Do Informed Traders Win? An Analysis of Changes in Corporate Ownership around Substantial Shareholder Notices[#]

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Abstract

The financial economics literature typically distinguishes between two classes of investors, namely 'informed' and 'uninformed' traders. Informed traders are those who possess some fundamental information about the true value of an asset which is not readily available to other traders. Presuming that this information advantage is obtained from costly information search there is a general assumption that these traders realise superior returns. Unlike previous researchers, we access a unique panel of institutional and retail ownership (CHESS records) that enable us to develop powerful measures that capture and benchmark abnormal changes in the share register across a number of dimensions. We find some evidence of a positive and significant relationship between the level of informed trading in the share register and abnormal market performance. However, our results suggest that informed traders move in and out of the share register in response to abnormal market performance, rather than in anticipation of abnormal market performance.

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Do informed traders win? An Analysis of Changes in Corporate Ownership around Substantial Shareholder Notices

1. Introduction

Capital market researchers frequently distinguish between two classes of investors, namely 'uninformed' and 'informed' traders. Informed traders are those who possess some fundamental information about the true value of an asset that is not readily available to other traders. Presuming that this information advantage is obtained from costly information search there is a general assumption that these traders realise superior returns. Uninformed traders, or noise traders, do not posses this information and they trade for their liquidity needs or on the basis of information that they incorrectly believe to be fundamental to an asset's value.

This distinction between classes of traders is well entrenched in the literature. However, there is a dearth of empirical evidence demonstrating that informed traders are able to recoup their information acquisition costs through the realisation of superior returns. In this study, we test whether informed investors are able to recover their information search costs through superior share market returns. Thus our study is one of the first to attempt to examine, analyse and compare the performance of informed traders against the market.

In the past researchers have faced great difficulty in identifying whether specific traders are informed or uninformed, and thus, there is very little evidence on the performance of informed traders. However, unlike previous empirical work in this area, we have access to a unique dataset of daily share ownership records for all listed firms on the Australian Stock Exchange (ASX). Utilising this unique dataset, we are able to develop powerful proxies that enable us to gauge the presence of informed investors in the register.

This paper proceeds as follows. Section 2 presents the institutional detail relevant to our analysis, while section 3 discusses the previous literature that is related to our work. In section 4 we describe the data that we utilise in our analysis as well as our sample selection criteria. Section 5 details our experimental design and develops the formal hypotheses tested in this paper, and section 6 provides details of our results. We test the sensitivity of our results to various respecifications of our models and variables in section 7. Finally we conclude and offer suggestions for future research in section 8.

2. Institutional detail

In this section we present the institutional detail relevant to our analysis. As we examine the performance of informed investors on the Australian equities market, we first describe the major features of the Australian Stock Exchange (ASX). We then detail the electronic settlement system that is used by ASX to settle trades and record share ownership details. In analysing the returns realised by informed investors, we condition our experiment on the basis of substantial shareholder notices. Thus we conclude this section with a description of the regulations governing substantial shareholder disclosures in Australia.

2.1. The Australian Stock Exchange

ASX operates an electronic order driven market in which trade occurs through a computerised system for trading called the Stock Exchange Automated Trading System (SEATS). SEATS is a network that facilitates on-line trading, regardless of where traders are located. It was fully implemented in October 1990, and all companies listed on ASX have their shares traded through SEATS.

ASX is one of the most liquid and transparent exchanges in the world. In the year 2000, average domestic market capitalisation rose to above \$600 billion with the average daily number of trades topping 55,000. Trading on ASX is highly concentrated across a number of dimensions. Throughout the calendar years 1993 to 1996, total trading in the top ten stocks as a percentage of total turnover was approximately 40%. Trading in the top 50 stocks accounts for approximately 70% of the total. Similarly, the top ten brokers shared in approximately 65% to 72% of trading with the top five brokers representing 40% of total trading activity during the years 1993 to 1996. Further, institutional investors dominate 80% of trading on ASX, of which approximately ten institutions comprise the bulk of trading. Most of these institutions are located in Sydney, with the result that traders in Sydney transact the majority of all national trades.¹

The above description of ASX highlights the concentrated nature of the market across four dimensions – stocks, brokers, institutions and geographic region. Thus one might expect to observe a high level of information asymmetry amongst market participants and hence a clear distinction between informed and uninformed traders.

2.2. The ASX settlement system

¹ For more detail see Aitken, Frino, Jarnecic, McCorry and Winn (1997).

ASX operates an electronic settlement and transfer system for securities known as the Clearing House Electronic Subregister System (CHESS). CHESS was introduced in September 1994 and it provides a system to facilitate the settlement and clearing of transactions in ASX listed companies.

CHESS provides a computerised register of investors' shareholdings and thus allows ownership to be transferred without having to rely on paper documentation.² However, not all investors have their shareholdings recorded with CHESS. Shareholders can register legal title to securities on either the CHESS subregister or an issuer sponsored register. A Holder Identification Number (HIN) identifies each holder in CHESS. The CHESS register is updated at the end of each trading day, hence enabling changes in individual holdings to be tracked on a daily basis. ASX settlement operates on a fixed period settlement discipline. A T+5 fixed settlement period was introduced in March 1992. T+3 settlement was introduced in February 1999.

At the end of June 2000, the CHESS subregister recorded ownership for 60.23% of the domestic market capitalisation and the total value of holdings was approximately \$462.9 billion. This comprised 917,373 holders with 4,793,059 holdings.

2.3. Substantial shareholder disclosures

Regulations governing substantial shareholder notices in Australia were first enacted as part of division 6A, section 69 of the *Companies Act* 1961. These required that an acquirer of more than a "prescribed percentage" of the voting shares in a company notify that company of such a holding within fourteen business days. Originally, this 'prescribed percentage' was 10%, however, it was reduced to 5% on January 1, 1991.

The *Companies Act* 1981 requires three types of disclosures be made in relation to substantial shareholdings.³ These are as follows:

(a) *Notice of initial substantial holder* – Section 137 stipulates that a person or entity that becomes a substantial shareholder in a company shall give notice to the company disclosing the particulars of the holding as well as the nature of any contract, scheme or

 $^{^{2}}$ A transfer in CHESS constitutes a transfer of legal title. This is in contrast to a depository system, such as in the U.S., where transfer of ownership refers to the transfer of beneficial interests within the registered holding of a nominee or trustee.

³ These notices are filed with the ASX and the company that the substantial shareholder has a holding in.

arrangement, or any other circumstance by which the position was acquired. This notice must be filed within two business days after the holder "becomes aware of the relevant interest or interests by virtue of which he is a substantial shareholder".

- (b) Notice of change of interests of substantial holder Section 138 requires that a substantial shareholder notify the relevant company if their holding changes by at least 1%, and they still remain a substantial holder after the change.
- (c) Notice of ceasing to be a substantial holder Section 139 requires that a person that ceases to be a substantial shareholder in a company give notice of this to the particular company. This involves a submission within two business days after the person becomes aware that they have ceased to be a substantial shareholder.

3. Literature review

3.1. The Efficient Markets Hypothesis

The EMH states that a market is termed efficient "when prices always 'fully reflect' available information" [Fama (1970, p383)]. In contrast to Fama (1970), Grossman and Stiglitz (1980) present a convincing analysis which demonstrates that costless information is a necessary condition for prices to 'fully reflect' all available information. Grossman and Stiglitz (1980) show that, in general, the price system does not reveal all the information about the true value of a risky asset. They explain that under such circumstances, informed traders can earn a return on their costly information searches if they can take positions in the market that are better than those of uninformed traders. However, if prices did fully reflect all available information, in the spirit of Fama (1970), informed traders would be unable to earn a return on their information. Such a market will not be stable because prices are 'over-informationally efficient' - i.e., they are revealing so much information that the incentives to acquire information are removed. Grossman and Stiglitz (1980) explain that in the presence of costly information a competitive equilibrium that reveals all available information cannot exist. If information is costly, then there must be noise in the price system. If there is no noise, and information is costly, then competitive markets will break down. Thus the "price system can only be maintained when it is noisy enough so that traders who collect information can hide that information from other traders".⁴ When this occurs it is not enough for traders to only observe price and there will exist incentives for traders to privately acquire information.

3.2. Empirical evidence on informationally efficient markets

The above section highlights the importance of private information acquisition to the development of an informationally efficient market. The arguments show why the financial economics literature typically assumes that informed traders realise superior returns. However, despite this generally accepted assumption, there is little empirical evidence to support the claim that traders who undertake a costly information search are actually compensated for their activities. This is primarily because researchers face great difficulty in identifying which particular traders are 'informed'. This section details the scarce empirical work which documents that trades by informed investors occur at prices sufficiently different from full-information prices to compensate them for the cost of becoming informed.

Larcker and Lys (1987) are among the first to attempt to document the superior performance of investors who undertake costly information search. They examine the purchases of risk arbitrageurs, a group of traders who are commonly alleged to engage in costly information acquisition regarding the potential outcomes associated with announced tender offers, mergers, liquidations, or other corporate reorganisations. Larcker and Lys argue that the private information acquired by such traders and the returns earned on their subsequent trading activities "provide an ideal setting" to investigate whether informed traders are compensated for their costly information search. They find that risk arbitrageurs purchase shares in firms with statistically higher reorganisation success rates than that implied by market prices at the time of the reorganisation. The results also indicate that arbitrageurs earn substantial positive returns on their trading activities.⁵ Thus the authors conclude that "security prices are sufficiently noisy to create incentives for costly information acquisition".

There is a large literature on the performance of active mutual funds.⁶ Active funds invest heavily in information search and they generally adopt the mandate of "beating the market". Accordingly active fund managers are often used as a proxy for informed investors. Despite the large literature on active fund performance, it is surprising that relatively few studies find evidence of funds being able to "beat the market". Two exceptions are Christopherson, Ferson

⁴ Grossman (1976, p585)

⁵ Arbitrageurs realised mean returns between 14.51% and 20.08% depending on the price used in the calculation of returns.

and Glassman (1998) for the US and Joye, da Silva Rosa, Jarnecic and Walter (2002) for Australia. Joye et al (2002) conclude as follows "it is also apparent that the (institutional) mutual fund market is in Grossman and Stiglitz (1980) style informational equilibrium. ... The mean active participant earns *pre-fee* risk-adjusted excess returns. Thus, in the mutual fund sphere ... informed traders extract rents from passive participants which are sufficient to compensate them for their costly information gathering activities."

In addition to the large amount of research into the performance of mutual and pension funds, there is also a growing body of literature on the performance of three other groups of institutional investors, namely, investment advisors, banks and insurance companies. These investors engage in active stock picking in an attempt to outperform the passive strategy of holding a diversified portfolio, thus, it is interesting to note the performance of this group of traders.

The available evidence from studies that utilise risk-adjusted measures suggests that the performance of non-mutual fund investors is no better than that of mutual funds. Kleiman and Sahu (1991) find that the equity portfolios of life insurance companies fail to outperform a market benchmark and that these managers do not display superior timing ability. Kleiman, Sahu and Callaghan (1998) find similar results in their analysis of bank trust departments. They find that bank trust department managers do not display either superior stock selection abilities or market timing skills. Further, Kleiman, Sahu and Callaghan (1996) provide a comprehensive analysis of investment advisor performance. Their results indicate that, consistent with the EMH, investment advisors are unable to outperform the market on a risk-adjusted basis. An analysis of the components of performance indicates that advisory firms do not display superior performance in terms of selectivity and/or market timing ability.

Thus the evidence on the performance of investment advisors, insurance companies and bank trust departments indicates that such investors are unable to better a passive investment strategy. This suggests that these investors are unable to realise the returns that are required to compensate their information acquisition activities.

