has been researched on market anomalies in New Zealand.

Analytical Procedure

Our sample includes the companies listed on the New Zealand Stock Exchange (NZX) for which the relevant accounting and share price data are available for analysis. The period under investigation spans from 1995 to 2006. We analyse, on average, 70 companies per year which represents 36% of the total population in the NZX over the study period.[4] The source of financial statement information was the NZX Deep Archive Service. The monthly adjusted stock prices and the market index were obtained from Datastream. We identified 75 accounting ratios from various sources but ended up using only 54; 21 ratios were dropped due to the unavailability of information needed for the calculation of such ratios.[5] We adopted the motto of 'let the data speak' rather than making a conscious attempt to select them.

We use the above accounting ratios for the six-year period from 1995 to 2000 to build multiple logit models that predict the changes in one-year-ahead earnings (indirect method) or the direction of one-year-ahead returns (direct method). The steps followed in each approach are highlighted below:

Indirect Method

i. Calculate the change in year-ahead earnings per share (EPS) for each company in every year from 1995 to 2000 as follows:

$$\Delta EPS_{i,t+1} = EPS_{i,t+1} - EPS_{i,t} - Drift_{i,t+1} \quad [1]$$

where $\Delta EPS_{i,t+1}$ is the change in (year-ahead) earnings per share for firm i in year t+1, $EPS_{i,t}$ is the earnings per share before extraordinary items for firm i in year t and $Drift_{i,t+1}$ is the drift term (i.e. the mean EPS change over the four years prior to year t+1).

ii. Use $\Delta EPS_{i,t+1}$ to create a binary variable; this variable takes the value of '1' if the one-year-ahead earnings change is positive and '0' if it is negative. This variable acts as the dependent variable in our logit models.

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[3] At the end of 2006, the last year of the prediction period of this study, the market capitalisation of New Zealand Stock Exchange (NZX) amounted to $NZ76.49 billion while its US and UK counterparts reported market capitalisations of $NZ30.65 trillion $NZ9.20 trillion respectively.

[4] Our sample is biased towards firms that have the necessary financial statement information for a long period. They tend to be large in size. Readers should be aware of this feature when interpreting results.

[5] We don't report the accounting ratios used in the analysis to conserve the space. They are available upon request from the authors.

iii. Estimate 54 univariate logit models on pooled data using each accounting descriptor as the sole explanatory variable and identify descriptors whose slope coefficients are significant at the 20 per cent level.[6]
iv. Estimate a multiple logit model using the variables that were found to be significant in the previous step. This was done in a step-by-step process by dropping insignificant explanatory variables until the final earnings prediction model was developed.

Direct Method

i. Calculate the year-ahead buy and hold raw return for each company in every year from 1995 to 2000 as follows:

$$BHRR_{i,12} = \prod_{t=1}^{12}(1+R_{i,t}) - 1 \qquad [2]$$

where $BHRR_{i,12}$ is the buy-and-hold return for firm i for twelve months and $R_{i,t}$ is the return of company i in month t. This return measure corresponds to the stock return generated by a firm in the year following the end of a particular accounting year. We keep a three-month gap between the end of the accounting year and the first month of the *BHRR* calculation period (i.e. t=1).

ii. Use $BHRR_{i,12}$ to create a binary variable; this variable takes the value of '1' if one-year-ahead *BHRR* is positive and '0' if it is negative. This variable acts as the dependent variable in our logit models.
iii. Repeat steps iii and iv as discussed in the indirect method and generate the final return prediction model.

The coefficient estimates of these logit models together with the relevant accounting ratios are used to generate *Pr* values for each company in each year for the six-year period from 2001 to 2006 as follows:

$$\Pr_{i,t} = \frac{1}{1+e^{-(\alpha+\beta_1 X_{1,t}+\beta_2 X_{2,t}+\ldots+\beta_j X_{j,t})}} \qquad [3]$$

where, $X_{1,t}$ to $X_{j,t}$ is a vector of accounting variables available for firm i at the end of year t and β_1 to β_j is a vector of coefficients generated by the multiple logit model. These *Pr* values are used to rank companies from lowest to highest and assign firms to one of six equally-sized portfolios in each year. We designate the companies in portfolios one and two as 'short position' investments and companies in portfolios five and six as 'long position' investments.

In the next stage, the return performance of these long and short position investments is examined for a number of holding periods; they include 3-month, 6-month, 12-month, 18-month and 24-month holding periods. We use monthly returns for the companies in the sample and generate market-adjusted buy-and-hold return as follows:

$$MABHR_{P,M} = \frac{1}{N}\sum_{i=1}^{N}\left[\prod_{t=1}^{M}(1+R_{i,t}) - \prod_{t=1}^{M}(1+R_{m,t})\right] \qquad [4]$$

In the above equations, $MABHR_{P,M}$ is the market-adjusted buy-and-hold return for portfolio P from month 1 (the fourth month after the accounting year end of a firm[7]) to month M, $R_{i,t}$ is

[6] Prior studies used 10 per cent but we use 20 per cent considering the small sample size available to generate logit models in the New Zealand market.

the return of firm i in month t, $R_{m,t}$ is the return of the market index in month t, and N is the number of observations in the portfolio. If a company is delisted during a holding period, such a company is assigned zero market-adjusted return for the remaining months of the holding period.

