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DO INSIDERS CROWD OUT ANALYSTS?

ABSTRACT

Both insiders and analysts are involved in the collection and dissemination of information to the market, roles which impact heavily on price efficiency and resource allocation. The differences between the two groups, however, result in a competitive relationship with analysts at a disadvantage as they face greater costs associated with information gathering. As a result they may choose not to participate in a one-sided competition. We employ transaction data to examine the impact of firm-year aggregate insider trading intensity on the level of analyst following. We find a negative relationship between insider trading intensity and analyst coverage. This result was driven by large blockholders suggesting that analysts are attracted to higher levels of information asymmetry from which they profit.

JEL Codes : G14, G38, C24, C25

Keywords: Analyst Following, Insider Trading, Disclosure, Informational Asymmetry

INTRODUCTION

The information gathering activities of brokerage firms and analysts are considered crucial to the efficient and smooth running of the financial markets (Lang, Lins and Miller, 2003; Coffee, 2002). To forecast and evaluate company prospects accurately analysts collect information from numerous and divergent sources. During this process they act as information conduits, passing the collected information onto the market and increasing the information content of prices (Dempsey, 1989; Lobo and Mahmoud, 1989; Kim, Lin and Slovin, 1997). The role analysts play in insuring the accuracy of share prices has effects on the allocation of resources within the market. Efficient allocations require the price to be an accurate reflection of the future payoffs and this can only be achieved if all available information is discounted. If prices do not incorporate all available information then expectations of the future will be misleading and result in resources being misallocated by the firm, its competitors and the market (Khanna and Slezak, 1994). Therefore, all efforts must be made to ensure that prices reflect all available information so as to mitigate the possible adverse private and social consequences. In particular, factors inhibiting analysts coverage should be identified and eliminated.

A great deal of research has been conducted determining factors that increase or decrease analyst following (O'Brien and Bhushan, 1990; Hong, Lim and Stein, 2000; Chang, Khanna and Palepu, 2000). One strand of the literature in particular has looked at the interactions between insiders and investment advisors. Insiders by definition have access to price-sensitive non-public information regarding their company which allows them to value the securities of their firms more accurately (Friederich, Gregory, Matako and Tonks, 2002). Other investors, including informed outsiders, are limited to information that is already in the public domain. The other important aspect of this informational superiority is that it is acquired at little cost as a result of the insider's position within the company (Fishman and Hagerty, 1992). This is in direct contrast to the position of analysts whose information has expenses both in terms of cost and time. The insider's advantage has inspired several models which conclude that insiders may crowd out analysts from the market.

Haddock and Macey (1987) were the first to argue that the rivalry for trading profits between insiders and stock market professionals may be fierce and the parties may resort to such actions as advocating for preferential SEC regulations in the US. In subsequent papers, Fishman and Hagerty (1992) and Khanna and Slezak (1994) provided theoretical frameworks assessing the impact of insider trading on informed outsiders. Both models were based on the premise that analysts' information is costly and the efforts to gather information will be undertaken only if the perceived expected return, or the marginal benefit from analyzing the company, will outweigh the expense. The cost benefit analysis is influenced by several factors. Competition in the collection of unpriced information increases with the number of investment advisors resulting in improved price efficiency. However, the expected benefit of equity research diminishes at the same time, reducing the incentive to gather information. At an equilibrium point the marginal cost of following a company should be exactly equal the expected return (Fishman and Hagerty, 1992).

The introduction of insiders into the models of Khanna and Slezak (1994) and Fishman and Hagerty (1992) has a major effect on the equilibrium number of analysts. Dealing by insiders, who by the virtue of their employment or ownership, have access to high quality information at little cost reduces the expected return to informed outsiders for two reasons. First, part of the inside information being traded on will be partially revealed to the market before it is publicly disclosed (Kyle, 1985; Leland, 1992). The smaller the difference between the correct and market prices for a security the weaker the drive of market professionals to exploit it. Second, despite significant equity research costs, analysts or their clients can still incur losses should they trade against a better-informed insider. Intuitively, expected returns should be negatively related to the frequency of insider trading and empirically an inverse relationship between analyst following and a proxy of insider trading prevalence is likely to be observed.

This relationship has been investigated at the country level and established to a degree by Bushman, Piotroski and Smith (2003). However, rather than use information on the actual level of insider trading within a country the authors focused on the impact of insider trading regulations. This has been done by examining the

effect of the initial enactment and enforcement of insider trading laws on analyst coverage. The dataset was based on the sample employed by Bhattacharya and Daouk (2002). However, as pointed out in that study the enforcement measure only specifies the first enforcement date rather than the enforcement frequency. The results in Bushman *et al*. (2003) do nevertheless lend support to the crowding out hypothesis. The authors found that overall analyst coverage increases in response to the first enforcement activity, an action that they argued reduced the insider trading incidence. They found little reaction to the introduction of insider trading laws, largely due to emerging market countries that have difficulty convincing market participants that they will enforce the enacted regulations.

This paper seeks to extend upon the empirical support for the crowding out hypothesis and to determine whether the conclusions reached in the cross-country analysis of Bushman *et al*. (2003) hold at the firm level. However, unlike Bushman *et al*. (2003), we use disclosed insider transactions to construct our proxy of insider trading prevalence. The relationship between insiders and analysts has been examined in the context of New Zealand market using both count data models and censored regressions. We conclude that as per the previous study of Etebari, Tourani-Rad and Gilbert (2003) insider trading profitability was largely due to director transactions, with substantial shareholder trades being profitable only in the long-run. After controlling for a number of determinants, a significant negative relationship between analyst coverage and the probability trading against an insider was found. This finding, however, was mostly driven by substantial shareholder trades. This suggests that the delayed disclosure by directors prolonged information asymmetry making it profitable for analysts to continue collecting information.

The rest of the paper is organized as follows. Section 2 describes the sample and variables employed in this study while Section 3 sets out the methodological framework. Section 4 presents and elaborates upon the main results from our testing and Section 4 concludes.

