When “No” Means “No”:
The Information Content of ASX PQs

Marco Anselmi
312055412

Supervisors
Sean Foley
Cary Di Lernia

Discipline: Finance

A dissertation submitted in partial fulfilment
of the requirements for the award of Honours

The University of Sydney

The University of Sydney
BUSINESS SCHOOL

2015

Certificate of Originality

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at University of Sydney or at any other educational institution, except where due acknowledgement is made in the thesis.

Any contribution made to the research by others, with whom I have worked at University of Sydney or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

…….

Marco Anselmi

October 2015

Acknowledgements

I am deeply thankful to my supervisors, Sean Foley and Cary Di Lernia, for their relentless assistance, guidance, and motivation throughout this honours year. Their generosity and ongoing support has exceeded every expectation, and has significantly enhanced the overall quality of this paper. This thesis was made possible by both Sean and Cary, who continuously provided invaluable feedback despite other commitments, and for this I am deeply grateful.

My sincere thanks also go to the Centre for International Finance and Regulation (CIFR), for the financial support of this research. Their willingness to provide assistance for the completion of this thesis was remarkable, and I am grateful to have developed lasting contacts at this inspiring institution.

Last but not least, I would also like to extend my gratitude for the patience and encouragement of friends and family who have been thoroughly supportive and understanding during the writing of this thesis.

Abstract

While Australia's continuous disclosure regime requires listed entities to release material information to the market, unusual price activity around disclosure events raises questions around the effective enforcement of the regime. Motivated by concerns of informed trading around the Australian Securities Exchange's issuance of PQs (PQs) to companies whose securities exhibit price volatility, this paper examines the disclosure behaviour of queried firms in order to distinguish between informed and uninformed queries. The findings of this study raise two fundamental questions: why do stock prices of queried firms remain at a substantially higher level after a PQ, even after "No News" responses? Secondly, why are PQ responses immediately followed by the release of sensitive and non-routine announcements? In addition to differentiating between seemingly informed and uninformed queries, this thesis identifies that small firms, firms with no revenues and firms with positive pre-query price movements have a higher likelihood of experiencing informed queries. Further, informed queries are more likely to occur when spreads are narrow and when limit order book depth is high, indicating that informed traders are more likely to use limit orders and engage in stealth trading in order to conceal their information advantage. Non-disclosure of price-sensitive information poses a significant threat to market efficiency and investor confidence, as such the results of this study provide a tool to focus regulatory attention on which types of companies should receive further guidance on the operation of the continuous disclosure regime.

Table of Contents

List of Tables and Figures

1. Introduction

Designed to minimise the potential for informed trading, the introduction of a statute-based continuous disclosure regime in 1994 has required Australian companies to immediately disclose material information to the market. However the prevalence of abnormal price movements – which the ASX monitors through the issuance of Price Queries (PQs) – reveal the potential extent of information leakage in the Australian market. This thesis attempts to identify queries where evidence suggests firms may be in breach of their continuous disclosure obligations and uses this evidence to draw conclusions as to the likelihood of informed trading (or the act of trading on privately held information) around PQ events.

The main objective of this thesis is to identify whether abnormal price changes ahead of PQ events are driven by new information. This research is motivated by concerns that, on numerous occasions, the share price of Australian firms often changes abruptly (on average over 40% in the sample of this study) despite the absence of any new information to explain such a dramatic movement. Although the ASX uses PQs to publicly question companies regarding abnormal price movements, the overwhelming majority of firms deny knowledge of any material information in their responses, despite frequently revealing new, price sensitive information within 10 days of their PQ response. If this subsequent price-sensitive information was driving the PQ, it would appear that firms may be breaching their continuous disclosure obligations, which is of critical importance to the efficiency and integrity of the Australian market.