⁶ See for representative examples Sharpe (1966), Jensen (1968), Ippolito (1989), Grinblatt and Titman (1992, 1993), Brown and Goetzmann (1995), Grinblatt Titman and Wermers (1995), Carhart (1997), Christopherson, Ferson and Glassman (1998) and Wermers (2000).

4. Sample selection and data

4.1. Substantial shareholder notices

Substantial shareholder notices lodged with ASX are made available to the public through 'Signal G'. Signal G is an electronic data feed, supplied by the ASX, which provides subscribers with all company announcements that are submitted to the Exchange. The full text of each announcement is transmitted to the public, member organisations and information vendors shortly after it is received.

We identify the population of substantial shareholder notices received by ASX over the period January 1, 1996 to June 30, 1999 by searching the Signal G electronic records database made available by the Securities Industry Research Centre of Asia Pacific (SIRCA). Searches were conducted across the database for the text strings "substantial shareholder" and "substantial shareholding". This process yielded approximately 24,000 text records of substantial shareholders in 1,269 ASX listed companies.

This initial dataset consisted of all text records of each substantial shareholder notice submitted to ASX. As has been detailed previously, these notices comprise three types – 'notice of initial substantial holder' (known as a Form 603), 'notice of change of interests of substantial holder' (a Form 604) and 'notice of ceasing to be a substantial holder' (a Form 605). To obtain the data required for our analysis, each of the 24,000 announcements was examined to extract the following key pieces of information:

- (a) The type of ASIC form submitted (either 603, 604 or 605);
- (b) The date on which the announcement is made;
- (c) The date on which the transaction occurred; 7
- (d) The ASX code of the company that is traded;
- (e) The name of the substantial shareholder making the disclosure;
- (f) The number of shares that the substantial shareholder controlled before the notice;
- (g) The percentage of shares that the substantial shareholder controlled before the notice;
- (h) The number of shares that the substantial shareholder controlled after the notice;
- (i) The percentage of shares that the substantial shareholder controlled after the notice;

⁷ Where a number of transactions occurred before a disclosure was required, the last transaction date before the disclosure is noted.

- (j) The total number of shares outstanding in the company that is traded;
- (k) Details of the consideration involved in the transaction(s);
- (1) Additional notes on the nature of the transaction;⁸

Although information on all three types of substantial shareholder disclosures was collected, our analysis focuses primarily on the 'notice of initial substantial holder' and 'notice of ceasing to be a substantial holder' subsets of the data. We concentrate on these announcements as they are major signals to the market, and as such will, more than likely, signal some information advantage.⁹ This is in contrast to the subset of 'notice of change of interests of substantial holder' announcements, which are more frequent and generally represent relatively small changes in holding. After excluding these more frequent announcements, we were left with approximately 6,500 records.

A number of exclusions had to be made from our initial dataset. We exclude all records where a holder becomes and ceases to be a substantial holder on the same trading day. Further, announcements of persons ceasing to be a substantial holder that were a direct effect of the issue of new shares are removed from the sample.¹⁰ Additionally, we exclude notices where the announcement date or transaction date was not available. In cases where multiple announcements disclose the same event, we take the earliest announcement date, and exclude the later announcements to avoid any look-back bias. Finally, incomplete announcements and disclosures with suspicious numbers were discarded rather than manually verified.¹¹ After these filters were applied, we were left with a final sample of 5,553 notices, consisting of 3,564 notices of initial substantial holders (purchases) and 1,989 notices of holders ceasing to be substantial shareholders.

4.2. CHESS data

⁸ Additional text on the nature of the transaction was noted where the transaction was not undertaken in the ordinary course of trading on ASX, for example, a takeover offer, option exercise or a dividend reinvestment plan.

⁹ Hasbrouck (1991) concludes that large trades indicate an increased likelihood that an information event has occurred. Additionally, as per Easley and O'Hara (1987) a large change in shareholding is likely to be a signal of some information.

¹⁰ Twenty-three notices were a direct result of the firm issuing new shares, thus causing the holder's percentage to fall below five percent, even though the absolute holding of the shareholder remained unchanged.

¹¹ A number of announcements were removed due to suspicious numbers. The majority of these were a sequence of notices that did not seem sensible. For example a sequence of initial substantial holder notices

The CHESS register reports the daily shareholdings in ASX listed companies for all investors. As the electronic register represents official ownership certificates, the data are very reliable and essentially free of errors. This database is, to our knowledge, the most comprehensive panel of institutional and retail holdings made available to researchers on a major market anywhere in the world.

Although recently a number of researchers have had access to the central register of shareholdings for Finnish stocks (see Grinblatt and Keloharju (2000)) the Helsinki stock exchange is small by world standards with a total market capitalisation in 1995 of only 200 billion FIM (5FIM \approx 1 USD).

CHESS ownership data is provided by ASX since the inception of CHESS on 1 September 1995 until 1 September 2000. As detailed previously, CHESS holders are identified by a HIN. In order to protect the true identity of holders in the register, we are given HINs that are disguised.¹² We are also provided with a two-digit classification number that identifies the type of shareholder. This number is assigned to each account after examining the relevant holder's postcode and searching for letter strings within the name of the holder.¹³

Another unique feature of our database is that we have access to retail and institutional holdings on a daily basis. The data details the opening and closing balance of each HIN account on each day that the holder traded. To reconstruct daily closing balances for the entire register over the period 1 September 1995 to 1 September 2000 we forward fill the closing balance from the day on which the holder traded until the next day a trade was executed. Additionally, if the trade is the first for the holder in the sample period, we fill the opening balance back until the listing date of the firm.

5. Research Methodology

5.1. The level of informed trading in the register

do not make sense if there are no notices in between that indicate the holder ceased to be a substantial shareholder.

¹² If a particular shareholder owns shares in BHP and ANZ and thus has the same real HIN, the numerical value of disguised HIN will be the same.

¹³ The first digit is either a 1 or a 2, with a 1 representing domestic investors, and a 2 for foreign investors. The second digit is in the range from 1 to 9. These nine categories are: Banks (1), Other Deposit Taking Institutions (2), Nominee Companies (3), Insurance Companies (4), Superannuation Funds (5), Trusts (6), Government Owned Organisations (7), Other Incorporated Companies (8) and Individuals (9). Thus the code 25 would be a foreign superannuation fund.

5.1.1. Hypotheses development

The brief survey of the market efficiency literature presented in section 3 implies that for a market with endogenous acquisition of information to exist, it must be the case that prices do not reveal all private information of the 'informed'. Underlying this assertion is the premise that in equilibrium those agents who have acquired information are better informed than those who have not. This gives rise to an empirically testable proposition, namely, that informed traders are able to profit on their information acquisition activities and thus realise superior rates of return than the market. Hence, we expect:

H1: Firms with more informed share registers will exhibit superior share market performance.

Additionally, due to their superior information, informed agents will be able to select stocks which are undervalued and invest in such firms prior to an increase in price. Thus we predict:

H2: The 'informativeness' of the share register will increase prior to the realisation of superior share market performance.

5.1.2. Measuring the 'informativeness' of the share register

To test the hypotheses detailed above we develop a number of metrics to proxy for the level of informed trading in the share register. As the literature offers little guidance on to the most appropriate method to measure the informativeness of the register, we measure informativeness across a number of dimensions. We develop these metrics based on the premise that large investments in a firm are more likely to be informationally motivated than smaller investments. This is because large investments represent larger accumulations of wealth, and thus such positions are likely to be based on some information advantage.

We develop the following metrics to measure the informativeness of the share register:

Proportion held by the biggest 1, 2, 5, 10 and 20 shareholders

To determine the degree to which ownership is concentrated in the share register, we calculate the proportion of total shares held by the biggest 1, 2, 5, 10 and 20 shareholders in each firm.¹⁴ These

¹⁴ For the purposes of measuring ownership concentration, we do not examine ownership interests beyond the largest 20, as the 20 biggest shareholders establishes a "workable outer limit [beyond which] it is

measures of ownership concentration have been utilised extensively in the literature beginning with Demsetz and Lehn (1985) who were among the first to empirically examine the structure of corporate ownership.

We examine the degree to which ownership is concentrated as it provides a useful measure of the level of informed trading in the register. This is based on the premise that informed investors will invest more of their portfolio in firms which they expect will have high future returns. This idea has been used previously in the literature and forms the basis of much of the recent mutual fund literature which utilises fund holding data to examine whether fund managers possess any stock-selection talents.¹⁵

Proportion held by blockholders with at least 2.5%, 5% and 7.5%

In addition to the proportion of shares owned by the biggest shareholders in the register, we also measure the proportion of the firm's stock held by blockholders who own at least 2.5, 5 or 7.5 percent of the firm.

Herfindahl index

The measures of concentration detailed above focus primarily on the holdings of the largest shareholders in the firm. To examine the concentration of the entire share register we utilise another common measure of concentration, the Herfindahl index. This measure provides a summary of the entire share register and allows us to determine the extent to which a small number of shareholders account for a high proportion of share ownership in the firm. We compute the Herfindhal index for the entire register according to the following formula:

Herfindahl Index =
$$\frac{\sum_{i=1}^{N} x_i^2}{\left(\sum_{i=1}^{N} x_i\right)^2}$$

Where: x_i is the number of shares held by the *i*th shareholder

difficult to interpret the measure as a meaningful index of ownership concentration" (Demsetz and Lehn (1985), p 1163).

¹⁵ For example, Chen, Jegadeesh and Wermers (2000) argue that if mutual fund managers are more informed than the market, then one would expect these managers would invest a greater proportion of their portfolios in stocks that have higher future returns than other stocks.

N is the total number of shareholders in the register

We calculate the above Herfindahl index to provide a summary measure of the entire register and two variations. In variation number one, we calculate the Herfindahl index for the largest one third of shareholders, and in variation number two, we compute the Herfindahl index for the largest two thirds shareholders in the register.

Proportion held by foreign and domestic investors

Brennan and Cao (1997) present a theoretical model as well as empirical evidence which supports the view that foreign investors pursue momentum strategies and achieve inferior performance because they are less informed than domestic investors. In contrast, Grinblatt and Keloharju (2000) argue that foreign investors in the Finnish market are more sophisticated than domestic investors. They find that foreign investors are well capitalised foreign financial institutions with a long history of successful investment in other stock markets and that these investors follow momentum strategies which have positive average performance. Thus it is unclear whether an increase in the proportion of foreign investors compared to domestic investors will result in an increase in the informativeness of the share register.

Proportion held by investor categories

The ASX provides us with nine codes which identify the category of investor. However, there appears to be noise in the various investor categories assigned by ASX (in particular in relation to the keyword searches) and thus we do not examine the proportions held by each separate investor category.¹⁶ Instead, we compute the metrics detailed in Table I.

The available evidence indicates that institutional investors are more likely to be informed than other types of investors.¹⁷ Further, it is unlikely that individual investors will be well informed. Barber and Odean (2000) conclude that trading unambiguously hurts investor performance. They find that gross returns earned by households are small and net returns are poor. Thus we expect that institutional investors are more likely to be informed than other investor groups. In the data provided by the ASX, investor categories 1 to 6 refer to institutional investors, categories 7, 8 and 9 represent government bodies, corporations and individuals respectively. We accumulate the holdings of each type of holder to mitigate the effect of any misclassification.

¹⁶ Investor categories are assigned to each holder by the ASX after searching for letter strings in the name of each holder.

Table I provides a summary of the 20 metrics that we use to measure the level of informed trading in the share register.