Multiple Logit Models and Prediction Accuracy

We use the financial statement information for the six-year period from 1995 to 2000 to derive the multiple logit models; between 411 and 416 companies were used for this purpose with annual observations ranging between 62 and 78 firms. When the univariate logit models were estimated, 20 accounting descriptors generated significant coefficients under the indirect method of which 14 were significant at the 10 per cent level while the remaining six were significant at the 20 per cent level. Under the direct method, 18 accounting ratios emerged as influential variables of which 15 coefficients were significant at the 10 per cent level while the remaining three were significant at the 20 per cent level.[8] These important accounting descriptors were included in multiple logit models, which followed a step-by-step process, in order to derive the final multiple logit models.

Table 1 presents the coefficient estimates for the two final models built under the indirect method and the direct method. Our earnings-based prediction model, Table 1 Panel A, contains five financial ratios which capture three important financial profiles of the firm – liquidity (represented by the change in the current ratio and the change in the quick ratio), profitability (represented by return on total assets and pre-tax income to sales) and operating activity (represented by the ratio of sales to inventory). Interestingly, three coefficients are significant at the five per cent level while the remaining two are significant at the 10 per cent level. As the multiple logit model parameters reported in Panel B of the table reveal, more accounting ratios seem to be useful in predicting year-ahead stock returns; nine accounting ratios entered into our stock return prediction model with significant coefficients. All but one of these coefficients are significant at the one per cent level indicating the robustness of this model compared to its earnings change prediction counterpart. Also, this model drew upon a wide range of firm financial profiles such as profitability (represented by return on opening equity, return on closing equity, pre-tax income to sales, operating income to total assets and change in operating income to total assets), the level of capital expenditure (lag of change in capital expenditure to total assets and change in depreciation), size of the firm (change in sales) and operating activity (sales to inventory).

We find some similarities between our models and those generated in prior studies. For example, in our EPS change prediction model, return on total assets and pre-tax income to sales variables have negative coefficients. In Ou and Penman's (1989) study, similar variables such as return on opening equity, return on closing equity and return on total assets enter into multiple logit models with negative coefficients. Setiono and Strong (1998) report similar findings for the UK market; in their EPS prediction model, return on opening equity and net profit margin contain negative coefficients. In our stock return prediction model, change in depreciation and change in capital expenditure possess negative coefficients. The sample period of this study coincided with a period of strong economic growth in New

[7] We keep a gap of three months in order to allow for the possible time gap between the end of the financial year of a firm and the publication of its annual reports. Conover et al. (2008) reported that, during the 1992-96 period, the New Zealand firms took a median number of 87.5 days to publish their financial statements.

[8] We don't report the coefficients of these univariate models in the text to save the space. They are available from the authors upon request.

Zealand. In such a period, companies may focus on investing in growth opportunities and this may have a depressing effect on short term profitability and share prices. The negative association between variables such as the change in capital expenditure and share returns may reflect this effect.

Table 1
Multiple Logit Model Parameters

Accounting Descriptor	Coefficient	*z*-statistic	*p*-value
Panel A: Logit Model generated by Indirect Method			
Intercept	0.0451	0.25	0.80
Change in current ratio	1.2659	1.63	0.10
Change in quick ratio	-1.4621	-1.90	0.06
Return on total assets	-4.0123	-2.58	0.01
Pre-tax income to sales	-1.9504	-2.42	0.02
Sales to inventory	0.0055	2.05	0.04
Panel B: Logit Model generated by Direct Method			
Intercept	-1.3316	-4.56	0.00
Change in sales	3.0405	2.87	0.00
Change in depreciation	-0.3636	-2.62	0.01
Return on opening equity	7.9456	3.04	0.00
Lag of change in capital expenditure to total assets	-3.6062	-2.26	0.02
Return on closing equity	-13.5525	-3.60	0.00
Pre-tax income to sales	3.0887	3.12	0.00
Sales to inventory	0.0087	2.51	0.01
Operating income/total assets	7.0604	2.75	0.01
Change in Operating income/total assets	0.5566	3.73	0.00

This table reports the output for the final Logit regression models which were developed through a step-by-step process by dropping explanatory variables which failed to generate significant slope coefficients at each step. It reports the accounting ratios that entered into the final models with significant coefficients, the slope coefficients of the explanatory variables, and the associated *z*-statistics and *p*-values. Panel A reports the coefficient estimates when the indirect method was used to generate the model while Panel B reports the coefficient estimates when the direct method was used to estimate the model.