DATA AND VARIABLES

The study employs a sample of companies listed on the New Zealand Exchange (*NZX*) between 1997 and 2003. For a company to be included the transactions of both substantial shareholders, those holding more than 5% of the voting rights in the company, and directors had to be available for the period under investigation. Substantial shareholder trades were gathered from the NZX while director trades were collected from company annual reports. This resulted in a sample of 83 companies, 464 firm-years and 2880 insider trades. Information on analyst following has been obtained from Datex, a local source that focuses on New Zealand and Australian companies. In any given year Datex carries analyst forecasts on approximately 60 New Zealand companies.

Two measures of analyst following were constructed to act as the dependent variables. The first was the number of analyst forecasts available for a company at the end of the calendar year (*Analysts*). The second measure was the percentage of the total number of analysts following companies that had provided an analyst forecast for the company in question by December of each year (*Analysts_F*). The scaling procedure, which limits the value to between zero and one, was employed due to a noticeable reduction in the number of investment advisors covering New Zealand companies. The insider trading variable (*INS*) employed was constructed by adding the volume of all insider transactions for both directors and substantial shareholders and then dividing by the total volume of trading in a given calendar year. Intuitively, this measure represents the probability of trading against an insider.

In order to isolate the impact of insider trading, a number of additional variables were also constructed to control for factors that have been established in the literature as affecting analyst following. Analysts tend to focus on larger (Atiase, 1985; Freeman, 1987; Bhushan, 1989), and more liquid companies (Dahlquist, Pinkowitz, Stulz and Williamson, 2003) when producing forecasts, factors which are controlled for by using size and turnover variables. *Size* is the natural logarithm of the companies average market capitalization per year while *Turnover* is the total volume traded per year divided by the average number of shares outstanding.

We also control for any potential bias against companies that have unpredictable earnings. Ang and Ciccone (2001) point out that analysts may avoid companies where the earnings are difficult to predict due to rapid growth. Several proxies were considered to identify growth firms including the earnings-to-price ratio (E/P) and the price-to-cashflow ratio (P/CF), all calculated at year end. As per the findings of Lakonishok, Shleifer and Vishny (1994) in the US and Chin, Prevost and Gottesman (2002) in New Zealand we did not consider the book-to-market ratio employing P/CF and E/P ratios instead. The final model specification employs only the P/CF variable as it proved to be marginally stronger than the E/P ratio although the results overall were similar. A leverage variable (*Leverage*) was included, measured as the companies debt-to-equity ratio at the end of the calendar year. This variable was used to control for the default risk of the company. Given the significant costs of equity research, analysts are unlikely to gather information about companies in financial distress as there is a higher probability they will be unable to exploit it.

Several papers have also noted that analysts tend to avoid companies with a high risk of extreme agency costs as manifested by concentrated share ownership (Chang, Khanna and Palepu, 2000; Lang *et al*., 2003) and weak corporate governance (Bushman *et al*., (2003). Lang *et al*. (2003) in particular found that concentrated ownership by the family and management sub-group resulted in reduced analyst coverage while other types of concentrated ownership including government ownership had no effect. This is particularly important in the context of the New Zealand market where the companies have over time become very tightly held, with the majority of New Zealand companies having over 50% institutional ownership (Fitzsimons, 1997; Fox and Walker, 1996). This situation, in light of the finding by Lang *et al*. (2003), suggests that concentrated share ownership could have an impact on analysts following. As such we included a variable to measure the level of institutional holdings in a company (*Inst*), measured as the percentage of holdings of the substantial shareholders in the company after controlling for potential double reporting of relevant interests. Furthermore, the independence of the board of directors (*Indep)*, defined as the proportion of the board that are classed as non-executive or independent directors has been included. *Indep* is used to proxy firm-level corporate governance, as increased levels of independent directors improves

monitoring of executive decision-making and, thereby, enhances corporate transparency.

Variable	Mean	Std. Dev.	25th Percentile	Median	75th Percentile
Analysts	2.7909	3.2982	0.0000	1.0000	5.0000
Analysts_F	0.3317	0.3669	0.0000	0.1429	0.7000
INS	0.0683	0.2843	0.0000	0.0026	0.0306
Size	11.4899	1.8505	10.2560	11.3787	12.5798
Turnover	0.2520	0.3067	0.0784	0.1712	0.3149
Leverage	0.7972	1.8634	0.0985	0.3060	0.7025
P/CF	9.7460	80.3671	4.2000	7.6700	11.8300
Inst	0.5524	0.2082	0.4001	0.5632	0.6998
Indep	0.7938	0.1581	0.7000	0.8333	0.8750
DGDP	0.0283	0.0171	0.0244	0.0310	0.0391
Confid	9.2857	20.4226	-4.8500	5.8000	20.2000
Market_Size	17.6930	0.0922	17.6011	17.7206	17.7420

Table 1: Descriptive Statistics

Table 1 Notes –*Analysts* is the number of analyst's forecasts per company available at the end of the year. *Analysts_F* is the number of analyst's forecasts available at year end as a percentage of the total number of analysts. *INS* is the total volume of aggregated insider trading (directors and substantial shareholders trades) per firm-year divided by the total volume traded in that firm-year. *Size* is the natural logarithm of the average market value of equity during the firm-year. *Turnover* is measured as the volume traded in a firm-year divided by the average shares outstanding. *Leverage* is the debt to equity ratio at the end of the calendar year. *P/CF* is price divided by cash flow at the end of the calendar year. *Inst* is the percentage of shares held by institutional shareholders, defined as substantial shareholders, as per the Securities Market Act 1988, corrected for duplicate reported relevant interests. *Indep* is the percentage of the board of directors that are classified as non-executive or independent directors. *dGDP* is the annual percentage change in real GDP. *Confid* is the calendar year end value of the net business confidence index (%improve/rise - %worsen/decline). *Market_Size* is the natural logarithm of the calendar year end market capitalisation for all companies on the New Zealand Stock Exchange.

The Datex analyst forecast data showed a declining number of analysts producing forecasts for New Zealand companies.[1] This trend is controlled for in two ways, firstly by including a time trend variable, *Time*. The second approach is the inclusion of three further variables in the regressions to account for potential macroeconomic and market-wide causes of the declining number of analysts. These variables are the annual real GDP growth rate (*dGDP*), the natural logarithm of the market capitalization of the NZSX (*Market_Size*), both measured at the end of the calendar year, and the general business confidence index (*Confid*). Business confidence data was collected from the National Bank of New Zealand and is based

on the results of a monthly survey of 1500 businesses nationwide. It is defined as the percentage of participants who believe that business conditions will rise/improve over the next 12 months less the percentage who believe the economy will decline/worsen. We use year end values to measure the level of confidence. Price, volume, leverage, P/CF, market size and GDP were collected from Thompson Financials Datastream. Information on institutional holdings and the independence of the board came from the company annual reports.