5.1.3. Methodology

The informativeness of the share register

We summarise the share register of each firm listed on the ASX on a daily basis from the inception of CHESS (1 September, 1995) until 30 September, 2000 by computing the metrics detailed above. In our analysis an informed register is one that is abnormally concentrated in relation to all other firms that comprise the market. In order to measure which firms have abnormally concentrated registers we define the benchmark level of each metric as the average value of that metric across all ASX listed firms. Specifically, we determine abnormal metrics on a daily basis over our sample period (1 September, 1995 to 30 September, 2000) according to the following formula:

Where: Abnormal $Metric_{it}$ is the abnormal metric value for firm *i* at time *t*

 $Metric_{it}$ is the abnormal metric value for firm *i* at time *t*

Average_t is the average value of the metric across all listed firms at time t^{18}

These 20 abnormal metrics provide proxy measures of the level of informed trading in the share register at a point in time.

Regression analysis

Interval estimation

Hypothesis H1 implies that a significant positive relationship will exist between the informativeness of the share register and share market returns. Thus we utilise regression analysis to determine the relationship between the abnormal metrics that were developed in section 5.1.2. and abnormal share market returns.

¹⁷ See sections 3.2.2 for evidence on the performance of institutional investors.

¹⁸ This average is computed across all other firms, thus firm i is not included in the average.

We condition our experiment around the lodgement 'notice of initial substantial holder' and 'notice of ceasing to be a substantial holder' announcements. Easley and O'Hara (1987) argue that large investments signal to the market that an information event has occurred.¹⁹ Indeed this proposition is confirmed by the literature which finds that there is a significant market response to substantial shareholder filings.²⁰ Additionally, as has been detailed previously, large shareholders (those owning more than ten percent of a firm) are termed as insiders for reporting purposes in the U.S.. This is because such large shareholders may have access to private information as a result of their insider status. Hence a majority of such portfolio adjustments will, more than likely, be motivated by some superior information rather than liquidity needs.²¹

We examine the relationship between abnormal returns and the informativeness of the register over the period -54 to +54 weeks surrounding each substantial shareholder announcement. Abnormal returns over each one-week interval are calculated using the zero-one variant of the market model as follows:

$$Abnormal \text{Return} = \ln\left(\frac{\text{closing price on last day} + \text{dividend}}{\text{closing price on first day}}\right) - \ln\left(\frac{\text{closing AOAI on last day}}{\text{closing AOAI on first day}}\right)$$
(2)

Where: *Closing AOAI* is the value of the All Ordinaries Accumulation Index at the close of trading

Closing price is the price at the close of trading *Dividend* is any dividend paid over the 5-day interval

Contemporaneous regression model

To determine if a positive and significant relationship exists between market returns and the informativeness of the share register at a point in time we estimate regressions of the following form:

Abnormal Return $t = \alpha + \beta \Delta Abnormal$ Metric $t + \varepsilon$ (3)

¹⁹ See also Hasbrouck (1991)

²⁰ See Mikkelson and Ruback (1985) and Holderness and Sheehan (1985) for evidence in the U.S. market and Bishop (1991) for Australian evidence.

²¹ It should also be noted that in Australia institutions will represent a large proportion of substantial shareholders. These institutions are likely to have an information advantage over other traders, as was demonstrated by Joye, da Silva Rosa, Jarnecic and Walter (2002).

Where: Abnormal Return_t is the abnormal return over interval t

 $\Delta A bnormal Metric_t$ is the change in each abnormal metric over interval t

The model presented in equation (3) is estimated separately for each of the 20 metrics. We pool each metric across firms in order to determine if the relationship between abnormal returns and our abnormal metrics is pervasive across all listed firms. Additionally, we estimate two sets of coefficients for each metric to incorporate potential changes in the model parameters pre and post each event. We utilise the approach of Newey and West (1987) to adjust the standard errors in the *t*-statistics to account for any heteroscedasticity and autocorrelation in the estimates.

Granger causality tests

Hypothesis H2 predicts that the informativeness of the share register will increase prior to a period of superior share market performance. This implies that changes in the share register will precede periods of abnormal returns, as there will be a rise in the level of informed trading in the share register before superior market performance.

In order to test this hypothesis, we adopt the Granger (1969) test of causality. This allows us to detect whether past changes in the series of abnormal register metrics precede current movements in abnormal returns. We estimate the following regressions:

Abnormal Return
$$_{t} = \alpha + \sum_{j=1}^{4} \beta_{j} Abnormal$$
 Return $_{t-j} + \sum_{k=1}^{4} \delta_{k} \Delta Abnormal$ Metric $_{t-k} + \varepsilon_{1t}$ (4)

$$\Delta Abnormal \quad Metric_{t} = \alpha + \sum_{j=1}^{4} \beta_{j} Abnormal \quad Return_{t-j} + \sum_{k=1}^{4} \delta_{k} \Delta Abnormal \quad Metric_{t-k} + \varepsilon_{2t} \quad (5)$$

Where: variables are defined as in equation (3).

As in the previous section, we estimate these models separately for each of the 20 abnormal metrics while pooling across firms and correcting for heteroscedasticity and autocorrelation with the Newey and West (1987) method.

Firm specific factors

In the above sections we estimate each regression model separately for each of the 20 metrics while pooling across firms. This approach assumes that the population regression coefficients are equal for all firms. Such an assumption may not be appropriate as it is likely that firm-specific factors will cause the regression coefficients to differ across firms, thus violating the implied assumption of equal regression coefficients across the population.²² To account for this possibility, rather than pooling across all firms in our sample, we estimate the regression models separately for each firm in our sample.

Thus we re-estimate contemporaneous regression model (3) separately for each abnormal metric and each firm.

Additionally, we re-estimate the Granger (1969) tests separately for each abnormal metric and for each firm. As in previous sections, these models are estimated pre and post each event while incorporating the Newey and West (1987) correction for heteroscedasticity and autocorrelation.

6. Results

6.1. Descriptive statistics

6.1.1. Substantial shareholder notices

Tables II and III present summary statistics for the population of substantial shareholder notices filed between 1 January 1996 and 30 June 1999.

Panel A of Table II presents the number of substantial shareholder disclosures through time. There are approximately twice as many acquisitions of substantial shareholding positions as disposals in each year of our sample period. This observation appears consistent with trends in ownership on the ASX. A bull market sentiment existed over our sample period, and thus it is reasonable to expect a greater number of purchases than sales during this time. Further, the level of institutional ownership has also increased over time, and institutional investors comprise the majority of substantial shareholders in the Australian marketplace.

Panel B of Table II details the reporting lag associated with all substantial shareholder disclosures in our sample period. We calculate the reporting lag as the number of days that elapse between

²² For further detail on why assuming all regression coefficients across individual units may not be appropriate when utilising panel data see Klein (1953, p211-225) and Swamy (1971, Ch. 1).

the date on which the shareholder became a substantial holder (the transaction date) and the date on which the announcement of the position was announced.²³ We find that the mean reporting lag for purchase and sale transactions is 19 and 14 days respectively, while the median reporting lag for purchases and sales is 5 and 4 days respectively. These results are affected by the presence of a number of outliers in the purchase and sale samples. The maximum reporting lag observed is 902 days for purchases and 890 days for sales. Although some of these large reporting lags may be the result of a clerical error in the substantial shareholder filing, it appears that the disclosure requirements of the *Companies Act* 1981 are not being strictly adhered to. The substantial shareholder notice be required to be filed within "two business days of becoming aware" of the change in holding. An average (median) reporting lag of 19 (5) days for purchase transactions implies that a number of investors do not become 'aware' of their change in holding for some time after the trades. Thus it appears that the disclosure requirements of the *Companies Act* 1981 are not being followed and enforced as strictly as required under law.

Table III depicts summary statistics on the size of each substantial shareholding in our sample period. Signal G transmits only a summary of the notice filed with the ASX. In the case of purchase transactions, the summary notice details the number and percentage of shares held by the substantial shareholder. However, the number and percentage of shares held by the substantial shareholder prior to a sale are not disclosed. Hence the number of observations used to estimate these summary statistics for sale transactions is small. The mean (median) percentage of shares that are held in an initial substantial shareholder position is 10.9% (6.82%). This is approximately equal to the 10.9% (mean) and 10.28% (median) percentage of shares held prior to the disposal of a substantial shareholder position.

6.1.2. The announcement effect associated with substantial shareholder disclosures

Table IV illustrates mean abnormal returns for all purchase and sale transactions over ten weekly intervals pre and post each announcement. These abnormal returns are measured using the zero-one variant of the market model.

There is evidence of a run-up in price leading up to all purchase announcements. It is clear that this increase in price begins around interval -6 where, on average, sample firms experience a statistically significant mean abnormal return of 0.4551%. In the ten intervals leading up to the

²³ We exclude all announcements that do not disclose a transaction date from this calculation. This results in the exclusion of 154 purchase announcements and 166 sale announcements from the reporting lag

each purchase announcement, sample firms experience a CAR of 1%. The abnormal returns in weeks -3, -2 and -1 are all significantly positive and total approximately 2%. Bishop (1991) finds a statistically significant market reaction of 7.74% in the month of the announcement and 3.01% in the month prior to each announcement. Thus, although statistically significant we find a much smaller market reaction leading up to each substantial shareholder announcement than Bishop (1991). This is unlikely to be a result of the different methods used to calculate returns in the present study and Bishop (1991). The most likely reason is the vastly different sample sizes in the two studies. We treat each substantial shareholder notice as an observation, and this results in some firms having multiple representations, albeit with different announcement dates. Bishop (1991) measures monthly abnormal returns associated with 111 substantial shareholder notices over 1972 to 1982 using the Scholes/Williams variant of the market model.

Thus there is a significant positive market reaction to announcements that disclose the acquisition of a substantial shareholding. This positive market reaction is mainly confined to the 30 trading days leading up to each announcement. The significant market reaction also implies that substantial shareholder purchase notices convey new information to the market place.

When one examines abnormal returns in Table IV in the 10-interval window surrounding sales, the run up in abnormal returns prior to each announcement is not statistically significant. Further, there is no evidence of a statistically significant market reaction to sale announcements. The only significant result is in week 2, where these is a significantly negative return of -0.53%. These results suggest that sale transactions do not reveal any new information to the market.

The contrasting market reaction to purchase and sale transactions is consistent with a number of findings in the literature. Nunn, Madden and Gombola (1983) suggest that sales may be undertaken for liquidity reasons, such as portfolio diversification and tax considerations, and thus there are reasons to expect periodic sales. They argue that purchases are more likely to be a profit motivated response to the analysis of either public or private information. Further, Lakonishok and Lee (1998) present results which suggest that purchases are more informed than sales in the context of insider trading. Additionally, much of the block trade literature argues that block purchases are more informative than block sales.²⁴ Hence it is reasonable to expect differing

calculations.

 $^{^{24}}$ Frino, Mollica and Walter (2003) show that the asymmetry in block sale and buys is due to bid-ask bounce.

market reactions to purchases and sales, as purchases are more likely to be informationally motivated than sales.

It should also be noted that, consistent with the 'stealth trading hypothesis' of Barclay and Warner (1993), it appears that the majority of substantial shareholder positions are acquired and disposed of through a series of smaller transactions.²⁵ On inspection of announcements prior to 30 August 1996 (full text Signal G announcements)²⁶, we observe that instead of trading in large blocks, substantial shareholders appear to undertake a series of medium sized trades in acquiring or disposing of their 5% stake in the firm. This series of trades prior to each disclosure provides a possible explanation for the run-up in price that is evident to substantial shareholder disclosures. Such trading behaviour will result a market reaction at the time of each trade leading up to the disclosure, and hence it is not surprising to observe an insignificant market reaction on the day of each announcement.²⁷

6.2. Regression analysis

6.2.1. The informativeness of the register Pooled analysis

Table V reports the results of contemporaneous pooled regression model (3) over the 54 weeks pre each event and Table VI reports the results of this pooled regression over the 54 weeks post each event.

It is clear from Table V that metrics which measure the proportion of shares held by the biggest holder (metric 1), as well as the biggest 2, 5 and 10 shareholders (metrics 2, 3, and 4) do not appear to be related to share market returns pre each event. The proportion held by the biggest 20 shareholders (metric 5) is positively related to abnormal returns at the 10% level of significance. Overall these results indicate no strong relationship between share market returns and informed trading in the register in the period leading up to each event.