The above models are used to generate *Pr* values (as shown in equation [3]) for each firm in each year over the six-year period 2001-2006. Using these *Pr* values, the companies were ranked from low to high and six equally-sized portfolios were created each year; the shares in portfolios five and six were designated as the long position investments while the shares in portfolios one and two were designated the short position investments.

Table 2 reports the information relating to predictive accuracy of our logit models. As Panel A of this table reveals, the indirect method analysed 416 company earnings changes while 411 company returns were subjected to the analysis under the direct method during this six-year period.[9] The logit model generated by the indirect method correctly classified 276 earnings changes and thereby achieved a 59.78 per cent accuracy rate; the multiple logit model generated by the direct method achieved a slightly lower prediction accuracy of 54.41

[9] The number of companies analysed under direct method is lower than that analysed under indirect method because of the unavailability of stock price information for some firms in the sample.

per cent by correctly classifying 272 firms. As the chi-squared statistics reveal, both these prediction accuracies are significant at the one per cent level. Our accuracy rates do not demonstrate significant deviations from those reported by previous studies for large markets. For example, Ou and Penman's (1989) EPS change prediction models produced accuracy rates between 60-67 per cent while Holthausen and Larcker's (1992) stock return prediction models generated accuracy rates between 51-53 per cent.

Table 2
Prediction Accuracy of Logit Models

Panel A: Prediction Accuracy for Total Sample		
	Indirect Method	**Direct Method**
No. of companies analysed	416	411
No. of observations correctly predicted	276	272
% correct predictions	59.78	54.41
Chi-squared	44.68**	62.52**
% correct EPS increase predictions	58.52	N/A
% actual EPS increasing firms	48.55	N/A
% correct EPS decrease predictions	60.99	N/A
% actual EPS decreasing firms	51.45	N/A
% correct positive return predictions	N/A	69.70
% actual positive return firms	N/A	64.71
% correct negative return predictions	N/A	40.00
% actual negative return firms	N/A	35.29

Panel B: Prediction Accuracy by Portfolios				
Portfolio	**Indirect Method**		**Direct Method**	
	No. of Observations	**% Correct Predictions**	**No. of Observations**	**% Correct Predictions**
Long Position:				
Portfolio 5	70	59.42	70	69.12
Portfolio 6	71	57.58	70	70.31
Short Position:				
Portfolio 1	71	59.15	70	52.86
Portfolio 2	70	62.86	70	27.14

The table reports information relating to the prediction accuracy of multiple logit models developed under both indirect and direct approaches. Panel A reports the prediction accuracy for the total sample while Panel B reports the prediction accuracy across individual portfolios in long and short positions. The ** indicates statistical significance at the 1 per cent level. The 0.01 critical value of the Chi-Squared statistic with one degree of freedom is 10.83. The NA refers to not applicable.

The logit model generated under the indirect method seems to be able to classify both EPS increases and EPS decreases with similar accuracies; this model predicted 59 per cent (61 per cent) EPS increases (EPS decreases) correctly. However, our stock return prediction model demonstrated a higher rate of accuracy in predicting positive returns (70 per cent) than predicting negative returns (40 per cent). Panel B of the table reports the accuracy rates for both the long and short position portfolios together with the number of firms placed in each portfolio. No discernible differences can be observed across the four portfolios except for the

relatively low predictive accuracy reported by the direct method model for the portfolio 2 with the short position investment.

The Profitability of Investment Strategy

Market-adjusted Buy-and-hold Return

Our investment strategy involves taking a long position in the two portfolios with the highest *Pr* values (portfolios 5 and 6) and a short position in the two portfolios with the lowest *Pr* values (portfolios 1 and 2).[10] In Table 3, we report the market-adjusted buy-and-hold returns for all six portfolios and for our strategy for the five holding periods mentioned above; Panel A of the table provides the returns earned by these portfolios from implementing the indirect method while Panel B reports the returns when the direct method was employed.

As the statistics in Panel A of this table reveal, when the indirect method was implemented, the two portfolios with the long position (portfolios 5 and 6) outperformed, on average, other portfolios in five holding periods considered by generating the highest returns. However, the portfolios with the short position (portfolios 1 and 2) did not necessarily underperform others in all the holding periods analysed; for example, they generated higher returns than portfolio 3 in the last two holding periods. There is a general tendency for portfolio returns to gradually decline when we move from portfolio 6 to portfolio 1. Clearly, the long position has outperformed its short position counterpart in all five holding periods. For a 24-month holding period, the long position generates an average market-adjusted buy-and-hold return of 18.76 per cent while its short position counterpart earns an average return of 12.22 per cent; the overall strategy, therefore, provides an average return of 6.54 per cent to investors.