Summary statistics on the variables to be employed in our models are given in Table 1. As can be seen there are on average 2.79 analysts covering a company over a sample year. This mean is similar to that found in Bushman *et al*. (2003) for 100 countries, 2.58. On average, companies were followed by 33.17% of the total number of analysts active in the New Zealand market. It has to be noted that 49% of the firm-years do not have any analysts following the company. The *INS* variable has a mean of 6.83% indicating that on average an outsider has more than a 6% chance of trading against an inherently better-informed insider. Studies in other markets have found much smaller percentages. Bettis, Cole and Lemmon (2000), for instance, found that in the US insider trades make up just 0.66% of daily share trading in allowed periods, less than 1/10 of the relative trading volume observed in our sample. The large sample mean of *INS* can likely be ascribed to the lack of vigorous enforcement of insider trading sanctions and low liquidity of the New Zealand market in general.

The untransformed mean (median) market value of equity is NZ$ 525 million (NZ$ 87 million) and a log transformation has been used to reduce the skewness of the data. These numbers are lower than those reported for other developed markets and the discrepancy between the mean and the median attests to the fact that the sample includes both small and large companies. The turnover variable shows that on average the sample companies traded 25% of the outstanding shares each year, although the range is wide including both highly liquid and illiquid companies. The *P/CF* variable has an average of 9.74 and a median of 7.67. The institutional holding variable (*Inst*) and independence of the board (*Indep*) have means of 55.24% and 79.38% respectively, values that are not too different from the median values. This

shows that New Zealand companies are more tightly held than particularly US companies which tend to have widespread ownership. The results also suggest that New Zealand firms are controlled by boards with a majority of independent directors. The average growth rate of real GDP over the sample period was 2.8% while the number of businesses that were optimistic exceeded the number pessimistic respondents by 9% on average. The average log size of the market was 17.69, which is equivalent to NZ$ 48,302 million in dollar terms.

Table 2 shows the cross-correlations between variables. The two analyst measures are, by construction, strongly correlated and both covariate negatively with *INS.* This provides some support for the hypothesis that insider trading crowds out analysts. It should be noted, however, that the univariate correlation coefficients are indicative measures only. The data also reveals a strong analyst preference for large and liquid companies. The significantly positive link between the independence of the board and analysts confirms the view that market professionals do prefer to avoid companies with potential for agency problems. As predicted by Lang *et al*. (2003) in light of the concentrated nature of firms' shareholdings in New Zealand we find a negative correlation between institutional holdings and *Analysts*. The inverse relationship between institutional holdings and turnover predictably indicates that higher levels of institutional holdings lead to less turnover. The strong positive link between *Analysts*, business confidence and market size suggests that analysts are more active when the market is growing and when confidence is high.

Table 2 also showed a positive relationship between *Size* and *Turnover* as well as *P/CF* and *Indep* implying that larger companies are more liquid, and value companies tend to have more developed board structures. *Turnover* expectedly co-moved with market size, demonstrating that liquidity is higher in times of prosperity. An interesting result is the negative relationships between business confidence and both change in GDP and market size which suggests that business confidence falls when the market and economy do well. This may be explained by the expectation that central banks will act to control inflationary pressures by raising the nominal interest rates which will lead to slower growth in the next period. We do, however, see the predicted positive relationship between change in *dGDP* and *Market_Size*.

	Analysts_F	INS	Size	Turnover	Leverage	P/CF	Inst	Indep	dGDP	Confid	Market_Size
Analysts	0.9454 (0.0000)	-0.0782 (0.0924)	0.6729 (0.0000)	0.3102 (0.0000)	-0.0190 (0.6827)	0.0421 (0.3658)	-0.0802 (0.0845)	0.1075 (0.0206)	-0.0158 (0.7341)	0.1853 (0.0001)	0.0849 (0.0676)
Analysts_F	1.0000	-0.1009 (0.0297)	0.7355 (0.0000)	0.3057 (0.0000)	-0.0335 (0.4717)	0.0444 (0.3395)	-0.0703 (0.1303)	0.1160 (0.0124)	0.0019 (0.9669)	0.0122 (0.7936)	0.0035 (0.4879)
INS		1.0000	-0.0002 (0.9967)	-0.0845 (0.0690)	-0.0099 (0.8322)	-0.0011 (0.9812)	0.0701 (0.1314)	-0.0308 (0.5088)	0.0028 (0.9518)	0.1305 (0.0049)	0.0219 (0.6382)
Size			1.0000	0.1180 (0.0110)	-0.0114 (0.8066)	0.1098 (0.0180)	-0.0328 (0.4808)	0.1276 (0.0059)	0.0509 (0.2738)	-0.0888 (0.0558)	0.0017 (0.9704)
Turnover				1.0000	-0.0186 (0.6896)	-0.2365 (0.0000)	-0.3257 (0.0000)	-0.0146 (0.7545)	0.0096 (0.8363)	0.0657 (0.1580)	0.0820 (0.0775)
Leverage					1.0000	0.0190 (0.6838)	0.0696 (0.1342)	-0.0527 (0.2572)	-0.0706 (0.1289)	0.0751 (0.1062)	-0.0333 (0.4741)
P/CF						1.0000	-0.0122 (0.7931)	0.1495 (0.0012)	-0.0113 (0.8077)	0.0017 (0.9704)	-0.1041 (0.0249)
Inst							1.0000	0.0929 (0.0455)	-0.0162 (0.7273)	0.0300 (0.5196)	-0.0029 (0.9501)
Indep								1.0000	0.0009 (0.9852)	0.0512 (0.2711)	0.0353 (0.4486)
DGDP									1.0000	-0.4807 (0.0000)	0.4512 (0.0000)
Confid										1.0000	-0.1356 (0.0034)