The continuous disclosure regime underpins the theoretical framework of this thesis. In Australia, continuous disclosure has been used to enhance the timely flow of information in order to improve market integrity, efficiency and maintain investor confidence. While the introduction of the regime has improved the timely delivery of information to Australian

market participants, as explored by Mayorga (2013), both researchers and practitioners argue that the system is still only weakly regulated. Andersen et al. (2013) claim that repeated incidents of information leakage and limited prosecutions for infringements of continuous disclosure are among the drawbacks of the current continuous disclosure regime. North (2011) highlights that small firms operating in the resource industry often fail to comply with their disclosure obligations, which is worrying given that the Australian market is dominated by such companies. This thesis examines evidence pertaining to the ability of the continuous disclosure regime in maintaining market integrity and ensuring markets are both fair and efficient.

Unfortunately it is impossible to know how much information is withheld from the market. Short of litigation, it is often difficult to establish whether firms are in compliance with the continuous disclosure regime, whether they may have had valid reasons for non-disclosure, or whether abnormal price movements are coincidental. To this end, this study analyses the flow of information around PQs to expose events where compliance with the regime appears uncertain, questioning the ability of regulators to effectively enforce the continuous disclosure regime.

PQs offer an ideal platform to examine events where a firm's compliance behaviour might be classified as questionable. When the price of a security inexplicably changes by a significant amount, the ASX issues a PQ, or what is colloquially known as a "speeding ticket". Company responses to PQs provide firms with the opportunity to justify abnormal price movements, yet the majority of queries conclude with firms denying the existence of any information driving the abnormal price change. Ultimately there are two possible explanations for the abnormal price change: i) it was an anomalous movement, driven by speculators or by a liquidity imbalance or ii) it was driven by an investor's information advantage. Identifying

the difference between these two explanations is the primary question of this thesis: was the pre-query abnormal price change driven by an informed trader?

Current literature argues that abnormal price movements causing PQs are predominantly driven by informed traders, given the lack of significant price reversals after PQs. Marsden and Poskitt (2009) show that despite responding to PQs with "No News", share prices of queried firms remain at an elevated level. The absence of a price reversal, and thus a substantially higher (lower) price is believed to reflect new and relevant information that is yet to be disclosed to the market. Gong (2007) and Drienko and Sault (2011) also fail to identify significant price reversals, which they attribute to asymmetric information.

This study creates a new methodology to distinguish between informed and uninformed price movements by focusing on a firm's behaviour directly after a PQ. Queried firms have the propensity to release price-sensitive announcements within days of receiving an ASX PQ. The content of an announcement released directly after a PQ is of fundamental importance in differentiating between informed and uninformed queries. This thesis provides evidence that many PQs appear to be driven by informed traders, highlighting the difficulties in enforcing the continuous disclosure framework.

This thesis also provides regulators with information on which firm characteristics make them most likely to fail to adhere to the continuous disclosure regime, allowing them to better focus their education of directors and executives about the continuous disclosure requirements. Understanding how specific firm characteristics affect the likelihood of observing an informed query will help regulators to identify a subset of common features among non-compliant entities by which they might engage in more targeted regulation. Current studies, including Neagle and Tsykin (2001), outline certain firm characteristics which increase the likelihood of a firm receiving a PQ; this thesis builds on those findings to identify which of

these firm-specific traits increase the probability of a query being informed. Lastly, this thesis examines whether informed traders engage in stealth trading in order to conceal their information advantage; this is analysed through the quoted spread and depth in the limit order book of queried firms.

The rest of this paper is organised as follows: Section 2 outlines the continuous disclosure regime in Australia, Section 3 discusses the existing literature and develops testable hypotheses, Section 4 outlines the Data used, Section 5 explains the Methodology applied, Section 6 describes the Results and Section 7 concludes.

2. Regulatory Background

2.1 Overview of the Australian Continuous Disclosure Regime

In addition to periodic disclosure, where listed companies report on a half-yearly basis, Australia has a continuous disclosure system in place whereby companies are required to publicly disclose all price-sensitive information as soon as they become aware of it. Australia has a co-regulatory regime such that the surveillance of continuous disclosure compliance is shared between the ASX (Australian Securities Exchange) and ASIC (Australian Securities and Investments Commission), and failure to comply can trigger both criminal and civil penalties[1].