However, as the table reveals, the indirect method did not generate consistently increasing returns for the strategy. The return to the strategy peaks at 5.31 per cent for a 6-month holding period but declines to 3.76 per cent for a 12-month holding period. It bounces back to 8.91 per cent for an 18-month holding period but again drops to 6.54 per cent for a 24-month holding period. The annual return generated by this strategy for different holding periods are as follows: for a three-month holding period 9.44 per cent; for a six-month holding period 10.62 per cent; for a twelve-month holding period 3.76 per cent; for an 18-month holding period 5.94 per cent; and for a 24-month holding period 3.27 per cent. Therefore, the optimum holding period for an investor who implements this indirect method seems to be six months. However, the largest magnitude of excess return for the strategy is reported for the 18-month holding period.

The market-adjusted buy-and-hold returns for the strategy, when the direct method is implemented, are reported in Panel B of the table. Portfolios 5 and 6 (long position) have outperformed the market by generating positive market-adjusted returns for almost all the holding periods analysed. On the other hand, portfolio one (in short position) underperformed the market consistently by generating negative returns in all the holding periods. The long position has been able to earn higher returns than its short position counterpart in all the holding periods of the study. For example, for a 24-month holding period, the long position (short position) realised 19.42 per cent (9.38 per cent) and thereby generated 10.04 per cent

[10] Our method is analogous to that used in Holthausen and Larcker (1992). Since the number of available firms in our sample is small, this approach ensures that we have enough observations in calculating investment profits generated by Pr values.

market-adjusted return to investors. The annual return achieved by the strategy for different holding periods are as follows: for a three-month holding period 2.48 per cent; for a six-month holding period 6.92 per cent; for a twelve-month holding period 8.14 per cent; for an 18-month holding period 8.75 per cent; and for a 24-month holding period 5.02 per cent. Unlike the indirect method, with this direct method the return to strategy continuously increases up to the holding period of 18 months; the optimum holding period for the strategy seems to be 18 months. As was observed under the indirect method, the largest magnitude of excess return is reported for the 18-month holding period.

Table 3
Market-adjusted Buy-and-Hold Returns for the Portfolios

Portfolio	**Average *Pr* Value**	**Holding Period**				
		3-month	**6-month**	**12-month**	**18-month**	**24-month**
Panel A: Indirect Method						
1	0.2002	-0.0043	0.0147	0.0844	0.0792	0.1004
2	0.3463	-0.0371	-0.0256	0.0306	0.0712	0.1439
3	0.4091	-0.0312	-0.0066	0.0592	0.0503	0.0693
4	0.4607	-0.0087	0.0238	0.0913	0.1319	0.2094
5	0.5574	-0.0245	0.0412	0.1115	0.1564	0.1977
6	0.8358	0.0303	0.0541	0.0787	0.1722	0.1774
Long Position (Portfolios 5+6)		0.0029	0.0476	0.0951	0.1643	0.1876
Short Position (Portfolios 1+2)		-0.0207	-0.0055	0.0575	0.0752	0.1222
Strategy [(5+6)-(1+2)]		0.0236	0.0531	0.0376	0.0891	0.0654
Panel B: Direct Method						
1	0.1254	-0.0203	-0.0187	-0.0765	-0.0716	-0.0261
2	0.3174	0.0022	0.0383	0.1579	0.1902	0.2137
3	0.4496	-0.0220	-0.0037	0.0974	0.1127	0.2140
4	0.5633	-0.0228	0.0039	0.0539	0.0818	0.1606
5	0.7207	-0.0444	0.0034	0.1087	0.1572	0.1915
6	0.9368	0.0387	0.0854	0.1356	0.2240	0.1969
Long Position (Portfolios 5+6)		-0.0028	0.0444	0.1221	0.1906	0.1942
Short Position (Portfolios 1+2)		-0.0090	0.0098	0.0407	0.0593	0.0938
Strategy [(5+6)-(1+2)]		0.0062	0.0346	0.0814	0.1313	0.1004

The table reports buy-and-hold market-adjusted returns for the six portfolios for the following holding periods: 3-month, 6-month, 12-month, 18-month and 24-month. It also provides the average *Pr* value for each portfolio together with the periodic returns to long position (i.e. investing in portfolios 5 and 6), short position (i.e. shorting portfolios 1 ad 2) and for the overall strategy (i.e. long position minus short position). Panel A provides the above statistics when the indirect method was implemented while Panel B provides the relevant statistics when the direct method is implemented.