Table 2: Sample Cross-Correlations

Note - The sample contains 464 company-years from 1997 to 2003. The *p*-values are shown in parentheses. *Analysts* is the number of analyst's forecasts per company available at the end of the year. *Analysts_F* is the number of analyst's forecasts available at year end as a percentage of the total number of analysts. *INS* is the total volume of aggregated insider trading (directors and substantial shareholders trades) per firm-year divided by the total volume traded in that firm-year. *Size* is the natural logarithm of the average market value of equity during the firm-year. *Turnover* is measured as the volume traded in a firm-year divided by the average shares outstanding. *Leverage* is the debt to equity ratio at the end of the calendar year. *P/CF* is price divided by cash flow at the end of the calendar year. *Inst* is the percentage of shares held by institutional shareholders, defined as substantial shareholders, as per the Securities Market Act 1988, corrected for duplicate reported relevant interests. *Indep* is the percentage of the board of directors that are classified as non-executive or independent directors. *dGDP* is the annual percentage change in real GDP. *Confid* is the calendar year end value of the net business confidence index (%improve/rise - %worsen/decline). *Market_Size* is the natural logarithm of the calendar year end market capitalisation for all companies on the New Zealand Stock Exchange

METHODOLOGY

To determine whether corporate insiders are able to trade profitably as a result of their access to preferential information we employ event study analysis. Specifically, the continuously compounded returns accruing to insiders over a pre-specified horizon were calculated and adjusted for the market movements. An equally-weighted, all share index, *NZSE ALL,* was chosen to represent the market portfolio. The market-adjusted returns were then aggregated in the time dimension and averaged across all trades.

The statistical significance of excess insider returns is tested using bootstrap methodology which was introduced by Efron (1979) and applied in the context of event studies by Foster, Olsen and Shelvin (1984) and Wisniewski and Bohl (2004). Specifically, from the entire population of companies and dates we randomly select with replacement a firm-date pair to match each of the insider purchases and sales from our initial sample. The cumulative abnormal returns following each of these random events are then computed for the respective event windows and aggregated. This process is repeated numerous times to develop an accurate empirical distribution of the abnormal returns under the null hypothesis. In our testing we use 2000 repetitions to develop the distribution. The null is rejected at the α percent level if the abnormal return from the insider trading sample exceeds $(1-\alpha)$*2,000 simulated values from the empirical distribution. The bootstrap testing procedure is deemed relatively robust to the problems of non-normality, heteroscedasticity and time dependence of security returns as it avoids many distributional assumptions of parametric tests (Kramer, 2001).

In addition to the bootstrap *p*-values, nonparametric sign test statistics were computed. Under the null hypothesis that insiders do not exploit preferential information in their share dealings the probability that prices will move abnormally in the direction of their trade should be a half. The test statistic, based on the deviation from the 0.5 benchmark, is asymptotically normal

$$z = 2\sqrt{N}(p-0.5) \sim N(0,1) \qquad [1]$$

where the parameter p = $\Pr(CAR_i > 0 \mid Trade_i = Purchase) + \Pr(CAR_i < 0 \mid Trade_i = Sale)$ is estimated directly from the sample. *N* is the total number of trades.

The next stage of our empirical inquiry pinpoints the determinants of analyst following. Since *Analysts* is a non-negative integer variable the normal linear model will tend to give inconsistent estimators of the true model parameters (Winkelmann, 2000). The final model specification therefore needs to take the count feature of the regressant into account. Furthermore, an inspection of the analyst following data uncovers that the zero outcome is underpredicted by all of the conventional count data distributions as almost 49% of the firm-years were not covered by market professionals. An econometric specification which is potentially able to accommodate both of the aforementioned data characteristics has been introduced by Lambert (1992), who studied the number of defects in manufacturing. More specifically, her zero-inflated Poisson regressions (*ZIP*) are suitable for a count generating process exhibiting excess of zeros.

In ZIP specification, the zero outcome can arise from two different regimes. In the first regime the outcome is always zero, whereas in the second regime the nonoccurrence can arise from the Poisson process. In other words, the Poisson is mixed with point mass at zero, i.e.

$$Analysts_{i,t} = \begin{cases} 0 & with\ probability\ \pi_{i,t} + (1-\pi_{i,t})e^{-\lambda_{i,t}} \\ k & with\ probability\ (1-\pi_{i,t})e^{-\lambda_{i,t}}\ \dfrac{\lambda_{i,t}^{k}}{k!},\ k = 1,2,... \end{cases} \qquad [2]$$

With little *a priori* information about common covariates that affect both the Poisson mean λ and the probability π a natural parameterization is

$$\log(\lambda_{i,t}) = \mathbf{x}_{i,t}\boldsymbol{\beta} = \beta_0 + \beta_1 INS_{i,t} + \beta_2 Size_{i,t} + \beta_3 Turnover_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 P/CF_{i,t} + \beta_6 Inst_{i,t} + \beta_7 Indep_{i,t} + \sum_j \beta_{7+j} Trend\_Variable_{i,t}^{j} \qquad [3]$$

$$\text{logit}(\pi_{i,t}) = \log(\pi_{i,t}/(1-\pi_{i,t})) = -\tau\mathbf{x}_{i,t}\boldsymbol{\beta}$$

where τ is a shape parameter. The log transformation of λ and the logit splitting model have been used to linearize the Poisson means and Bernoulli probabilities of success. The parameter *j* takes the value of one in Models 1 and 3, with the *Trend_Variable* being a simple time trend. In the two remaining model specification *j* = 3 with *dGDP, Confid* and *Market_Size* capturing the trends and cyclical variation.

The Newton-Raphson algorithm has been used to maximize the following ZIP log-likelihood function

$$\log L(\boldsymbol{\beta}, \tau; \mathbf{Analysts}) = \sum_{Analysts_{i,t}=0} \log(e^{-\tau \mathbf{x}_{i,t}\boldsymbol{\beta}} + \exp(-e^{\mathbf{x}_{i,t}\boldsymbol{\beta}})) + \sum_{Analysts_{i,t}>0} (Analysts_{i,t}\mathbf{x}_{i,t}\boldsymbol{\beta} - e^{\mathbf{x}_{i,t}\boldsymbol{\beta}}) - \sum_{i,t} \log(1 + e^{-\tau \mathbf{x}_{i,t}\boldsymbol{\beta}}) \quad [4]$$

The ZIP model induces overdispersion which, given the mean and variance of *Analysts*, may suggest that it is a more accurate description of the data relative to an unaltered Poisson. A direct test is called for, but the testing procedure is complicated by the fact that ZIP is not nested within the Poisson model. In his seminal paper, Vuong (1989) developed general tests for nonnested models which were subsequently implemented by Greene (1994) to test the ZIP model versus the unaltered alternative. The extremely large positive values of the directional Vuong statistics in all of our model specifications attest to the appropriateness of the ZIP specification.