The official legislation is set out in s.674 of the *Corporations Act* 2001 (Cth) which subsumes ASX Listing Rule 3.1, and states that "once an entity becomes aware of any information concerning it that a reasonable person would expect to have a material effect on the price of value of the entity's securities, the entity must immediately tell the ASX that information". The ASX's Guidance Note 8 (GN8) includes a detailed outline that assists "entities to understand and comply with their disclosure obligations under Listing Rule 3.1".

[1] Corporations Act 2001 (Cth), s674(2).

Importantly, GN8 contains a detailed explanation of what the ASX deems "market sensitive information", what is meant by releasing the information "immediately" as well as explanations of the exemption rule (Listing Rule 3.1A) and the appropriate use of trading halts to manage disclosure delays[2].

The purpose of continuous disclosure is to ensure the timely flow of information and to enhance market integrity and efficiency. It seeks to i) enhance price discovery and ii) minimize information leakage. Continuous disclosure provides equal access to information among market participants by attempting to create a "level playing field"; this is achieved by minimising the information advantage between company insiders and the market. However, for continuous disclosure to encourage disclosure transparency and inspire investor confidence, the system has to be reliable and effective, otherwise the regime loses credibility.

To ensure equal access to information, continuous disclosure requires firms to announce price-sensitive information to the market immediately. Still, companies can be in possession of confidential information yet to be disclosed (such as firms engaged in incomplete negotiations), therefore Listing Rule 3.1A includes a specific provision that can exempt firms from complying with Listing Rule 3.1. These are known as the disclosure carve-outs, under which firms may access exemptions from compliance with Listing Rule 3.1 in a number of circumstances. Examples include firms involved in incomplete and confidential negotiations or firms with information which is "insufficiently definite to warrant disclosure"[3]. These exemptions have important implications for this study because queried firms that admit to a loss of confidentiality often claim that the reason for withholding information from the market was the reliance on one of the exemptions. Nonetheless, when a PQ is issued, a firm can longer

[2] Australian Securities Exchange, *ASX Listing Rules: Guidance Note 8 – Continuous Disclosure: Listing Rules 3.1 – 3.1B,* (2015), p.6, available at <*http://www.asx.com.au/documents/about/guidance-note-8-clean-copy.pdf*>
[3] Australian Securities Exchange, *ASX Listing Rules: Guidance Note 8 – Continuous Disclosure: Listing Rules 3.1 – 3.1B*, (2015), p.30, available at <*http://www.asx.com.au/documents/about/guidance-note-8-clean-copy.pdf*>

rely on the carve-outs as an excuse for failing to inform the market because private information has ceased to be confidential. Regardless of whether a query is driven by informed traders, if a company relies on an exemption, the abnormal price change illustrates generally poor governance practices on behalf of the company, those associated with it, or its advisers.

2.2 The Price Query Mechanism

When the ASX detects large movements in security prices or volumes, they assess whether this behaviour can be explained by publicly available information; if the ASX is unable to justify the price movement from publicly available information, it issues a PQ asking the company if they are in compliance with their continuous disclosure requirements. More specifically, an ASX PQ requires a firm to explain the sudden change in price/volume, thus earning the tag "speeding tickets", or 'please explain' notices, amongst market participants. PQs have a standardised format and contain the following 4 questions:

Figure 1: ASX Price Query Questions

1. "Is the Entity aware of any information concerning it that has not been announced to the market which, if known by some in the market, could explain the recent trading in its securities?"
2. "If the answer to question 1 is 'yes':"
   a. "Is the Entity relying on Listing Rule 3.1A not to announce that information under Listing Rule 3.1?"
   b. "Can an announcement be made immediately"
   "Please note, if the answer to this question is 'no', you need to contact us immediately to discuss requesting a trading halt."
   c. "If an announcement cannot be made immediately, why not and when is it expected that an announcement will be made?"
3. "If the answer to question 1 is "no", is there any other explanation that the Entity may have for the recent trading in its securities?"
4. "Please confirm that the Entity is in compliance with the Listing Rules and, in particular, Listing Rule 3.1"