The general conclusion that emerges from the analyses conducted so far is that the direct method (which uses financial information to predict the direction of year-ahead stock returns and then uses such predictions to assign stocks into long and short positions) is persistent in generating increasing excess returns for investors as the holding period increases gradually. But, its indirect counterpart (which uses financial information to predict the year-ahead EPS changes and then uses such changes to assign stocks into long and short positions) is unable to sustain an incremental growth in excess returns across different holding periods. However, both methods, on average, reported the highest magnitude of excess returns to the

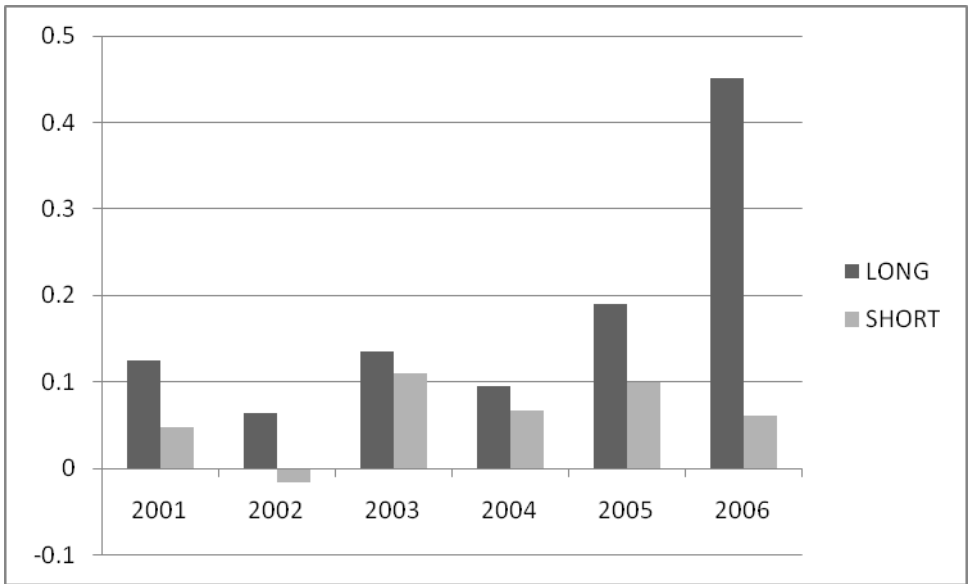
strategy for the 18-month holding period. Due to this reason, we use the 18-month holding-period returns generated by these two methods as the basis in our forthcoming analyses.[11]

Year by Year Analysis of Returns

Figures 1 and 2 present year-by-year distributions of market-adjusted buy-and-hold returns for the 18-month holding period.

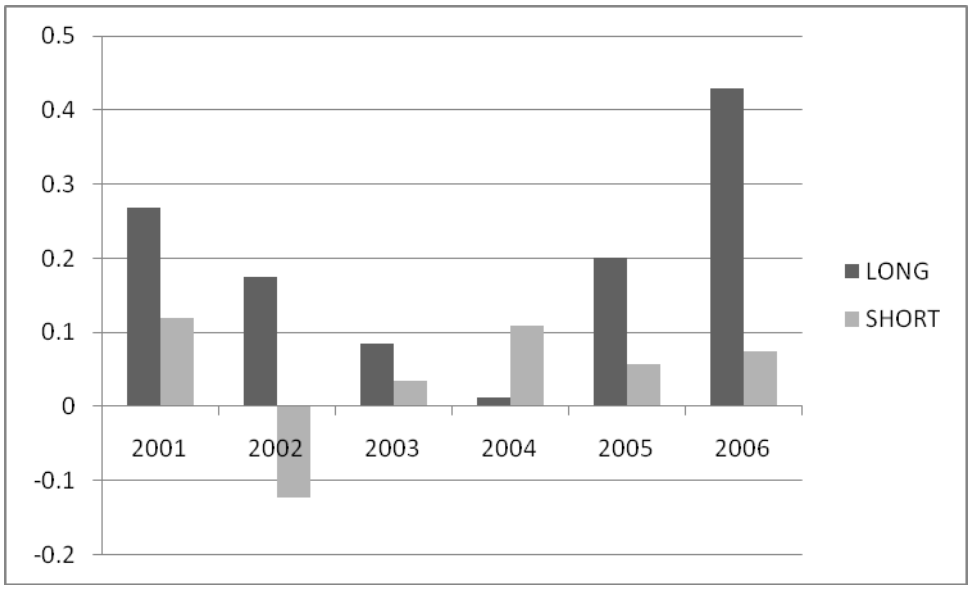
As can be seen in Figure 1, under the indirect method, the long position reports higher market-adjusted returns than the short position in all six years analysed. Therefore, the overall strategy generates positive returns in every year of the sample period. The contribution of the long position to the strategy demonstrates a large spike in 2006. However, the short position does not necessarily generate negative returns; it is only negative in 2002. A similar picture emerges from an analysis of Figure 2. The market-adjusted return for the long position is positive in every year and higher than that of the short position in five of the six years analysed. The short position outperforms the long position only in 2004. The return to the overall strategy, therefore, is positive in five years. The year-by-year return statistics do not demonstrate any year-specific influence on the results generated by the two methods.

Figure 1
Year by Year Distribution of 18-month holding period Market-adjusted Returns for the Indirect Method: 2001-2006



[11] Our findings can be interpreted as evidence of a capital market anomaly where fundamental analysis can generate abnormal returns to investors. This interpretation is based on the assumption that market is efficient in semi-strong form and at any point in time, actual prices of individual securities already reflect the information based on events that have already happened and on events the market expects to take place in the future. The readers should be aware of the limitation associated with this type of analysis in interpreting the possible implications of our findings accordingly.