Due to the declining number of investment advisors in general, the analyst following has been expressed as a percentage of the total number of analysts active on the New Zealand market in a given calendar year (*Analysts_F*). By construction, this variable lies between zero and one with a significant proportion of observations being concentrated at these limiting values. The classical regression, however, dismisses the notion of qualitative difference between limit and nonlimit observations. A suitable model, which has been frequently applied to sample data which is a mixture of continuous and discrete distributions, is the censored regression model of Tobin (1958). We specify the doubly censored Tobit regression as follows

$$
\begin{aligned}
Index_{i,t} &= \mathbf{x}_{i,t}\boldsymbol{\gamma} + \varepsilon \\
Analysts\_F_{i,t} &= Min\left[Max\left[0, Index_{i,t}\right], 1\right] \\
\varepsilon &\sim N(0, \sigma^2)
\end{aligned}
\qquad [5]
$$

where *Index* is a latent variable and the regressors included in the **x** matrix are the same as in equation [3].

The corresponding log-likelihood function

$$
\begin{aligned}
\log L(\boldsymbol{\gamma}, \sigma; \mathbf{Analysts\_F}) = &\sum_{Analysts\_F_{i,t}=0} \log \Phi\left[\frac{-\mathbf{x}_{i,t}\boldsymbol{\gamma}}{\sigma}\right] + \sum_{Analysts\_F_{i,t}=1} \log\left[1 - \Phi\left(\frac{1-\mathbf{x}_{i,t}\boldsymbol{\gamma}}{\sigma}\right)\right] \\
&+ \sum_{0<Analysts\_F_{i,t}<1} \log \frac{1}{\sigma}\phi\left[\frac{Analysts\_F_{i,t} - \mathbf{x}_{i,t}\boldsymbol{\gamma}}{\sigma}\right]
\end{aligned}
\qquad [6]
$$

is maximized using the Olsen's (1978) reparametrization.

RESULTS

Insider trading has been shown to be profitable in nearly all the markets studied, including markets perceived to be extremely well regulated.[2] Intuitively, insiders, who are in a position of informational superiority, have a clear advantage over uninformed investors against whom they trade. This gives them the ability to conduct well-timed transactions and reap significant abnormal returns. However, as pointed out by Fishman and Hagerty (1992) deregulation of insider trading can lead to a reduction in profits accruing to market professionals as their information becomes less valuable and should they trade against an insider their losses could be substantial. This leads outsiders to reduce the amount of resources they are prepared to invest in acquiring information to inform their decision making and may, in turn, reduce the informational efficiency of the market. If insiders are not required to disclose and the market is unable to detect their trading this problem can be further exacerbated and the information being traded on is not impounded into the price. This means that outsiders, and analysts in particular, are likely to continue expending resources to gather information in situations where the market should already have impounded it in the price. In essence the market is allocating resources on the basis of less

accurate and informed prices than would be the case if insider trades have been disclosed.

We firstly examine the profitability of insider transactions to determine whether insiders exploit the informational advantage they possess. Table 3 reports the cumulative abnormal returns, equivalent to the profits expropriated by insiders. Panel A examines the CARs for all declared insider dealing, both directors and substantial shareholders. The results show that insiders make abnormal returns of 1.7% above the market benchmark over the first 50 days following the trade. The returns increase monotonically peaking at 5.01% by the 200 day event window. All of the values are significant at the 1% level. This finding is supported by the sign test results which indicate that over the four considered event windows most of the trades were in the predicted direction. The results, therefore, lend support to the assertion that insiders are earning significant abnormal returns and are not concerned with concealing this fact by engaging in camouflaging their trades, i.e. trading small volumes against the predicted direction of the market reaction to news in order to confuse regulators.

When the results are separated by the class of insider notable differences in the profitability of trading emerge. The figures for directors in Panel B show that all transactions earned highly significant abnormal returns over all the event windows. The magnitude of the undue gains is striking, peaking at almost 7% for the longest considered investment horizon. The CARs are also of a greater magnitude than for the aggregated sample by 1% over the first window, growing to 1.8% for the 200 day period. The sign test statistics support the significance of CARs and the corresponding *p*-values are markedly low. The results in Panel C for substantial shareholders, however, are in stark contrast to those in Panels A and B. Only in the final event window do substantial shareholders earn statistically significant CARs at the 10% level. The sign test results are also unable to reject the null hypothesis in all cases.

Panel A: Aggregated Sample Cumulative Abnormal Returns

Event Windows	CARs	Bootstrap *p*-values	Sign Test	Sign Test *p*-values
0,50	0.0170	0.0020	3.7237	0.0001
0,100	0.0302	0.0000	5.3220	0.0000
0,150	0.0422	0.0000	4.7833	0.0000
0,200	0.0501	0.0000	4.3061	0.0000

Panel B: Director Transactions Cumulative Abnormal Returns

Event Windows	CARs	Bootstrap *p*-values	Sign Test	Sign Test *p*-values
0,50	0.0270	0.0000	4.8040	0.0000
0,100	0.0472	0.0000	6.5050	0.0000
0,150	0.0664	0.0000	6.1124	0.0000
0,200	0.0683	0.0000	5.7885	0.0000

Panel C: Substantial Shareholder Transactions Cumulative Abnormal Returns

Event Windows	CARs	Bootstrap *p*-values	Sign Test	Sign Test *p*-values
0,50	0.0023	0.3045	0.0332	0.4868
0,100	0.0057	0.2405	0.5014	0.3080
0,150	0.0091	0.1810	0.2694	0.3938
0,200	0.0163	0.0710	0.5828	0.2800

Table 3: Cumulative Abnormal Returns

Note- The CARs were calculated using a market adjusted model against the NZSE ALL. The Bootstrap p-values were calculated by employing the Bootstrap methodology described in Section 3. The sign test statistics calculated in accordance with equation [1] and the corresponding *p*-values are reported in columns 4 and 5, respectively.