However, in the period following each event there is evidence of a statistically significant relationship between abnormal returns and the proportion held by the biggest shareholder. The

²⁵ Barclay and Warner (1993) argue that informed traders will attempt to hide their trades by trading small parcels in a number of different transactions. ²⁶ Full text announcements disclose the trade history of each substantial shareholder. This includes

transaction dates, the number of shares traded and the price at which each transaction occurred.

coefficients of the proportion held by the biggest 5, 10 and 20 shareholders are significant at the 5%, 1% and 0.1% levels of significance respectively. Further, these coefficients are all positive. These results suggest that of firms which exhibit better performance than the market have more informed registers and thus provides some preliminary evidence that informed traders are able to recoup their information search costs.

It is interesting to note the asymmetry in results pre and post each event for those metrics that measure the proportion held by the biggest shareholders. This asymmetry in results suggests that the main structural changes in the relationship between the share register and abnormal market returns occur after substantial shareholder announcements. This structural change may arise after each event as the market is more informed than it was prior to the substantial shareholder disclosure. However, this does not explain why our results are different in the pre-event and post-event period, as we expect that informed investors will act on many diverse pieces of information and move in and out of the share register accordingly. Thus, this asymmetry in our results pre and post-each disclosure has no obvious explanation.

The results for the proportion of shares held by blockholders with at least 5% (metric 7) and 7.5% (metric 8) are similar to those for the metrics discussed above. We find that in general there is no significant relationship between share market returns and these measures of informed trading in the register 54 weeks pre and post each event. However, the proportion held by blockholders with at least 2.5% of the firm (metric 6) is positively and significantly related to abnormal returns at the 5% level in the pre-event period and at the 10% level in the post-event period. This is perhaps a better proxy for the level of informed trading in the register than a simple proportion held by the biggest shareholders, because the proportion held by the biggest shareholders may not represent a large investment in a firm with a very diffuse ownership structure. However, it is surprising that the relationship between abnormal returns and the set of blockholder metrics is only significant for blockholders with at least 2.5% of the firm. One would expect that a holding of 5% or 7.5% in a firm is more likely to be informationally motivated than a 2.5% holding.²⁸

²⁷ In future work we hope to examine the short-term profitability of this series of smaller trades leading up to each substantial shareholder notice.

 $^{^{28}}$ We attempt to explain these conflicting results in the sensitivity analysis section of this paper by partitioning our sample on the basis of size in order to distinguish between 2.5% holdings in small firms and large firms.

The results for the Herfindahl index based on the entire share register (metric 9) indicates no significant relationship between abnormal returns and share market returns in the period before and after each event. The results for metrics 10 and 11 indicate an insignificant relationship between abnormal returns and the share register in the pre period. However, in the post period, metrics 10 and 11 are positively and significantly related to abnormal returns at the 10% level of significance. This suggests that firms that perform well in the share market have registers which are more concentrated among the top one-third and top two-thirds of shareholders. However, as with metrics 3, 4, and 5, this asymmetry in results pre and post each event defies explanation.

The proportion of foreign ownership in the register (metric 12) is significantly related to abnormal returns in both the pre-event and post-event periods. However, the relationship is negative in the pre period and positive in the post period. As detailed previously it is unclear whether an increase in foreign ownership represents an increase in the level of informed trading in the register, hence we do not offer any expectations on the nature of the relationship between this metric and abnormal returns. However, the differing sign of the relationship around each event suggests that this result is unreliable. This is possibly due to noise in the method used to assign foreign and domestic investor codes to the HINs in the register. Foreign and domestic investor category codes are assigned to HINs on the basis of the relations of each holder. This process is unreliable because a foreign investor utilising a domestic mailing address will be assigned a domestic investor category. Hence, it is not surprising to observe strange and conflicting results from regressions that utilise metric 12.

When we measure the informativeness of the share register utilising the proportions held by investor categories we find that generally there is a significant positive relationship between changes in the share register and abnormal returns. We find that the proportion held by investor category 1 (metric 13), investor categories 1 and 2 (metric 14), investor categories 1, 2 and 3 (metric 15), investor categories 1, 2, 3 and 4 (metric 16), investor categories 1, 2, 3, 4, and 5 (metric 17), investor categories 1, 2, 3, 4, 5 and 6 (metric 18), investor categories 1, 2, 3, 4, 5, 6 and 7 (metric 19) and investor categories 1, 2, 3, 4, 5, 6, 7 and 8 (metric 20) are all positively and significantly related to abnormal returns in the pre-event period. In the post-event period all of these metrics are significant except for metrics 13 and 14, which display an insignificant relationship with abnormal returns.²⁹ However, as noted previously, one should be cautious when

²⁹ The estimated coefficients and their standard errors are very large, possibly indicating that the change in the abnormal proportion of shares held by investor categories 1 and 2 are close to zero.

interpreting these results as there are problems in the individual investor category data provided by the ASX as it appears that there is some misclassification among groups 1 to 5. To overcome this problem we accumulate investor categories. Thus metric 17 represents the holdings of institutional investors in the register. Given that most recent evidence concludes that institutional investors are more likely to be informed than the market,³⁰ metric 17 provides a powerful gauge of the level of informed trading in the register. We find a significant positive relationship between metric 17 and abnormal returns, indicating that informed investors hold a greater proportion of firms which perform well in the share market.

Thus, in general we find that the level of informed trading in the register displays a positive and significant contemporaneous relationship with abnormal share market performance. This finding is consistent with hypothesis H1 and these results are especially strong in the post-event period. We find the strongest support for hypothesis H1 when we measure the informativeness of the share register with the proportion held by accumulated investor categories (metrics 13 to 20). There is also support our hypothesis from measures which examine the concentration in the register among the biggest holders (metrics 10 and 11) as well as metrics that examine the proportion of the firm held by blockholders (metric 6).

Table VI presents a summary of our Granger causality tests across each metric in the pre-event and post-event periods. It is clear from this table that, in general, we find only weak evidence for hypothesis H2. We find statistically significant evidence of returns preceding changes in the register in 16 cases (out of 40), while the register precedes the share market returns in only nine cases. Although we measure the informativeness of the share register across a number of dimensions, the results do not consistently show that informed traders are able to take positions in the share register prior to periods of superior share market performance. Overall the results seem to indicate that informed traders move in and out of the share register in response to abnormal market performance, rather than in anticipation of abnormal market performance.

Analysis taking into account firm-specific factors

The pooled analysis above assumes that the population regression coefficients are equal across all firms. In this section we relax this implicit assumption by estimating separate regressions for each firm, in order to establish whether our results are robust to the effects of firm specific factors.

³⁰ See Joye, da Silva Rosa, Jarnecic and Walter (2002).

We estimate regression model (3) in the pre-event and post-event periods. This involves the estimation of separate coefficients for approximately 1200 firms at each point in time. In order to determine whether there is a positive relationship between our register metrics and abnormal market performance, we calculate the average β across all these firms. We then test the null hypothesis that this average β is positive and significantly different from zero with a *t*-statistic which we calculate based on the distribution of the coefficients estimated for each firm.

The average β and *t*-statistic for each metric is presented in Table VII for the pre-event period and the post-event period. Table VII illustrates that in the pre-event period metrics 3 and 5 are, on average, positively and significantly related to abnormal returns at the 10% level of significance. Additionally metric 7 displays a positive and significant relationship with abnormal returns, suggesting that the proportion held by blockholders with at least 5% of the firm increases during periods of positive abnormal returns. Further, metrics 15 to 20 are all significant at the 0.1% level. These results are very similar to those from the pooled analysis in the pre-event period.

Table VII details our results over the post-event period and as in the pooled analysis, we find that there is an asymmetry in results pre and post each event. We find that metric 4 displays a positive and significant relationship with abnormal returns at the 10% level of significance. Additionally metrics 15 to 20 are all positively and significantly related to abnormal returns. All other metrics do not display a positive and significant relationship with abnormal returns with abnormal returns. As with the pre-event period, these findings are similar to our results over the post-event period in the pooled analysis.

In estimating the *t*-statistic in the above section we make the implicit assumption that the true distribution of the population coefficients is known. Such an approach may not be tenable. Thus we test the significance of our results utilising a different method based on the proportion of positive and significant coefficients in our regression output. As our hypothesis implies the existence of positive and significant coefficients in each of our regressions we examine how many of our models produce a positive and significant coefficient. We estimate separate regressions for each firm (approximately 1200) and for each metric. We then calculate the proportion of positive and significant coefficients, and the proportion of negative and significant coefficients that are obtained from each set of regressions. The results are not reported in detail, though in summary we find that for metrics 1 to 11, the proportions of positive and significant coefficients in approximately the same as the proportion of negative and significant coefficients in both the pre-event and post-event periods. There appear to be a greater proportion of positive and

significant than negative and significant coefficients for metric 12 pre and post each event. However, as detailed previously, this result is unreliable. In line with our previous findings, the results for metrics 13 to 20 indicate a much greater proportion of positive and significant rather than negative and significant coefficients. Overall, these results from these tests are largely similar to all our previous findings.

Granger causality tests

In the section above we estimate regressions for each firm in order to check the robustness of our results. We also conduct Granger tests on these firm-specific regressions. We then count the number of times lagged values of metric and return are significant for these regressions at three conventional levels of significance, namely 5%, 1% and 0.1%. However, due to the large volume of output that this process produces, we do not discuss these results in detail because as with the contemporaneous models detailed above, we find that our results for this section are very similar to those of the pooled analysis.

Summary of results regarding the informativeness of the share register

Hypothesis H1 implies that there should be a positive and significant relationship between the informativeness of the share register and abnormal share market performance at any point in time. In general we find evidence that is consistent with this hypothesis in the post-event period. When we measure the level of informed trading in the share register by examining the proportion held by accumulated investor categories (metrics 15 to 20), we find strong support for hypothesis H1. Further, metrics that examine the proportion held by blockholders (metric 6) and the concentration amongst the largest shareholders (metrics 10 and 11) all produce results which indicate that firms that perform well in the share market have more informed registers.

A possible reason for our conflicting results may stem from our research design. We measure the contemporaneous relationship between the level of informed trading in the register and abnormal returns over 5-day intervals. This interval may be too short to detect any strong relationship between the presence of informed traders in the share register and abnormal market performance. This is because the share of the register made up by informed traders is likely to build up gradually as informed traders are likely to trade in small to medium sized parcels in order to camouflage their trading activities.³¹ Hence it may be appropriate to also measure the

³¹ See the "stealth trading hypothesis" proposed by Barclay and Warner (1993).

contemporaneous relationship between the register and abnormal returns over a longer time interval.

Hypothesis H2 implies that informed investors will move into the share register before periods of positive abnormal returns, and move out of the share register prior to periods of below normal performance. However, the results of our Granger causality tests indicate only weak evidence for hypothesis H2 as we find no consistent evidence that informed investors are able to move into the share register before changes in abnormal returns. Overall the results suggest that informed traders move in and out of the share register in response to abnormal performance, rather than in anticipation of abnormal market performance.

7. Sensitivity analysis

In this section we test the sensitivity of our regression results with regards to the informativeness of the share register to various re-specifications of our models. We partition our results on the basis of purchase and sale notifications, industry, and company size (only summary results are reported). We also report, again in summary, the results of tests that use an alternative method of defining whether a share register change is abnormal.

7.1. Partitions

7.1.1. Purchases versus sales partition

It section 6.1.2 we find that the market reacts differently to the announcement of a substantial shareholder acquisitions and disposals. The results suggest that purchase transactions convey more information to the market than sales.