Figure 2
Year by Year Distribution of 18-month holding period Market-adjusted Returns for the Direct Method: 2001-2006



Stock Characters and the Performance of Investment Strategy

Numerous studies have established strong evidence for the existence of a relationship between accounting fundamentals and stock returns. Such characteristics include the P/E ratio (Basu 1977), firm size (Banz 1981), the book-to-market ratio (Fama & French 1992), cash flow yield (Chan, Hamao & Lakonishok 1991) and the debt-to-equity percentages (Mukherji, Dhatt & Yong 1997). Previous studies that employed both indirect and direct methods have analysed the influence of these characteristics on the return generated by the strategy; the evidence is inconclusive, however.

To demonstrate the robustness of our results, we consider the influence of a number of stock characteristics on our results. These stock characteristics include firm beta (BETA, calculated by regressing the returns of the company on that of the market for the previous 36-months), the book to market ratio (B/M, calculated by dividing the book value of equity by the market value of equity at the end of the most recent financial year), the earnings to price ratio (E/P, calculated by dividing the EPS at the end of the most recent financial year by the share price at the beginning of that financial year), the natural logarithm of market value (LOGMV, calculated using the market value at the end of the most recent financial year) and cumulative raw returns for the last 12 months as a measure of momentum (CRR12, calculated using monthly returns for the 12-month period prior to the formation of portfolios).

The influence of these variables is examined by estimating the following regression:

$$MABHR_{i,t} = a_{0,t} + a_{1,t}PR_{i,t} + a_{2,t}BETA_{i,t} + a_{3,t}\left(B/M\right)_{i,t} + a_{4,t}\left(E/P\right)_{i,t} + a_{5,t}SIZE_{i,t} + a_{6,t}CRR12_{i,t} \quad [5]$$

where $MABHR_{i,t}$ is the market-adjusted buy-and-hold return for firm i (generated for the 18-month holding period); $PR_{i,t}$ is the *Pr* measure generated for the share; $BETA_{i,t}$, $B/M_{i,t}$, $E/P_{i,t}$, $SIZE_{i,t}$ and $CRR12_{i,t}$ are the stock characteristics introduced before.[12] The above

[12] The correlations between variables in the model may cause the multicolinearity problem. We found that the correlations between the explanatory variables in equation [5] were generally low (well below 0.20 in absolute

regression was estimated using all the stocks considered in the study – i.e. not only those included in the long and short portfolios.

We first estimate univariate regressions to directly test the influence of stock characteristics on market-adjusted buy-and-hold return. To ensure we have enough observations, we use the pooled time-series cross-section approach in the analysis. Table 4 reports the coefficient estimates for the stock characteristics; the relevant *t*-statistics of these coefficients are reported in parentheses. The univariate regression results reported in the above table do not reveal any evidence that the market-adjusted returns generated by these strategies for New Zealand stocks are influenced by the stock characteristics identified in the finance literature. All the stock characteristics except beta generate insignificant coefficients; however, the coefficient of firm beta is negative, which suggests that low beta stocks have higher subsequent returns than high beta stocks in our sample. On the other hand, both *Pr* coefficients generate positive values but only that generated by the direct method demonstrates a significant relationship with stock returns.

Table 4
Influence of Stock Characteristics on the Returns of the Strategy

Constant	**BETA**	**B/M**	**E/P**	**LOGMV**	**CRR12**	***Pr* (Indirect)**	***Pr* (Direct)**
0.1512 (4.98)**	-0.1239** (-3.65)						
0.0495 (1.72)		0.3088 (1.59)					
0.0815 (3.95)**			0.0094 (1.36)				
-0.2390 (-0.90)				0.0171 (1.24)			
0.0899 (4.01)**					-0.7389 (-1.07)		
0.0286 (0.40)						0.1837 (1.11)	
-0.0173 (-0.32)							0.2576** (2.79)
-0.0480 (-0.15)	-0.1072 (-1.67)	0.1343 (0.39)	0.1850 (0.47)	0.0057 (0.34)	-1.3518 (-1.39)	0.2245 (1.61)	
0.0858 (0.28)	-0.0766 (-1.19)	0.3173 (0.99)	-0.0303 (-0.07)	-0.0052 (-0.32)	-1.7461 (-1.87)		0.3090** (2.64)

The table reports coefficient estimates when the 18-month market-adjusted buy-and-hold return is regressed on a set of independent variables. The independent variables considered in the estimation of the model include *Pr* value of an individual stock, firm beta (BETA), book-to-market value (B/M), earnings-to-price ratio (E/P), natural logarithm of market value (LOGMV) and the 12-month cumulative raw return (CRR12). The *t*-statistics are provided in parentheses. An *(**) indicates statistical significance at the 5 per cent (1 per cent) level.