Several rationalizations of the difference in profitability between large blockholders and director trades can be propounded. The first, as explained in Etebari, Tourani-Rad and Gilbert (2003), is the difference in the disclosure regimes that existed until recently. Under the Security Markets Act 1988 directors were only required to disclosure their transactions in the annual reports, a delay on average of 9-10 months. Substantial shareholders, on the other hand, are required to disclose the details of their trades within 5 working days of the transaction. The ability to delay disclosure leads to ongoing profits as the market is not informed of the director's trade and therefore the insiders information is not included in the pricing of the share (Huddart, Hughes and Levine, 2001). This allows later trades to be made on the same information with the same advantage whereas substantial shareholders have only a short window in which to profit. The other reason, as has been argued by Lakonishok and Lee (2001) and Seyhun (2000), is that blockholders do not have the

same access to information as a result of not having continuous input into the company operations and therefore tend to profit less than directors and executives.

Overall, the results confirm decisively that insider trading is profitable for all insiders in the long-run, although directors who can delay their disclosure are able to earn greater returns over all event windows. Informed investors such as analysts are likely to be aware of their disadvantage in relation to insiders and therefore minimize the probability of trading against them. One would consequently expect to find that the presence of insiders crowds out analysts.

This hypothesis that the presence of insiders reduces analysts following is supported by our empirical results. Table 4 presents the regression coefficients for the aggregated insider trading sample (both director and substantial shareholder trades). Models 1 and 2 use *Analysts* as the dependent variable, with Model 1 controlling for the decreasing number of analysts via the time trend variable (*Time*) and Model 2 employing the three macroeconomic variables, *dGDP, Confid and Market_Size*. The results in Model 1 show the expected negative relationship between insiders and analysts which indicates that higher levels of insider trading are associated with lower levels of analyst following. This result is significant at the conventional 5% level after controlling for other diverse factors that affect analyst coverage. *Size* and *Turnover* are both positive and significant at the 1% level supporting the earlier conclusions based on correlation analysis and prior literature which found that analysts prefer large, liquid companies (Atiase, 1985; Freeman, 1987; Bhushan, 1989; Dahlquist *et al*., 2003). The time trend variable is strongly negatively related to the dependent variable indicating that, over the sample period, analysts were becoming increasingly disinclined to follow New Zealand companies. Neither the number of independent board members (*Indep)* nor the percentage of institutional shareholders (*Inst)* had notable explanatory power despite the significance of earlier simple correlation coefficients. This may be explained by the cross-correlation relationships between *Inst* and *Turnover* as well as *Indep* and *Size* which suggests that the expected effect of these variables may already have been largely accounted for.

	Zero Inflated Poisson Model				Tobit Model			
	Model 1		Model 2		Model 3		Model 4	
Constant	-1.3088	***	-23.4162	***	-3.1662	***	-5.1367	**
	(-0.3080)		*(3.8047)*		*(0.2183)*		*(2.7840)*	
INS	-3.5254	**	-4.7210	**	-4.5302	**	-5.0444	***
	(1.7294)		*(1.8804)*		*(1.7983)*		*(1.8257)*	
Size	0.2564	***	0.2723	***	0.2822	***	0.2837	***
	(0.0171)		*(0.0160)*		*(0.0160)*		*(0.0159)*	
Turnover	0.2940	***	0.2726	***	0.4112	***	0.4012	***
	(0.0918)		*(0.0840)*		*(0.0845)*		*(0.0837)*	
Leverage	-0.0107		-0.0088		-0.0080		-0.0083	
	(0.0225)		*(0.0201)*		*(0.0110)*		*(0.0002)*	
P/CF	0.0020		0.0014		0.0001		0.0000	
	(0.0015)		*(0.0013)*		*(0.0002)*		*(0.0109)*	
Inst	0.0006		0.0003		-0.0006		-0.0006	
	(0.0016)		*(0.0016)*		*(0.0011)*		*(0.0010)*	
Indep	0.1748		0.0606		0.1412		0.1330	
	(0.2745)		*(0.2754)*		*(0.1392)*		*(0.1380)*	
Time	-0.1646	***			-0.0238	**		
	(0.0177)				*(0.0108)*			
dGDP			0.0340				-0.2615	
			(2.3303)				*(1.6635)*	
Confid			0.0165	***			0.0038	***
			(0.0020)				*(0.0013)*	
Market_Size			1.9644	***			0.1706	
			(0.3529)				*(0.2582)*	
Tau	0.5142	***	0.5945	***				
	(0.1006)		*(0.1103)*					
Sigma					0.3729		0.3691	
Log Likelihood	-764.1151		-762.4931		-210.6490		-207.3455	

Table 4: Determinants of Analyst Following with Aggregated Insider Trading

Note – *** Significant at 1%, ** Significant at 5%, * Significant at 1%
Standard errors are shown in parentheses. The sample comprises 464 firm-year observations. The dependent variable in Models 1 and 2 is *Analysts* defined as the number of analysts forecasts per company available at the end of the year. The dependent variable in Models 3 and 4 is *Analysts_F* defined as the number of analysts forecasts available at year end as a percentage of the total number of analysts. *INS* is the total volume of aggregated insider trading (directors and substantial shareholders trades) per firm-year divided by the total volume traded in that firm-year. *Size* is the natural logarithm of the average market value of equity during the firm-year. *Turnover* is measured as the volume traded in a firm-year divided by the average shares outstanding. *Leverage* is the debt to equity ratio at the end of the calendar year. *P/CF* is price divided by cash flow at the end of the calendar year. *Inst* is the percentage of shares held by institutional shareholders, defined as substantial shareholders, as per the Securities Market Act 1988, corrected for duplicate reported relevant interests. *Indep* is the percentage of the board of directors that are classified as non-executive or independent directors. *Time* is a time trend with 1997=1. *dGDP* is the annual percentage change in real GDP. *Confid* is the calendar year end value of the net business confidence index (%improve/rise - %worsen/decline). *Market_Size* is the natural logarithm of the calendar year end market capitalisation for all companies on the New Zealand Stock Exchange.