The ASX issues PQs on a daily basis, however it has never specified the minimum price change threshold that triggers a PQ. Although the majority of the pre-query price movements are large (>25%), PQs have been issued for price changes as small as 5% in this study. If companies fail to respond to a PQ, or if they are unable to make an announcement immediately, the ASX may place the firm in a trading halt. This prevents the potential for further information leakage as the pre-query price movement may suggest that formerly private information has ceased to be confidential.

2.3 Critiques of the Enforcement of Continuous Disclosure

Recent research argues that the Australian continuous disclosure regime is not well enforced. Early studies by Cassidy and Chapple (2003) and Raykovski (2004) question the effectiveness of the Australian continuous disclosure regime and emphasize its weak enforcement through repeated incidents of information leakage. More recently, Andersen et al. (2013) analyse companies that breach compliance with disclosure obligations, and only find that 19 firms have been issued infringement notices for a breach of continuous disclosure between 2004 and 2012. They argue that their findings reflect a system with weak enforcement. North (2011) finds that in 2007 and 2008, around 80% of firms with significant variations in earnings failed to inform the ASX, citing this as evidence of poor compliance. North (2011) also finds that there is a bias among Australian companies that have weak disclosure, with small firms, those in the resource sector, or with operating losses rarely providing earnings forecasts.

Seamer (2014) investigates the impact of a firm's corporate governance on its continuous disclosure obligations and, similar to North (2011), finds that less profitable companies are less likely to meet their obligations. Di Lernia (2013) has analysed the effectiveness of enforcing disclosure obligations and questions whether the disclosure of material information is well policed. Responding with a "tentative yes", Di Lernia (2013) argues that there are nevertheless inherent issues with the current regime, and that investors should be wary of responses to ASX queries which fail to clearly explain price movements. Such research suggests that a significant proportion of ASX-listed firms may be failing to comply with their continuous disclosure obligations.

Although past research has argued that Listing Rule 3.1 was subject to interpretive issues, the ASX has responded to this feedback by updating GN8 to clarify the implications of 'material' information and being announced 'immediately'. Hsu (2009) discussed the

challenges in monitoring and enforcing disclosure rules by arguing that there was ambiguity in interpreting the meaning of disclosing 'material' information and announcing it 'immediately'. Neagle and Tsykin (2001) argued the same point, adding that when a company became 'aware' of the information was another point of confusion. GN8 received a significant amendment in May 2013, when the ASX added granular detail of what constitutes information deserving market dissemination[4]. Although it is positive that the ASX has amended GN8, there is still perhaps an argument that GN8 could be improved further in particular with regards to the exemption rule, given the large number of firms that still rely on the carve-outs to delay disclosure.

2.4 Periodic Disclosure

While critics of the continuous disclosure regime argue that Australian firms maintain significant discretion over what they choose to disclose (North, 2011), there are still benefits to such a system. Under periodic disclosure, market participants are not updated immediately when firms become aware of new and material information, as companies in Australia are required to report on a half-yearly basis[5]. Thus, by having information delivered to the market only at predetermined intervals, the price of a security may not accurately reflect a firm's current business conditions, as argued by Chapple and Truong (2013). Their argument is that, on its own, periodic disclosure delays the disclosure of information that should be in the hands of investors as early as possible. Similarly, Di Lernia (2013) emphasises the necessity of continuous disclosure in conjunction with periodic disclosure due to the extraordinary speed with which information changes in modern markets. Under a system of pure periodic disclosure, there are more opportunities for information to be leaked making such a system

[4] Australian Securities Exchange, *ASX Listing Rules: Guidance Note 8 – Continuous Disclosure: Listing Rules 3.1 – 3.1B,* (2013), p.30, available at <*http://www.asx.com.au/documents/about/guidance-note-8-clean-copy.pdf*>
[5] Australian Securities Exchange Listing Rules, Chapter 4 *Periodic Disclosure*, (2013), p.401, available at <*http://www.asx.com.au/documents/rules/Chapter04.pdf*>

more vulnerable to informed trading. Given continuous disclosure is critical to the enhancement of market efficiency and integrity, the enforcement and monitoring of the continuous disclosure regime requires closer scrutiny (Hsu, 2009).