Tables VIII and IX present our partitioned results for contemporaneous regression model (3) in the pre-event and post-event periods. In the pre-event period, we find that metrics 1 and 2 display a positive and significant relationship with abnormal returns only leading up to purchase transactions and not to sales. This result is different from that for the entire sample where we find that in the pre-event period metrics 1 and 2 are unrelated to abnormal returns. However, in the post event period, this result is reversed and there appears to be no relationship between abnormal returns and the share register for either purchase or sale transactions when we utilise metrics 1 and 2. These results are consistent with our tests on the entire sample. Also consistent with our main findings are the results for metrics 4 and 5 in the post-event period, where we find that these metrics are positively and significantly related to abnormal returns. However, the results are not sensitive to the type of transaction as both metrics display a significant relationship with abnormal returns for both purchases and sale announcements.

In the pre-event period we find that the proportion held by blockholders with at least 2.5% of the firm (metric 6) is significantly related to abnormal returns at the 5% level. This suggests that the observed positive relationship between this metric and abnormal returns observed in our main results are driven by trading in the period prior to sale announcements. However, in the post-event period we find that metric 6 is significantly related to abnormal returns for both purchase and sale transactions. Additionally we find that metrics 15 to 20 display a positive and significant relationship with abnormal returns in the pre-event and post-event period, and this result is not sensitive to the nature of the substantial shareholder announcement.

Thus we find that the results reported in the main body of this paper are not driven by relationships which hold for only purchase or sale transactions. Hence we conclude that, although there is a different market reaction to substantial shareholder purchases and sales, our regression results are not sensitive to the type of substantial shareholder disclosure.

7.1.2. Industry partition

The level of information asymmetry in the market is likely to vary systematically within industry groups and thus, one may expect different relationships to hold within different industry groups. Further, Demsetz and Lehn (1985) suggest that the industry that a firm operates in is empirically significant in explaining the variation in ownership structure.³² Thus, to determine if the relationship between share market returns and the informativeness of the share register is dependent on the type of industry in which the firm operates, we partition our tests on the basis of industry. We obtain industry code data for each firm in our sample as of the event date and divide the sample into three industry groups, namely, natural resources, financial services and all other firms.

Table X and XI present the results of our industry partitioned contemporaneous regression analysis in the pre-event and post-event periods respectively. Unlike our findings when we partition on the basis of purchases and sales, we find that the observed relationship between the informativeness of the share register and abnormal returns in section 6 is, to a degree, related to the industry that the firm operates in. We find that generally there is a positive and significant relationship between the informativeness of the register (when measured by metrics 15 to 20) and abnormal returns for firms operating in the natural resources industry and in industries other than financial services or natural resources. This result suggests that there is more informed trading in the natural resources industry than the financial services industry. Further, it is interesting to note that metric 8 (the proportion held by blockholders with at least 7.5% of the firm) displays a negative and significant relationship with abnormal returns only for financial services industry firms in the pre-event and post-event periods. This result is intriguing as it suggests that firms in the financial services sector that perform well have less informed share registers.

Thus in general it appears that, in general, the contemporaneous relationships between the informativeness of the share register and abnormal market returns are driven by trading in natural resources firms and firms other than those operating in the financial services industry. However, this conclusion is undermined by the fact that for metrics 15 to 20, the positive relationship between the informativeness of the share register and abnormal returns is not sensitive to the industry the firm operates in.

7.1.3. Size partition

The relationship between the informativeness of the share register and share market returns is likely to vary depending on the size of the firm. The level of information production for large firms is higher than that for small firms. This implies that information asymmetries are larger for firms with smaller market values.³³ Further the shares of larger firms are likely to be more widely held by liquidity traders. The relative proportion of informed traders is likely to be higher in smaller firms, and hence the level of informed trading in the share register is likely to vary systematically with firm size.

Further, the metrics which we utilise to gauge the informativeness of the share register all measure concentration by examining the proportion of shares held by certain groups of shareholders. However, such an approach does not take fully take into account for the size each individual holding. For example, a blockholding of 2.5% in a small firm with a market capitalisation of \$1 million is very different from a blockholding of 2.5% in a large firm with a

³² Demsetz and Lehn (1985) find that whether or not the firm is a financial institution or a regulated utility, or whether the firm operates in the mass media or sports industry are significant determinants of ownership structure.

³³ See Hasbrouck (1991) for empirical evidence on this point.

market capitalisation of \$1 billion. The latter investment is more likely to be based on some information than a similar percentage holding in a small firm due to the large amount of money that is required to acquire such a holding. By partitioning on the basis of firm size, we are able to differentiate between shareholdings that represent large and small dollar investments in the firm.

We partition our regression analysis on the basis of firm size by ranking all firms subject to a substantial shareholder disclosure by their market capitalisation 1 month prior to the announcement date. The events are then divided into quartiles and the regression models estimated separately for each of these size quartiles. The results for our size partitioned contemporaneous regression models in the pre-event and post-event periods are, in summary, as follows.

In the pre-event period we find that a positive and significant relationship exists between our register metrics and abnormal market performance. Metrics 4 and 5 display positive and significant relationships with abnormal returns (at the 5% and 1% level of significance respectively) for the largest firms in our sample. These findings are consistent with hypothesis H1 as they suggest that firms with better performance have more informed registers. Further, the proportion held by blockholders with at least 2.5% and 7.5% of the firm (metrics 7 and 8) are positively and significantly related to abnormal returns. As detailed previously, the proportion held by blockholders in large firms is a powerful proxy for the presence of informed traders in the share register as these blockholdings represent vast amounts of money, and thus on average, they are likely to be informationally motivated positions. Observing a positive and significant relationship between the number of shares held by blockholders in the largest firms and abnormal returns provides us with strong evidence in support of hypothesis H1, namely that there is a higher level of informed trading in firms that perform well. This suggests that informed traders are able to realise superior returns than the market. Additionally the relationships between metrics 15 to 20 and abnormal returns appear to hold for the largest firms, thus supporting hypothesis H1.

In the post period we find evidence that is largely consistent with those for the pre-event period. We find that metrics 4 and 5 display a positive and significant relationship with abnormal returns at the 0.1% level of significance for the largest firms. This provides us with strong evidence in support of our hypothesis, and suggests that informed traders are able to earn compensation for their costly information search.

It is also interesting to note that a number of metrics in the pre-event and post-event periods are significant for the smallest firms as well as the largest firms. For example, metrics 4, 5 and 7 are all significantly related to abnormal returns in the pre-event period. However, the nature of this relationship is negative. This suggests that smaller firms that perform well in the share market have registers that are less informed. However, one should be cautious in concluding that this is evidence inconsistent with hypothesis H1. This is because metrics 4, 5 and 7 measured in the smallest firms is unlikely to provide a useful gauge for the presence of informed traders in the register. This is because the dollar value of the investments of the top 10 or 20 shareholders, is likely to be small, and thus such an investment position is less likely to be informationally motivated.

7.2. Abnormal metrics and the impact of size

In the body of this paper we develop a number of metrics which proxy for the informativeness of the share register. We define an 'informed' register as one that is abnormally concentrated when compared to all other listed firms. In computing this measure of abnormal concentration, we compare the value of each metric to the average value of the particular metric across all other firms in the market. Thus we set the benchmark level of informativeness to be the average concentration across all firms. This approach rests on the assumption that concentration in the share register does not vary systematically across different firms with different characteristics. However, there are reasons to believe that this implied assumption underlying our analysis is not strictly valid.

Demsetz and Lehn (1985) highlight that "the larger is the competitively viable size [of the firm], *ceteris paribus*, the larger is the firm's capital resources and, generally, the greater is the market value of a given fraction of ownership".³⁴ They argue that this higher price of a given fraction of the firm will reduce the degree to which ownership is concentrated.³⁵ This implies that larger firms will have more diffuse ownership structures and that ownership concentration may vary systematically with size. Such a result casts doubt on the validity of our assumption that concentration does not vary across firms with different characteristics.

Additionally, there is now a large body of evidence that analyses the trading activity of institutional investors and the results from this field of research raise a number of issues relevant

³⁴ Demsetz and Lehn (1985, p1158)

to our analysis. Gompers and Metrick (1998) find that large institutions, when compared with other investors, prefer to invest in stocks that have greater market capitalisations, are more liquid and have higher book to market ratios. This is consistent with previous findings in the literature, such as Lakonoshok, Shleifer, and Vishny (1992) who find that over 95% of pension fund trading in concentrated in large stocks (those in the top two quintiles by market capitalisation). Such behaviour on the part of these large investors implies that concentration will vary with firm characteristics such as size and book to market ratios.

To correct for ownership concentration varying systematically with firm size we reformulate the benchmark utilised to compute the abnormal measures of informativeness. As the informativeness of the register is likely to behave similarly within groups of firms with comparable size, we redefine the benchmark concentration for each firm. This new benchmark is defined to be the average across all other firms in the same size quartile as the firm being examined. We classify firms into size quartiles based on the market capitalisation of all listed firms as at 1 January each year from 1995 to 2000. This process allows for a reclassification of the firms each year and thus ensures that the informativeness of the share register is determined with reference to other firms of similar size.

The output for contemporaneous regression model (3) utilising these abnormal metrics with redefined benchmarks is summarised for the pre-event period and the post-event period. In the pre-event period we find that metric 6 is negatively and significantly related to abnormal returns. This result is the opposite of those reported in the body of this paper. This is surprising, as such a result suggests that there are less informed investors present in the registers of firms that perform well in the share market. However, metrics 15 to 20 continue to display a positive and significant relationship with abnormal returns in the pre-event period. This result is consistent with our prior findings and hypothesis H1.

We find also find results that conflict with our prior findings in the post-event period. Unlike in any of our previous tests we find that metrics 1 to 7 are all negatively and significantly related to abnormal returns in the post event period. Additionally, metrics 10 and 11 display a negative and significant relationship with abnormal returns. These results suggest that firms with superior share market performance have less informed registers. As with the pre-event period and in

³⁵ Demsetz and Lehn (1985) confirm this proposition empirically as the find that the size of the firm, measured by the market value of equity, is negatively and significantly related to ownership concentration.

previous results, we find that metrics 15 to 20 are positively and significantly related to abnormal returns.

However, although this preliminary evidence utilising metrics with redefined benchmarks suggests some evidence that is inconsistent with hypothesis H1, we are reluctant to conclude that the informativeness of the register is not positively related to abnormal market performance. As detailed in section 7.1.3, partitioning our tests on the basis of size provides a powerful gauge of the level of informed trading in the register. It may be the case that the results for small firms drive the observed findings for the redefined benchmarks with regards to metrics 1 to 11.

8. Conclusions and future research

8.1 Summary of findings

In this paper we attempt to provide evidence to support the general prediction that informed investors realise superior returns than other investors, and thus that these investors receive compensation for their costly information search. This paper is one of the first to attempt to empirically examine, analyse and compare the performance of informed traders against the market. Due to data limitations, previous work in this field has only been able to investigate the performance of small groups of investors who are likely to be informed, such as risk arbitrageurs, mutual funds and institutional funds. However, unlike this previous literature, we have access to a unique panel of institutional and retail ownership records that allows for the examination of the performance of all groups of investors that are likely to be informed. Utilising this unique dataset, we are able to develop powerful measures that capture and benchmark abnormal changes in the share register across a number of dimensions and we believe that these measures provide us with the most accurate method to date of identifying the presence of informed investors in the share register.

In general we find some evidence that the level of informed trading in the share register displays a positive and significant contemporaneous relationship with abnormal share market performance. We find evidence of this when we examine the concentration in register among the biggest shareholders, as well as the proportion of shares held by blockholders with at least 2.5% of the firm. These results suggest that informed investors are able to take positions in firms that realise abnormal market performance. Thus this study is one of the first to provide evidence that informed investors are able to realise superior market returns and recoup their information

acquisition costs. However, it should be noted that these results are not consistent across all our measures of the level of informed trading in the share register. Further there is an asymmetry in our results pre and post the lodgement of substantial shareholder notices. This asymmetry in results has no obvious explanation and it is the subject of ongoing research.