The results for Model 2 are virtually identical for *INS, Size* and *Turnover.* Of the macroeconomic variables *Confid* and *Market_Size* are both positively correlated with analyst following, again in line with expectations that analysts will be more active when the economy is booming and the market increases in size. The insignificance of the *dGDP* variable is possibly due to its effect being already accounted for with the *Market_Size* variable. Alternatively, investment advisors may be only concerned with the future, rather than current economy-wide fluctuations. Although not directly comparable between the Tobit and ZIP specifications, the log likelihood values indicate that the addition of the macroeconomic variables strengthens the models.

The positive and statistically significant estimate of the τ parameter has an appealing economic interpretation. As was described in the methodology section, the ZIP specification assumes that the population is characterized by two regimes, one where the observations always take a value of zero and one where the values follow a Poisson distribution. With $\tau > 0$ the likelihood of being in the "never to be analyzed" regime is inversely related to the Poisson mean λ. Consequently, it means that the companies with high levels of insider activity can bear a stigma and be collectively avoided by all market professionals.

The results in Model 3 and 4 utilize the same variable specifications as the previous models with the replacement of *Analysts_F* as the dependent variable. Due to the nature of the regressant, a left-censored at zero and right-censored at one, Tobit regressions are employed. The results for both specifications corroborate the earlier finding of a significantly negative relationship between *Analysts* and *INS* with Model 4 at the 1% level. The log market value of equity and the liquidity proxy still remain relevant determinants in the regressions. Furthermore, since the analyst following has been scaled by the total number of analysts active in the New Zealand market, one would expect *Analysts_F* not to be strongly procyclical. The estimates in Table 4 confirm this intuition; the coefficient of *Market_Size* became insignificant and the slope of the business confidence variable decreased in magnitude.

The results in Table 3, which lend further credence to the earlier findings of Eterbari *et al*. (2003), show that directors are able to trade more profitably than

substantial shareholders. Given this difference in profitability of differing insider classes we separate out the sample by insider type to examine whether this has an impact on the relationship with analysts. The crowding out hypothesis suggests that analysts are worried about the possibility of trading against an insider for informational reasons, as in this situation the analysts expected return will be reduced and the costs of gathering their information will not be recovered. However, insider trading impacts on the expected returns of analysts in at least two ways. First, analysts' ability to profit from acquiring information is reduced when an insider's trade is disclosed as the disclosure corrects the price, removing unpriced information from the market. The other cost is that of trading against an insider, in which case the informed outsider will suffer trading costs. As shown from the cumulative abnormal returns, an analyst trading against a director stands to lose more than when they trade against a substantial shareholder. However, in terms of ongoing information asymmetry, because director trades are not disclosed promptly there exists a continued opportunity to profit from information collection. The exact nature of the relationship between analysts and the different classes of insiders will therefore depend on the relative importance of these differing factors reducing the expected returns to informed outsiders.

To test the impact of the class of insider on the crowding out hypothesis, we replace the previous measure of insider trading intensity (*INS*) with three variables measuring the trading intensity of substantial shareholders (*SUB*), directors (*DIR*) and a lag of the directors trade (*LDIR*). The lagged measure was included to account for directors' disclosing in the annual report meaning that the market was unable to observe their trading until the next financial year. These measures were constructed in the same fashion as the *INS* measure but included only the trades in a year from the relevant class of insider.

	Zero Inflated Poisson Model				Tobit Model			
	Model 1		Model 2		Model 3		Model 4	
Constant	-1.2261	***	-23.0047	***	-3.1454	***	-5.2333	*
	(0.3177)		*(3.8683)*		*(0.2232)*		*(2.8577)*	
SUB	-0.9502	**	-1.0824	***	-0.8074	***	-0.8637	***
	(0.4146)		*(0.3568)*		*(0.2778)*		*(0.2787)*	
DIR	0.0741		-0.1403		-0.2630		-0.3127	
	(0.6419)		*(0.5926)*		*(0.3496)*		*(0.3495)*	
LDIR	0.0757		0.2292		-0.2500		-0.2468	
	(1.1176)		*(1.2100)*		*(0.3324)*		*(0.3300)*	
Size	0.2536	***	0.2730	***	0.2824	***	0.2839	***
	(0.0182)		*(0.0170)*		*(0.0165)*		*(0.0164)*	
Turnover	0.2794	***	0.2507	***	0.4035	***	0.3954	***
	(0.1037)		*(0.0963)*		*(0.0857)*		*(0.0853)*	
Leverage	-0.0096		-0.0073		-0.0071		-0.0071	
	(0.0225)		*(0.0206)*		*(0.0111)*		*(0.0110)*	
P/CF	0.0015		0.0005		0.0000		0.0000	
	(0.0014)		*(0.0009)*		*(0.0001)*		*(0.0001)*	
Inst	0.0006		0.0002		-0.0004		-0.0003	
	(0.0017)		*(0.0016)*		*(0.0011)*		*(0.0011)*	
Indep	0.1158		0.0116		0.1105		0.1003	
	(0.2872)		*(0.2825)*		*(0.1440)*		*(0.1430)*	
Time	-0.1608	***			-0.0242	***		
	(0.0183)				*(0.0111)*			
dGDP			0.8251				0.5821	
			(2.4338)				*(1.7196)*	
Confid			0.0163	***			0.0039	***
			(0.0021)				*(0.0013)*	
Market_Size			1.9300	***			0.1792	
			(0.3593)				*(0.2650)*	
Tau	0.5156	***	0.6094	***				
	(0.1053)		*(0.1172)*					
Sigma					0.3722		0.3690	
Log Likelihood	-723.2960		-721.5494		-198.5178		-195.8237	

Table 5: Determinants of Analyst Following with Differing Insider Classifications

Note – *** Significant at 1%, ** Significant at 5%, * Significant at 1%
Standard errors are shown in parentheses. The sample comprises 443 firm-year observations. The dependent variable in Models 1 and 2 is *Analysts* defined as the number of analysts forecasts per company available at the end of the year. The dependent variable in Models 3 and 4 is *Analysts_F* defined as the number of analysts forecasts available at year end as a percentage of the total number of analysts. *Sub* is the total volume of substantial shareholder trades per firm-year divided by the total volume traded in that firm-year. *Dir* is the total volume of director trades per firm-year divided by the total volume traded in that firm-year. *LDir* is the total volume of director trades per firm-year divided by the total volume traded in the previous firm-year. *Size* is the natural logarithm of the average market value of equity during the firm-year. *Turnover* is measured as the volume traded in a firm-year divided by the average shares outstanding. *Leverage* is the debt to equity ratio at the end of the calendar year. *P/CF* is price divided by cash flow at the end of the calendar year. *Inst* is the percentage of shares held by institutional shareholders, defined as substantial shareholders, as per the Securities Market Act 1988, corrected for duplicate reported relevant interests. *Indep* is the percentage of the board of directors that are classified as non-executive or independent directors. *Time* is a time trend with 1997=1. *dGDP* is the annual percentage change in real GDP. *Confid* is the calendar year end value of the net business confidence index (%improve/rise - %worsen/decline). *Market_Size* is the natural logarithm of the calendar year end market capitalisation for all companies on the New Zealand Stock Exchange.