3. Literature Review and Hypotheses Development

3.1 Market Efficiency and Disclosure Frequency

The Efficient Market Hypothesis (EMH), formally developed by Eugene Fama in 1970, argues that market prices should reflect all available information and that temporary mispricings will be eliminated by arbitrage. This provides a strong case for continuous disclosure regulations since they facilitate the timely flow of information; Di Lernia (2014) argues that a continuous disclosure system has the potential to create value by enhancing market integrity and increasing investor confidence. As discussed by Golding and Kalfus (2004), continuous disclosure makes prices more informative with the aim of creating a "level playing field", thereby aiding the sustainability of both market efficiency and market integrity.

In understanding the effectiveness of PQs as a mechanism for ensuring compliance with the continuous disclosure regime, it is important to consider their effect on a company's disclosure behaviour. Increased disclosure has been shown to result in a lower cost of capital and a reduction in information asymmetry (Verrecchia 1983; Christensen et al. 2010), while also improving liquidity (Verrecchia, 2001) and motivating managers to make better investment decisions (Lambert et al., 2006). Conversely, some argue that greater disclosure may not be beneficial, creating uncertainty (Leuz and Wysocki 2008; Johnstone 2013), increasing the cost of capital by reducing incentives for market makers (Diamond and Verrecchia 1991), and that managers are biased towards positive disclosures (Healy and Palepu

2001). These aspects are important to consider because they frame the importance of having a system whereby information is continuously disclosed to the market.

Importantly, O'Shea et al. (2008) dispute that more disclosures may not convey better information – they emphasize the key difference between quantity and quality of disclosures. O'Shea et al. (2008) stipulate that firms in speculative industries increase their level of disclosure to generate market interest. They find that the volatility of firms in speculative industries is positively affected by the level of disclosures, suggesting that these companies have an incentive to promote their securities by increasing the level of disclosure. Nevertheless, despite the criticisms, the traditional view is that more transparent disclosures reduce uncertainty and increase investor confidence (Leuz and Verrecchia 2000). Consequently, the Australian continuous disclosure regime is aimed at ensuring that all market participants have timely and equal access to information.

Given the contrast between the US framework of periodic disclosure and the Australian system of continuous disclosure, US-based research in this field is not directly comparable. Continuous disclosure received statutory backing with serious consequences for breach in 1994, resulting in just a handful of studies examining the effect of the new disclosure regime on company disclosure, and fewer investigating the change in a firm's disclosure behaviour following PQs.

Soon after continuous disclosure was introduced, Brown et al. (1999) explored the impact on disclosure frequency and concluded that the number of disclosures made by Australian companies increased significantly with the introduction of statutory force and related consequences. Disclosure increased particularly among small firms and in firms subject to negative news events. Notably, Brown et al. (1999) found that the frequency of price-sensitive and non-routine announcements also increased, suggestive of a system that

encourages greater disclosure. Other researchers argue that despite the introduction of the continuous disclosure regime, Australian firms still have a significant degree of discretion over what they choose to disclose, including Hsu (2009) who finds that, on average, Australian firms with declining earnings make disclosures more often than firms with increasing earnings because the former are more closely scrutinised by regulators.

With a study focused on PQs, Chapple and Truong (2012) find results consistent with Brown et al. (1999) in the New Zealand continuous disclosure regime (which is similar to the Australian system). They show that the frequency of market announcements – particularly non-routine announcements – made by NZX-listed firms was higher following the introduction of PQs. Although this study is based on the smaller NZX market, their results show that the continuous disclosure regime provides an incentive to increase disclosure frequency. Although firms' disclosure behaviour should be independent of being subjected to a PQ, the findings by Chapple and Truong (2012) indicate the opposite.