We find only weak evidence in support of the proposition that informed investors, due to their information advantage are able to take positions in firms prior to periods of abnormal share market performance. Although we measure the presence of informed traders in the share register across a number of dimensions, our results do not consistently indicate that informed investors are able to anticipate periods of abnormal returns. Overall our results suggest that informed traders move in and out of the share register in response to abnormal market performance, rather than in anticipation of abnormal market performance.

Our findings appear to be robust to the effects of firm specific factors as we observe similar results when we when we pool our tests across all firms and estimate our regression models separately for each firm. Further, we find that the relationships we observe between the share register and abnormal returns are not sensitive to the type of transaction (purchase or sale) under examination or the industry group to which the firm belongs. However, the results indicate that our findings are sensitive firm size. We find that the positive relationship between the level of informed trading in the share register and abnormal returns predominantly holds for large firms. This suggests strong support for the proposition that informed traders are able to recover their information acquisition costs.

In addition to the relationship between the level of informed trading in the share register and abnormal returns, we also examine the relationship between structural changes in the share register and abnormal returns. We find that structural changes in the share register are related to abnormal returns following substantial shareholder disclosures. When abnormal returns are positive, there is a negative and significant relationship between abnormal returns and structural change in the share register. When abnormal returns are negative, the relationship is positive. These results suggest that investors tend to stick with 'winners' and move away from 'losers'. However, as with previous tests, there is an asymmetry in our results as the above relationships do not hold in the period leading up to substantial shareholder disclosures.

8.2 Suggestions for future research

There are a number of avenues for future research that arise from this paper. This paper utilises the zero-one variant of the market model to calculate abnormal returns. It may be more appropriate to utilise a much more thorough return calculation, such as the Fama-French 3 factor model in order to control for such things as size effects.

Avenues for future work also include examining the relationship between the share register and abnormal returns over longer intervals than one week, such as monthly or yearly intervals. This is because informed investors will attempt to camouflage their activities. Thus it is likely that informed investors will build up in the register over long periods of time. Hence, it is may be more appropriate to examine the relationship between the presence of informed traders in the register and abnormal returns over a period time longer than one week. Additionally, future work could address the asymmetry in our results over the pre-event and post-event periods.

In our sample a number of firms are subject to multiple substantial shareholder disclosures. Thus there are a number of overlapping time periods in our regression analysis. This may cloud the relationship between the share register and abnormal returns in the pre-event and post-event periods. In order to account for this, it may be worthwhile to select a sub sample of announcements that are the first for each firm over the sample period, and estimate our regression models pre and post this subset of events. This may provide an insight into the causes of the asymmetry in our results pre and post substantial shareholder disclosures.

In addition to the above, there are a number of future research directions that stem from the unique hand collected database of substantial shareholder filings utilised in this study. The database contains a summary of the population of substantial shareholder filings made to ASX over the period 1 January 1996 to 30 July 1999 and it is, to our knowledge, the most complete database of substantial shareholder disclosures in Australia. In the future researchers may wish to utilise this database to examine the announcement effect of these disclosures in a more thorough manner than the present study. Further, it may be interesting to examine the gaming behaviour associated with such disclosures. Other avenues for future research also include the intra-day impact of these substantial shareholder disclosures.

TABLE I

A summary of the metrics used to measure the informativeness of the share register

This table provides a summary of the 20 metrics used to measure the informativeness of the share register. A description of each of these metrics is provided in section 5.1.2. For ease of presentation, we will refer to these metrics by metric number in the body of the text.

Metric Number	Description
1	Proportion held by biggest holder
2	Proportion held by biggest 2
3	Proportion held by biggest 5
4	Proportion held by biggest 10
5	Proportion held by biggest 20
6	Proportion held by blockholders with at least 2.5%
7	Proportion held by blockholders with at least 5%
8	Proportion held by blockholders with at least 7.5%
9	Herfindahl index
10	Herfindahl index based on biggest 1/3 shareholders
11	Herfindahl index based on biggest 2/3 shareholders
12	Foreign versus Domestic
13	Proportion of shares held by category 1
14	Proportion of shares held by category 1,2
15	Proportion of shares held by category 1,2,3
16	Proportion of shares held by category 1,2,3,4
17	Proportion of shares held by category 1,2,3,4,5
18	Proportion of shares held by category 1,2,3,4,5,6
19	Proportion of shares held by category 1,2,3,4,5,6,7
20	Proportion of shares held by category 1,2,3,4,5,6,7,8

TABLE II

Summary statistics for the population of substantial shareholder disclosures announced between 1 January 1996 and 30 June 1999: Reporting lag and number through time

This table presents summary statistics for the population of substantial shareholder disclosures announced between 1 January 1996 and 30 June 1999. Purchase transactions refer to acquisitions of substantial shareholding positions which are disclosed by ASIC Form 603 'Notice of initial substantial holder'. Sale transactions refer to disposals of substantial shareholding positions which are disclosed by ASIC Form 603 'Notice of initial substantial holder'. Sale transactions refer to disposals of substantial holder'. Panel A presents the number of substantial shareholder disclosures through time. Panel B depicts the reporting lag associated with substantial shareholder disclosures. The reporting lag is defined as the number of days that elapse between the transaction date and the announcement date. Where the substantial shareholder position is acquired or disposed through a series of small transactions, the transaction date is taken to be the date of the last transaction in the sequence. Announcements that do not disclose a transaction date are excluded from the calculation of the reporting lag summary statistics.

A: Number of substantial shareholder disclosures through time						
	Purchases	Sales				
1/1/96 to 31/12/96	1059	583				
1/1/97 to 31/12/97	987	536				
1/1/98 to 31/12/98	1031	561				
1/1/99 to 30/06/99	467	309				
Total	3544	1989				
B: Reporting lag associated	with substantial share	holder disclosures				
	Purchases	Sales				
Mean reporting lag (days)	19	14				
Median reporting lag (days)	5	4				
Min reporting lag (days)	0	0				
Max reporting lag (days)	902	890				
Number of observations	3390	1823				

TABLE III

Summary statistics for the population of substantial shareholder disclosures announced between 1 January 1996 and 30 June 1999: Size of each holding

This table presents summary statistics for the population of substantial shareholder disclosures announced between 1 January 1996 and 30 June 1999. Purchase transactions refer to acquisitions of substantial shareholding positions which are disclosed by ASIC Form 603 'Notice of initial substantial holder'. Sale transactions refer to disposals of substantial shareholding positions that are disclosed by ASIC Form 605 'Notice of ceasing to be a substantial holder'. This table depicts statistics on the size of each substantial shareholding that is acquired and the size of each holding that is sold. We exclude 47 purchase announcements from these statistics as the size of the substantial shareholding is not disclosed in the announcement. We exclude such a large number of sale transactions from these statistics as after 30 August 1996, Signal G only transmits a summary of the notice filed with the ASX. This summary does not disclose the size of the holding prior to the sale. Thus we are only able to calculate statistics on the size of each substantial shareholding for disclosures made between 1 January 1996 and 30 August 1996.

Summary statistics on the size of each substantial shareholder position					
	Purchases	Sales			
Number of shares					
Mean	16,916,521	17,366,202			
Median	6,055,793	6,283,322			
Min	38,492	41,284			
Max	1,186,353,408	242,880,000			
Number of observations	3,497	70			
Percentage of total shares	Purchases	Sales			
Mean	10.90	10.28			
Median	6.82	7.10			
Min	5	5			
Max	100	45			
Number of observations	3497	70			

TABLE IV

The announcement effect associated with substantial shareholder disclosures announced between 1 January 1996 and 30 June 1999

This table presents the announcement effects associated with substantial shareholder disclosures announced between 1 January 1996 and 30 June 1999. Average abnormal returns are detailed over a -10 to 10 interval window. Intervals are defined relative to the announcement date and each interval comprises 5 trading days. Average abnormal returns are computed for each interval and abnormal returns are calculated as:

 $A bnormal Return = \ln \left(\frac{closing \ price \ on \ last \ day \ of \ interval + dividend}{closing \ price \ on \ first \ day \ of \ interval} \right) - \ln \left(\frac{closing \ AOAI \ on \ last \ day \ of \ interval}{closing \ AOAI \ on \ first \ day \ of \ interval} \right)$

Student t-statistics indicating whether the mean return is significantly different from zero are calculated as:

t – statistic. = –	Average abnormal return _t
t statistic _t –	Variance _t
1	Number of observations _t -1

Purchases					S	Sales				
Interval	Mean % Abnor Ret	<i>t</i> statistic		CAR %	Number of obs	Mean % Abnor Ret	<i>t</i> statistic		CAR %	Number of obs
-10	-0.5683	-3.6119	**	-0.5683	3031	-0.2995	-1.4191		-0.2995	1881
-9	-0.1816	-1.3009		-0.7499	3036	-0.0711	-0.4458		-0.3706	1881
-8	-0.5983	-3.0419	**	-1.3482	3042	-0.2143	-1.2420		-0.5849	1881
-7	0.1563	0.8560		-1.1919	3055	-0.1757	-0.8909		-0.7606	1886
-6	0.4551	2.6424	**	-0.7368	3066	0.1425	0.7492		-0.6181	1890
-5	0.0173	0.1188		-0.7195	3078	0.0116	0.0700		-0.6065	1891
-4	-0.4092	-2.9565	**	-1.1287	3094	0.3599	1.6768		-0.2466	1895
-3	0.3744	2.5130	**	-0.7543	3100	0.2996	1.6758		0.0530	1896
-2	0.6044	3.8942	**	-0.1499	3129	0.171	0.8957		0.2240	1902
-1	1.1279	5.7467	**	0.9780	3186	0.3412	1.6620		0.5652	1907
1	0.0428	0.3151		1.0208	3397	0.0288	0.1557		0.5940	1913
2	-0.4232	-3.0517	**	0.5976	3409	-0.5322	-3.2484	**	0.0618	1913
3	-0.3394	-2.6928	**	0.2582	3409	-0.2718	-1.7004		-0.2100	1914
4	-0.2353	-1.7953		0.0229	3410	-0.2124	-1.1672		-0.4224	1912
5	-0.3243	-2.3323	**	-0.3014	3411	-0.329	-1.9180		-0.7514	1912
6	-0.4262	-3.5496	**	-0.7276	3411	-0.3661	-2.0433		-1.1175	1913
7	-0.5121	-3.9348	**	-1.2397	3411	-0.3398	-1.9834		-1.4573	1913
8	-0.3407	-2.5900	**	-1.5804	3410	-0.1176	-0.6567		-1.5749	1913
9	-0.3053	-2.0741	**	-1.8857	3410	-0.0841	-0.5141		-1.6590	1913
10	-0.4864	-3.0977	**	-2.3721	3412	-0.1868	-0.7961		-1.8458	1913

** indicates significance at the 1% level.

TABLE V

The informativeness of the share register: Results for contemporaneous pooled regression model (3) over the pre-event and post-event periods

This table reports the results for contemporaneous pooled regression model (3) over the pre-event period. The model estimated is as follows while pooling across all firms and correcting for heteroscedasticity and autocorrelation with the method of Newey and West (1987):

Abnormal Return_t = $\alpha + \beta \Delta A bnormal Metric_t + \varepsilon$ (3)

Where *Abnormal Return*_t is the abnormal return over interval t and $\Delta Abnormal Metric_t$ is the change in each abnormal metric over interval t. The above model is estimated separately for each of the 20 abnormal metrics that we develop to summarise the informativeness of the share register.