A similar picture emerged when we estimated equation [5]. When the 18-month buy-and-hold market-adjusted return was regressed on the stock characteristics and the *Pr* values generated by the indirect method, all the independent variables entered into the regression model with insignificant coefficients. However, when the same model was estimated using stock characteristics and the *Pr* values generated by the direct method, the *Pr* coefficient entered into the model with a positive and statistically significant coefficient (coefficient

term) except for those with firm size. We re-estimated the regressions excluding firm size and found that the results were qualitatively similar.

value = 0.3090 and *t*-value = 2.64) while the other independent variables possessed insignificant coefficients. Clearly, the predictive ability of the logit model that directly predicts one-year-ahead stock return using financial statement information is not subsumed by any relationship that stock characteristics have with subsequent returns. Therefore, in this small developed market, this direct method demonstrated a superior ability to generate significant excess returns to investors than its indirect counterpart.

The Effect of Cross Listing on the Return Generated by Strategy

We argue that due to the small size of the New Zealand market, the financial statements may not be extensively researched by the investment community and therefore, this strategy could be more profitable in this market. However, some of the New Zealand stocks are listed on the Australian market; these companies may attract a wider coverage than those that are listed only in the New Zealand market. In this section, we investigate whether these dual listed stocks influence our findings. For this purpose, we exclude stocks that were listed on exchanges outside New Zealand and conduct the analyses outlined in prior sections using stocks listed only on NZX. Approximately 30 per cent of our sample stocks have been listed on the Australian Securities Exchange (ASX) and the majority of them are large in size. We use the remaining stocks to build logit models based on the direct and indirect approaches. We then calculate *Pr* values for each stock in the updated sample and use them to formulate the investment strategy outlined in the previous section.[13] The results are presented in Table 5.

The results are similar to those in Table 3. The strategy generates consistently higher returns under the direct method than under the indirect method for every holding period analysed. For example, for a 18-month holding period, the direct method generates market-adjusted buy and hold return of 15.92 per cent while its indirect counterpart returns only 4.26 per cent. We also estimate equation [5] for this category of using 18 months market-adjusted buy-and-hold return as the dependent variable. The results (not tabulated) indicate that, similar to those reported in Table 4, only the *Pr* variable generated from the direct approach is significant. Together, these findings indicate that our results are not influenced by large companies which are listed on both exchanges.

[13] We are thankful to the reviewer for raising this point.

Table 5
Market-adjusted Buy-and-Hold Returns for the Portfolios formed Using Only NZX Listed Firms

Portfolio	Average *Pr* Value	Holding Period				
		3-month	6-month	12-month	18-month	24-month
Panel A: Indirect Method						
1	0.1064	0.0128	-0.0184	0.0412	-0.0015	0.0037
2	0.3068	-0.0139	0.0022	0.0901	0.1000	0.1313
3	0.4099	-0.0104	0.0332	0.1375	0.1910	0.2691
4	0.4988	-0.0026	0.0442	0.1577	0.2488	0.3847
5	0.5863	-0.0135	0.0466	0.1021	0.1048	0.1419
6	0.8101	-0.0175	-0.0360	-0.0158	0.0789	0.1363
Long Position (Portfolios 5+6)		-0.0155	0.0053	0.0432	0.0918	0.1391
Short Position (Portfolios 1+2)		-0.0006	-0.0081	0.0657	0.0493	0.0675
Strategy [(5+6) - (1+2)]		-0.0149	0.0134	-0.0225	0.0426	0.0716
Panel B: Direct Method						
1	0.0916	-0.0334	-0.0600	-0.0499	-0.0345	0.0081
2	0.2534	-0.0238	0.0474	0.1010	0.1563	0.2609
3	0.3837	-0.0097	0.0144	0.1174	0.2269	0.3378
4	0.4883	-0.0350	0.0001	0.1076	0.0926	0.1972
5	0.6348	-0.0087	0.0433	0.1475	0.1393	0.2123
6	0.8731	0.0256	0.0616	0.2273	0.3008	0.3548
Long Position (Portfolios 5+6)		0.0085	0.0524	0.1874	0.2201	0.2836
Short Position (Portfolios 1+2)		-0.0286	-0.0063	0.0256	0.0609	0.1345
Strategy [(5+6) - (1+2)]		0.0370	0.0587	0.1619	0.1592	0.1491

The table reports buy-and-hold market-adjusted returns for the six portfolios for the following holding periods: 3-month, 6-month, 12-month, 18-month and 24-month. It also provides the average *Pr* value for each portfolio together with the periodic returns to long position (i.e. investing in portfolios 5 and 6), short position (i.e. shorting portfolios 1 ad 2) and for the overall strategy (i.e. long position minus short position). Panel A provides the above statistics when the indirect method was implemented while Panel B provides the relevant statistics when the direct method is implemented.