Table 5 presents the results for the regressions rerun with the sample split by class of insider. The measure of substantial shareholder trading (*SUB*) is highly significant in all four models. Curiously, the contemporaneous and lagged values of director trading (*DIR* and *LDIR*) have no impact on analyst following, despite the fact that an outside investor trading against a director stands to lose the most. Principal shareholders who make only marginally profitable deals, however, have a significantly negative impact on the number of analysts examining companies. This seems to indicate that it is the impact on informational asymmetry which is the key factor. As discussed above, the requirement that substantial shareholders disclose in a timely fashion, in conjunction with their superior ability to price the securities of the company they are involved with, means that whenever they trade new information is revealed to the market. The result is that any effort to gather extra information is wasted and given the cost in terms of time and resources it stands to reason that analysts would reduce their coverage when there is little hidden information to be found. The delay in disclosure for directors, however, means unpriced information remains undetected by the market and therefore can still be collected and used profitably (Zhang, 2001). It is interesting, however, that as neither of the director variables are significant the risk of trading against a director does not seem to be a concern for investment advisors, or as is more likely, the cost of trading against a director is outweighed by the continued opportunities to collect and profit from unpriced information. This means that provided the analyst is trading in the same direction as the director, their expected returns should not be significantly reduced giving them the incentive to expend resources searching out new information that the majority of the market still does not have. The insignificant reaction to the lagged director trading variable suggests that analysts believe last years trading is unrelated to the possibility of trading against a director in the current year.

The end result of either explanation is that the market inefficiently allocates resources as the information that should have been conveyed to the market via the insider trading remains hidden and analysts expend valuable resources trying to find it. Further, given the importance of accurate securities prices for resource allocation, less efficient prices resulting either from hidden information or from a reduction in the number of analysts directly impact on the efficacy of the market in fulfilling its

function. This supports the policy that insider trading should be disclosed promptly to improve the informational efficiency of the markets.

CONCLUSIONS

The purpose of this paper was to examine the interactions between insiders and analysts in the context of the New Zealand market which is largely perceived to have relatively lenient insider trading regulations. Under the Security Markets Act 1988 and the Securities Market Amendment Act 2002 there is no criminal liability for exploitation of material non-public information. The enforcement of civil sanctions can be also called into question as, to date, there has not been a single successful prosecution of insider trading charges.[3] The results presented in this study substantiate that trading by directors and principal shareholders in this market is pervasive as the transactions of individuals subject to mandatory disclosure requirements make up a large proportion of the total NZX trading volume. Insiders also tend to exploit the investing public by using the private information they posses in security trading. The magnitude and significance of abnormal returns that occur subsequent to insiders' shareholding changes are in sharp conflict with the strong form of the efficient market hypothesis. On average, the cumulative market-adjusted return accruing to an insider within 200 days of his or her transaction exceeds 5%, with the directors earning over 6.8% and substantial shareholders reaping about 1.6%. The difference in profitability between the two considered groups may derive either from the two-tier disclosure regime that persisted in New Zealand or from the proximity with company operations.

As was argued in Fishman and Hagerty (1992) and Khanna, Slezak, and Bradley (1994), presence of insiders creates a hazardous investment environment in which outsiders are reluctant to collect and evaluate costly information. In a round of trading against an issuer's affiliated person the losses can be considerable and the information gathering efforts become wasted. Furthermore, promptly disclosed insider trading reduces the extent of informational asymmetry in the market, which further lowers the expected benefits of outsiders' private information search. As a consequence, analysts, who invest either on their own or on behalf of their clients, are expected to be crowded out by insiders. To assess the empirical validity of this

assertion we inquire into the relationship between the firm-level insider trading and the number of earnings forecasts provided by market professionals. This paper presents compelling evidence that companies with high level of aggregate insider dealing have *ceteris paribus* lower analyst coverage.

An intriguing finding was that analyst following was more severely reduced in response to substantial shareholder trading rather than director trading. This result can be ascribed to a relatively unique characteristic of the New Zealand regulatory framework. Until recently substantial shareholder, those with more than 5% of the company voting rights were required to disclose details of their trades within 5 working days of the transaction, while directors could defer their reporting until the year end. Prompt disclosure means little information remains hidden and analysts, who cannot earn sufficient profit from informational asymmetry, devote fewer resources to equity research. Delayed trades however do not correct securities prices quickly allowing analysts an opportunity to profit. Thus, in light of our results, the recently enacted Sarbanes-Oxley Act of 2002 in the U.S. and Securities Market Amendment Act 2002 in New Zealand which shortened the reporting deadlines for corporate insiders can be deemed vital for the functioning of the capital markets as they aim at promoting price efficiency and better resource allocation.

ENDNOTES

1. The decline in the number of analysts seems to be due to the withdrawal of a number of investment banks from the New Zealand market resulting in a decrease in the number of local analysts.

2. The profitability of self-reported insider transactions has been examined in the U.S. (Finnerty, 1976; Seyhun, 1986; Lakonishok and Lee, 2001), Canada (Baesel and Stein, 1979), Spain (Del Brio, Miguel and Perote, 2002), Poland (Wisniewski and Bohl, 2004) and U.K. (Pope *et al*., 1990; Friederich *et al*., 2002).

3. While Kerry Hoggard, CEO of Fletcher Forests, was prosecuted, the judge directed it to be settled out of court. The settlement however was less than the minimum punishment likely to have been imposed by the court.

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