	Pre- Event				Post- Event			
Metric	Period Estimate	Standard Error	t statistic	p value	Period Estimate	Standard Error	t statistic	p value
1	0.0041	0.0128	0.32	0.7522	0.0113	0.0059	1.9	0.0574
2	-0.0050	0.0104	-0.48	0.6325	0.0127	0.0067	1.89	0.0592
3	-0.0039	0.0124	-0.32	0.7519	0.0187	0.0087	2.16	0.0308 *
4	0.0141	0.0149	0.94	0.3456	0.0378	0.0119	3.19	0.0014 **
5	0.0333	0.0192	1.74	0.0823	0.0795	0.0169	4.72	0.0001 ***
6	0.0269	0.0129	2.08	0.0371 *	0.0182	0.0108	1.68	0.0923
7	0.0026	0.0097	0.26	0.7912	0.0083	0.0074	1.12	0.264
8	0.0024	0.0073	0.33	0.7381	0.0008	0.0060	0.14	0.8907
9	0.0035	0.0174	0.2	0.8417	0.0046	0.0059	0.79	0.4289
10	-0.0015	0.0047	-0.32	0.7467	0.0082	0.0048	1.73	0.0837
11	-0.0035	0.0105	-0.34	0.736	0.0089	0.0051	1.76	0.0783
12	-0.0007	0.0003	-2.3	0.0212 *	0.0013	0.0006	2.17	0.0302 *
13	0.1526	0.0385	3.97	0.0001 ***	0.0393	0.1128	0.35	0.7273
14	0.1523	0.0385	3.96	0.0001 ***	0.0406	0.1125	0.36	0.7179
15	0.0618	0.0100	6.25	0.0001 ***	0.1227	0.0103	11.91	0.0001 ***
16	0.0599	0.0100	5.98	0.0001 ***	0.1218	0.0097	12.56	0.0001 ***
17	0.0571	0.0102	5.57	0.0001 ***	0.1198	0.0097	12.37	0.0001 ***
18	0.0586	0.0108	5.42	0.0001 ***	0.1112	0.0095	11.64	0.0001 ***
19	0.0585	0.0108	5.41	0.0001 ***	0.1110	0.0095	11.63	0.0001 ***
20	0.1278	0.0218	5.85	0.0001 ***	0.2501	0.0239	10.48	0.0001 ***

* indicates significance at the 5% level, ** indicates significance at the 1% level, and *** indicates significance at the 0.1% level

TABLE VI

The informativeness of the share register: Summary of the results of Granger causality tests over the post-event period for the pooled analysis (models (4) and (5))

This table provides a summary of the results from the Granger causality tests for the pooled analysis. "Returns" refers to abnormal returns and "register" refers to the share register metrics that we develop to summarise the informativeness of the share register. "Independent" means that current values of abnormal returns *are not* related to past values of the register metrics, and that current values of the register metrics *are not* related to past values of abnormal returns. "Bi-lateral" means that current values of abnormal returns *are* related to past values of the register metrics, and that current values of the register metrics *are* related to past values of the register metrics, and that current values of the register metrics *are* related to past values of the register metrics, and that current values of the register metrics *are* related to past values of the register metrics.

	Pre	Post
Metric	Direction of Granger causality	Direction of Granger causality
1	Returns precede the register*	Register precedes returns**
2	Returns precede the register**	Independent
3	Returns precede the register**	Returns precede the register*
4	Returns precede the register**	Returns precede the register***
5	Returns precede the register [#]	Returns precede the register***
6	Returns precede the register**	Returns precede the register***
7	Returns precede the register**	Returns precede the register*
8	Returns precede the register*	Returns precede the register*
9	Returns precede the register***	Register precedes returns [#]
10	Register precedes returns**	Register precedes returns**
11	Returns precede the register*	Register precedes returns***
12	Independent	Bi-lateral
13	Register precedes returns*	Register precedes returns***
14	Register precedes returns*	Register precedes returns***
15	Bi-lateral	Bi-lateral
16	Bi-lateral	Bi-lateral
17	Bi-lateral	Bi-lateral
18	Bi-lateral	Bi-lateral
19	Bi-lateral	Bi-lateral
20	Bi-lateral	Bi-lateral

[#] indicates significance at the 10% level, * indicates significance at the 5% level, ** indicates significance at the 1% level, and *** indicates significance at the 0.1% level

TABLE VII

The informativeness of the share register: Results for contemporaneous regression model (6) over the pre-event and post-event periods (Average coefficient)

This table reports the results for contemporaneous regression model (3) over the pre-event period. We estimate separate regression models for all firms as follows correcting for heteroscedasticity and autocorrelation with the method of Newey and West (1987):

Abnormal Return_{it} =
$$\alpha_i + \beta_i \Delta Abnormal Metric_{it} + \varepsilon_i$$
 (6)

Where *Abnormal Return_{it}* is the abnormal return for firm *i* over interval *t* and $\Delta Abnormal Metric_{it}$ is the change in each abnormal metric for firm *i* over interval *t*. The above model is estimated separately for each firm in our sample and for each of the 20 abnormal metrics and that we develop to summarise the informativeness of the share register.

In this table we report the average of the β_i coefficients that we estimate for each firm. We then test the null hypothesis that this average β is positive and significantly different from zero with a *t*-statistic which we calculate based on the distribution of the coefficients estimated for each firm (this is a one-tailed test).

	Pre-event Period		Post-event Period	
Metric	Average	t-statistic	Average	t-statistic
1	-0.2495	-1.7699	0.2097	1.0265
2	-0.0660	-0.6546	-0.0394	-0.2073
3	0.0957	$1.3200^{\#}$	-0.1038	-0.8757
4	-0.0239	-0.2052	0.1650	1.4664 [#]
5	0.1355	1.2478#	0.1355	0.7022
6	-0.0053	-0.0928	-0.0053	-0.1160
7	0.0993	$1.4860^{\#}$	0.0993	0.8977
8	0.1326	0.5770	0.1326	1.1303
9	-0.0512	-0.2261	-0.0512	-0.1315
10	-0.0950	-0.9782	-0.0950	-0.9924
11	-0.2680	-1.5656	-0.2680	-1.5169
12	0.11360	0.2417	0.1136	0.6513
13	551.3945	17.2474***	551.3945	0.9416
14	-32.3963	-1.0099	-32.3963	-0.6777
15	0.2337	5.0019***	0.2337	3.4666***
16	0.2351	4.8357***	0.2351	3.4476***
17	0.2164	4.3685***	0.2164	3.3207***
18	0.2290	4.5660***	0.2290	3.4027***
19	0.2278	4.5231***	0.2278	3.4094***
20	0.6915	4.0877^{***}	0.6915	6 8576***

[#] indicates significance at the 10% level, * indicates significance at the 5% level, ** indicates significance at the 1% level, and *** indicates significance at the 0.1% level

TABLE VIII

The informativeness of the share register: Purchases and sales partition results for contemporaneous pooled regression model (3) over the pre-event period

This table reports the results for contemporaneous pooled regression model (3) over the pre-event period while partitioning on the basis of purchases and sales. The model estimated is as follows while pooling across all firms and correcting for heteroscedasticity and autocorrelation with the method of Newey and West (1987):

Abnormal Return_t = $\alpha + \beta \Delta Abnormal Metric_t + \varepsilon$ (3)

Where *Abnormal Return*_t is the abnormal return over interval t and $\Delta Abnormal Metric_t$ is the change in each abnormal metric over interval t. The above model is estimated separately for each of the 20 abnormal metrics that we develop to summarise the informativeness of the share register.

In the table below, Trade type 0 refers to purchase transactions and Trade type 1 refers to sale transactions.

			Standard			
Metric	Trade type	Estimate	Error	t statistic	p value	
1	0	0.0730	0.0321	2.27	0.0231	*
1	1	0.0039	0.0161	0.24	0.8084	
2	0	0.0610	0.0307	1.99	0.0467	*
2	1	0.0053	0.0181	0.30	0.7679	
3	0	0.0467	0.0315	1.49	0.1375	
3	1	-0.0141	0.0212	-0.66	0.5073	
4	0	0.0185	0.025	0.74	0.4604	
4	1	-0.0413	0.0258	-1.60	0.1085	
5	0	0.0146	0.0257	0.57	0.5713	
5	1	-0.0267	0.0365	-0.73	0.4641	
6	0	-0.0195	0.0162	-1.21	0.2278	
6	1	-0.0441	0.0225	-1.96	0.0500	*
7	0	0.0192	0.0179	1.07	0.2831	
7	1	-0.0197	0.0156	-1.26	0.2059	
8	0	0.0125	0.0197	0.63	0.5265	
8	1	-0.0182	0.0129	-1.41	0.1589	
9	0	0.1123	0.0488	2.30	0.0214	*
9	1	0.0011	0.0182	0.06	0.9533	
10	0	0.0005	0.00709	0.07	0.9456	
10	1	0.0040	0.00827	0.48	0.6293	
11	0	0.0493	0.0253	1.95	0.0515	
11	1	-0.0051	0.0126	-0.41	0.6839	
12	0	0.0004	0.00051	0.72	0.4686	
12	1	-0.0055	0.00476	-1.15	0.2517	

13	0	-0.0120	0.0586	-0.21	0.8374	
13	1	0.0141	0.0784	0.18	0.8574	
14	0	-0.0128	0.0585	-0.22	0.8274	
14	1	0.0148	0.0785	0.19	0.8506	
15	0	0.1500	0.0268	5.60	0.0001	***
15	1	0.0907	0.0166	5.48	0.0001	***
16	0	0.1543	0.0274	5.63	0.0001	***
16	1	0.0864	0.0165	5.22	0.0001	***
17	0	0.1590	0.0287	5.53	0.0001	***
17	1	0.0852	0.0169	5.06	0.0001	***
18	0	0.1680	0.0299	5.62	0.0001	***
18	1	0.0812	0.018	4.51	0.0001	***
19	0	0.1680	0.0299	5.62	0.0001	***
19	1	0.0811	0.018	4.50	0.0001	***
20	0	0.2446	0.0416	5.87	0.0001	***
20	1	0.1488	0.0356	4.18	0.0001	***

* indicates significance at the 5% level, ** indicates significance at the 1% level, and *** indicates significance at the 0.1% level

TABLE IX

The informativeness of the share register: Purchases and sales partition results for contemporaneous pooled regression model (3) over the post-event period

This table reports the results for contemporaneous pooled regression model (3) over the post-event period while partitioning on the basis of purchases and sales. The model estimated is as follows while pooling across all firms and correcting for heteroscedasticity and autocorrelation with the method of Newey and West (1987):

Abnormal Return_t = $\alpha + \beta \Delta Abnormal Metric_t + \varepsilon$ (3)

Where *Abnormal Return*_t is the abnormal return over interval t and $\Delta Abnormal Metric_t$ is the change in each abnormal metric over interval t. The above model is estimated separately for each of the 20 abnormal metrics that we develop to summarise the informativeness of the share register.

In the table below, Trade type 0 refers to purchase transactions and Trade type 1 refers to sale transactions.