Sensitivity Checks

Our decision to use a four-year drift term in equation [1] may induce a survivorship bias to the indirect method employed in the study. A company has to survive four years in order to enter into our sample; many small companies in small markets may not survive very long and as a result such a filtering system may favour large surviving firms. In order to address this possible bias, we reduced the drift term to two years and repeated the process. This alteration resulted in a slight increase in the sample size. However, the strategy did not generate impressive returns. In fact, the hedge position remained unprofitable up to twelve months

generating negative returns; the market adjusted buy-and hold return for a 12- month holding period was a negative 5.39 per cent and the associated return for an 18-month holding period was only 0.49 per cent. As the surviving companies are mainly large and healthy firms, this result implies that the indirect method may only, if at all, work among firms that have good future prospects in the New Zealand market.

Our second concern is how stock characteristics react to different holding period returns. The investment strategy was found to perform well for a six-month holding period under the indirect method; it is also highly profitable for a 12-month holding period under the direct method. In order to examine whether our findings are holding-period specific, we re-estimated equation [5] using both six-month and 12-month buy-and-hold market adjusted returns. The findings revealed that, irrespective of the length of the holding period used, the *Pr* coefficient remained insignificant under the indirect method but remained significant under the direct method, thereby ruling out the possibility of holding-period specific influence on our findings.[14]

Our last concern is the absence of negative returns among short portfolios. In previous studies, stocks in short portfolios generated negative returns, on average, during respective holding periods. However, in our study, the short position generated positive returns for the holding periods above 12 months. As mentioned before, we analysed, on average, 70 stocks per year from 2001 to 2006; the market had, on average, 200 listed companies. Many companies in the sample survived long as evidenced by the availability of financial statement information for many years. In addition, the sample period coincided with an expansionary period experienced by the New Zealand economy. It is therefore possible that these stocks have performed relatively well compared to the market. A comparison of average monthly return (equally-weighted) of our sample with the market revealed that, for the period from 2001 to 2006 (i.e. the period used to calculate portfolio returns), the sample earned an average monthly return of 1.16 per cent while the market generated 0.55 per cent. Accordingly, it is not surprising that the "market-adjusted" returns are positive for all the portfolios formed in our study.[15]

Conclusion, Limitations and Suggestions for Future Research

We conducted a comprehensive financial analysis using New Zealand data and developed multiple logit models that predict the direction of year-ahead earnings changes or stock returns. These multiple logit models were built using the data for the six-year period from 1995 to 2000 and the parameters of these models together with financial information were used to generate *Pr* values for each company in each year for the six-year period from 2001 to 2006. The *Pr* values generated by these logit models were used to assign companies into six portfolios and the profitability of taking a long position in the top two portfolios and a short position in the bottom two portfolios was examined across different time intervals up to 24 months.

[14] For the sake of brevity, we do not report these findings in the text. They are available from the authors upon request.

[15] Indeed, if we use the equally-weighted return of the sample stocks as the "market", we will observe negative returns appearing in portfolios 1 and 2 and positive returns in portfolios 5 and 6. This corroborates our findings that stocks with high *Pr* values outperform those with low *Pr* values.

The preliminary evidence revealed that both approaches were able to generate excess returns to the strategy. For an 18-month holding period, the indirect approach generated market adjusted return of 8.91 per cent while the direct approach generated market adjusted return of 13.13 per cent. The direct method was found to produce consistently increasing returns as the holding period expands; such a pattern was not visible under the indirect method. Also, the year-by-year analysis of stock returns revealed that the return generated by the overall strategy under the indirect method was concentrated mainly around one or two years of the analytical period. The influence of stock characteristics on our results was also investigated. We could not uncover strong evidence that these stock characteristics influence the returns generated by New Zealand firms. However, the regression outputs revealed that the *Pr* values generated under the direct method remained significant even after introducing these variables into the analysis while those generated by the indirect method did not display any significant influence on subsequent stock returns. Overall, in this small developed market, the direct method of using financial statement information to predict year-ahead stock returns outperformed its indirect counterpart by establishing a strong link between the predicted *Pr* values and subsequent stock returns.

One of the main limitations common to this type of an investigation is the lack of a sound theoretical foundation to justify the selection of accounting fundamentals. In this context, future research could benefit by employing approaches adopted in studies such as Lev and Thiagarajan (1993) and Piotroski (2000) that use readily available financial signals in separating companies into different portfolios. The other limitation of this study is the small sample size. Ou and Penman (1989) used more than 11,000 observations in developing their prediction models while Setiono and Strong (1998) used more than 2,000 observations. By contrast, our models are based on a sample of slightly higher than 400 observations. This limitation is mainly attributable to small size of the New Zealand market. However, it can be argued that an analytical procedure of this nature does not fit with the size of the sample. Future research could benefit by analysing large samples gathered across long time periods that represent different cycles of the economy. Future research could also investigate whether the approaches adopted in studies such as Lev and Thiagarajan (1993) and Piotroski (2000), that use readily available financial signals in separating companies into different portfolios, could produce similar results to those uncovered in this study.

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