			Standard			
Metric	Trade type	Estimate	Error	t statistic	p value	
1	0	-0.0105	0.0090	-1.17	0.2418	
1	1	-0.0194	0.0131	-1.49	0.1373	
2	0	-0.0081	0.0103	-0.78	0.4334	
2	1	-0.0205	0.0162	-1.27	0.2046	
3	0	-0.0215	0.0143	-1.50	0.1342	
3	1	-0.0476	0.0256	-1.86	0.0625	
4	0	-0.0588	0.0192	-3.06	0.0022	**
4	1	-0.1011	0.0409	-2.47	0.0135	*
5	0	-0.1057	0.0268	-3.94	0.0001	***
5	1	-0.1833	0.0654	-2.80	0.0051	**
6	0	-0.0710	0.0167	-4.26	0.0001	***
6	1	-0.0938	0.0331	-2.83	0.0046	**
7	0	-0.0204	0.0116	-1.75	0.0798	
7	1	-0.0426	0.0179	-2.37	0.0177	*
8	0	-0.013	0.0097	-1.34	0.1798	
8	1	-0.0169	0.0160	-1.06	0.2908	
9	0	0.0010	0.0086	0.12	0.9061	
9	1	-0.0072	0.0102	-0.71	0.4797	
10	0	-0.0136	0.0069	-1.99	0.0466	*
10	1	-0.0115	0.0128	-0.90	0.3707	
11	0	-0.006	0.0074	-0.81	0.4185	
11	1	-0.0104	0.0110	-0.95	0.3416	
12	0	-0.0017	0.0010	-1.74	0.0826	
12	1	0.0040	0.0026	1.56	0.1192	

13	0	0.0539	0.1127	0.48	0.6327	
13	1	-0.1149	0.1085	-1.06	0.2896	
14	0	0.0536	0.1126	0.48	0.6340	
14	1	-0.1257	0.1068	-1.18	0.2395	
15	0	0.1043	0.0102	10.2255	0.0001	***
15	1	0.0585	0.0130	4.5000	0.0001	***
16	0	0.0579	0.0104	5.5673	0.0001	***
16	1	-0.1020	0.0141	-7.2340	0.0001	***
17	0	0.0906	0.0105	8.6285	0.0001	***
17	1	-0.0730	0.0140	-5.2143	0.0001	***
18	0	0.0630	0.0101	6.2376	0.0001	***
18	1	-0.0770	0.0130	-5.9230	0.0001	***
19	0	0.0640	0.0101	6.3366	0.0001	***
19	1	-0.0780	0.0130	-6.0000	0.0001	***
20	0	0.4411	0.0202	21.8366	0.0001	***
20	1	0.3978	0.0386	10.3057	0.0001	***

* indicates significance at the 5% level, ** indicates significance at the 1% level, and *** indicates significance at the 0.1% level (the results for metric 15 to 20 need to be confirmed)

TABLE X

The informativeness of the share register: Industry partition results for contemporaneous pooled regression model (3) over the pre-event period

This table reports the results for contemporaneous pooled regression model (3) over the pre-event period while partitioning on the basis of industry. The model estimated is as follows while pooling across all firms and correcting for heteroscedasticity and autocorrelation with the method of Newey and West (1987):

Abnormal Return_t = $\alpha + \beta \Delta A bnormal Metric_t + \varepsilon$ (3)

Where *Abnormal Return*_t is the abnormal return over interval t and $\Delta Abnormal Metric_t$ is the change in each abnormal metric over interval t. The above model is estimated separately for each of the 20 abnormal metrics that we develop to summarise the informativeness of the share register.

In the table below, Industry group 1 refers to natural resources firms, Industry group 2 refers to financial services firms and Industry group 3 refers to all other firms.

			Standard			
Metric	Industry	Estimate	Error	t statistic	p value	
1	1	-0.0200	0.0200	-1.3800	0.1665	
1	2	0.0400	0.0200	2.0600	0.0389	*
1	3	0.0045	0.0100	0.2800	0.7829	
2	1	-0.0300	0.0200	-1.8300	0.0676	
2	2	0.0200	0.0100	1.4300	0.1538	
2	3	-0.0026	0.0100	-0.2000	0.8410	
3	1	-0.0400	0.0200	-1.9000	0.0568	
3	2	-0.0043	0.0200	-0.2000	0.8427	
3	3	0.0036	0.0100	0.2300	0.8157	
4	1	-0.0300	0.0200	-1.3800	0.1667	
4	2	-0.0200	0.0200	-0.9800	0.3283	
4	3	0.0200	0.0100	1.5500	0.1212	
5	1	-0.0200	0.0300	-0.8200	0.4141	
5	2	-0.0200	0.0200	-0.9500	0.3446	
5	3	0.0500	0.0200	2.2400	0.0254	*
6	1	0.0100	0.0200	0.5900	0.5579	
6	2	-0.0200	0.0100	-1.1400	0.2540	
6	3	0.0300	0.0100	2.1900	0.0287	*
7	1	0.0099	0.0100	0.6100	0.5447	
7	2	-0.0200	0.0100	-1.3900	0.1649	
7	3	0.0045	0.0100	0.3700	0.7131	
8	1	-0.0300	0.0100	-2.0400	0.0418	*
8	2	0.0100	0.0100	1.2100	0.2245	
8	3	0.0081	0.0089	0.9000	0.3668	

9	1	-0.0300	0.0200	-1.8300	0.0674	
9	2	0.0500	0.0200	1.9200	0.0547	
9	3	0.0054	0.0200	0.2400	0.8104	
10	1	-0.0100	0.0097	-1.2000	0.2300	
10	2	0.0016	0.0096	0.1700	0.8678	
10	3	-0.0001	0.0059	-0.0100	0.9885	
11	1	-0.0200	0.0200	-1.0400	0.2963	
11	2	0.0200	0.0100	1.6500	0.0984	
11	3	-0.0049	0.0100	-0.3800	0.7065	
12	1	-0.0080	0.0039	-2.0500	0.0401	*
12	2	-0.0700	0.0300	-2.1200	0.0342	*
12	3	-0.0004	0.0002	-2.0500	0.0408	*
13	1	-1.6300	0.7500	-2.1700	0.0303	*
13	2	-0.1900	0.6800	-0.2900	0.7754	
13	3	0.1700	0.0300	4.6600	0.0001	***
14	1	-1.6200	0.7500	-2.1600	0.0311	*
14	2	-0.1900	0.6800	-0.2900	0.7737	
14	3	0.1700	0.0300	4.6500	0.0001	***
15	1	0.0600	0.0200	2.6100	0.0091	**
15	2	0.0600	0.0100	3.4200	0.0006	***
15	3	0.0600	0.0100	4.9900	0.0001	***
16	1	0.0600	0.0200	2.5600	0.0105	*
16	2	0.0600	0.0100	3.6400	0.0003	***
16	3	0.0500	0.0100	4.6600	0.0001	***
17	1	0.0500	0.0200	2.4400	0.0145	*
17	2	0.0600	0.0100	3.5800	0.0004	***
17	3	0.0500	0.0100	4.2600	0.0001	***
18	1	0.0400	0.0200	1.9600	0.0503	
18	2	0.0600	0.0200	2.9900	0.0028	**
18	3	0.0600	0.0100	4.4200	0.0001	***
19	1	0.0400	0.0200	1.9700	0.0493	*
19	2	0.0600	0.0200	2.9800	0.0029	**
19	3	0.0600	0.0100	4.4100	0.0001	***
20	1	0.1400	0.0400	3.3100	0.0009	***
20	2	0.1500	0.0400	3.6500	0.0003	***
20	3	0.1200	0.0200	4.7600	0.0001	***

* indicates significance at the 5% level, ** indicates significance at the 1% level, and *** indicates significance at the 0.1% level

TABLE XI

The informativeness of the share register: Industry partition results for contemporaneous pooled regression model (3) over the post-event period

This table reports the results for contemporaneous pooled regression model (3) over the post-event period while partitioning on the basis of industry. The model estimated is as follows while pooling across all firms and correcting for heteroscedasticity and autocorrelation with the method of Newey and West (1987):

Abnormal Return_t = $\alpha + \beta \Delta A bnormal Metric_t + \varepsilon$ (3)

Where *Abnormal Return*_t is the abnormal return over interval t and $\Delta Abnormal Metric_t$ is the change in each abnormal metric over interval t. The above model is estimated separately for each of the 20 abnormal metrics that we develop to summarise the informativeness of the share register.

In the table below, Industry group 1 refers to natural resources firms, Industry group 2 refers to financial services firms and Industry group 3 refers to all other firms.

			Standard			
Metric	Industry	Estimate	Error	t statistic	p value	
1	1	0.0100	0.0100	1.0700	0.2830	
1	2	0.0066	0.0100	0.4600	0.6420	
1	3	0.0100	0.0069	1.5900	0.1115	
2	1	0.0007	0.0100	0.0400	0.9658	
2	2	0.0029	0.0100	0.1800	0.8573	
2	3	0.0100	0.0080	2.0100	0.0443	*
3	1	0.0300	0.0200	1.5300	0.1260	
3	2	-0.0300	0.0200	-1.6500	0.0983	
3	3	0.0200	0.0100	2.2500	0.0243	*
4	1	0.0900	0.0300	2.7000	0.0068	**
4	2	-0.0400	0.0200	-1.4300	0.1526	
4	3	0.0300	0.0100	2.7800	0.0054	**
5	1	0.2200	0.0500	4.2800	0.0001	***
5	2	-0.0100	0.0400	-0.3400	0.7348	
5	3	0.0600	0.0100	3.2400	0.0012	**
6	1	0.0100	0.0300	0.5700	0.5660	
6	2	-0.0100	0.0200	-0.4000	0.6881	
6	3	0.0200	0.0100	1.8100	0.0710	
7	1	0.0300	0.0100	1.9900	0.0466	*
7	2	-0.0300	0.0200	-1.8100	0.0698	
7	3	0.0081	0.0085	0.9500	0.3414	
8	1	-0.0015	0.0100	-0.0900	0.9277	
8	2	-0.0600	0.0100	-3.7600	0.0002	***
8	3	0.0092	0.0069	1.3300	0.1837	

9	1	0.0200	0.0100	1.9100	0.0559	
9	2	-0.0058	0.0100	-0.4100	0.6809	
9	3	0.0041	0.0068	0.6100	0.5423	
10	1	-0.0200	0.0100	-1.8200	0.0688	
10	2	0.0100	0.0100	1.1200	0.2618	
10	3	0.0100	0.0055	2.7600	0.0058	**
11	1	0.0100	0.0100	1.4800	0.1383	
11	2	0.0053	0.0100	0.3300	0.7388	
11	3	0.0082	0.0059	1.3800	0.1674	
12	1	0.1100	0.0400	2.3800	0.0174	*
12	2	0.0062	0.0600	0.1000	0.9232	
12	3	0.0011	0.0006	1.9100	0.0567	
13	1	-0.7900	1.4800	-0.5400	0.5894	
13	2	-0.2100	0.2500	-0.8200	0.4107	
13	3	0.0900	0.1000	0.9700	0.3338	
14	1	-0.7800	1.4800	-0.5300	0.5979	
14	2	-0.2100	0.2500	-0.8500	0.3950	
14	3	0.0900	0.0900	1.0000	0.3180	
15	1	0.3400	0.0400	8.1800	0.0001	***
15	2	0.0400	0.0100	2.4100	0.0160	*
15	3	0.1000	0.0100	9.6800	0.0001	***
16	1	0.3400	0.0400	8.1300	0.0001	***
16	2	0.0500	0.0100	3.0100	0.0026	**
16	3	0.1000	0.0100	10.3300	0.0001	***
17	1	0.3300	0.0400	7.9800	0.0001	***
17	2	0.0500	0.0100	2.6900	0.0072	**
17	3	0.1000	0.0100	10.2400	0.0001	***
18	1	0.3000	0.0400	7.6500	0.0001	***
18	2	0.0600	0.0200	2.7600	0.0058	**
18	3	0.0900	0.0096	9.4900	0.0001	***
19	1	0.3000	0.0400	7.6500	0.0001	***
19	2	0.0600	0.0200	2.7400	0.0061	**
19	3	0.0900	0.0096	9.4900	0.0001	***
20	1	0.6300	0.1000	6.1600	0.0001	***
20	2	0.1100	0.0300	3.0200	0.0025	**
20	3	0.2100	0.0200	8.9100	0.0001	***

* indicates significance at the 5% level, ** indicates significance at the 1% level, and *** indicates significance at the 0.1% level

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