3.2 Subsequent Company Announcements

Only Neagle and Tsykin (2001) analyse company announcements released directly after PQs. When studying subsequent company announcements, the two key determinants are i) the *time* which has elapsed between a PQ response and the next announcement made by the company and ii) the *type* of company announcement released. As part of their analysis of PQs, Neagle and Tsykin (2001) find that subsequent company announcements are often released shortly after a PQ. Of the 911 queries studied, a significant proportion were followed by a market announcement: 390 announcements were made in the day following the PQ response and another 412 announcements were released 2-5 days after the PQ response. These results suggest that firms behaved reactively, rather than proactively, in disclosing information to the

market. This leads Neagle and Tsykin (2001) to conclude that firms may have breached continuous disclosure regulations.

This thesis examines subsequent company disclosures in greater detail to identify potential breaches of continuous disclosure. Although Neagle and Tsykin (2001) do not analyse the *types* of company announcements released following a PQ, the type of company announcement may prove more important in determining whether the PQ was information-driven than the simple release of an announcement. For example, if a takeover announcement or a mining update is released within days of a PQ, then the pre-query abnormal price change is arguably more likely to have been driven by this important price-sensitive information than an announcement of negligible materiality. Although queried firms may justify such behaviour by claiming access to an exemption through rule 3.1A, the pre-query price move caused by the potential loss of confidentiality may suggest poor corporate governance practices.

If non-scheduled price-sensitive announcements are consistently released shortly after a PQ, this may indicate a breach of the continuous disclosure regime. The release of announcements shortly after a PQ response is not able to prove the presence of informed trading beyond reasonable doubt, but it can highlight weak disclosure practices. The type of company announcement released following a PQ will be an indicator of whether the pre-query price change was speculative or information-driven. A shorter-time period between a PQ response and a subsequent announcement may be expected among firms which possess undisclosed information. As such, this study will investigate i) the delay between responses and subsequent company announcements, and ii) the types of company announcements released directly after a PQ.

3.3 PQ Responses and Price Reversals

Few studies have sought to understand patterns of compliance surrounding PQ events. The first comprehensive study was performed by Neagle and Tsykin (2001), who investigated specific firm characteristics among companies likely to engage in non-disclosure. Their results reveal that the majority of PQs were issued to firms in the Biotechnology and Mineral Exploration sectors, arguing that companies in these industries are subject to information leakage due to the project-oriented nature of their operations. Further, they find that queried firms were smaller and unprofitable: 80% of firms had a market capitalisation lower than a $100 million and 75% had negative earnings.

As company responses to PQs vary, PQ responses are allocated into three categories, following a classification criteria similar to Gong (2007). i) "No News" responses, where companies assert they do not have any knowledge of information responsible for the pre-query price change; ii) "New Information" responses, where companies attribute the price change to a new piece of undisclosed information, such as mining updates, new contract agreements, new funding arrangements or merger announcements; iii) "Ambiguous Responses", where an explanation for the price movement is unclear – this category consists of all responses that do not meet the criteria to be allocated to "No News" or "New Information" responses. "New Information" responses should be concerning to regulators because they expose events where firms admit to a loss of confidentiality. Interestingly, studies in this field find that the majority of PQ responses fall into the "No News" category: Gong (2007) finds that only 30% contain new or partially new information, Marsden and Poskitt (2009) find that only 14% were "New Information" responses while Neagle and Tsykin (2001) classify 16% of their sample as "New Information" responses. As the majority of PQ responses contain "No News", a closer

examination of these is warranted to investigate whether "No News" really means "No News", or if the subsequent release of information may suggest otherwise.

Existing studies have focused on price reversals as a key determinant of whether the issuance of a PQ is informationally-driven. Gong (2007) postulates that if pre-query price movements are not driven by informed investors, then the abnormal trading activity should be speculative or liquidity-driven. Gong (2007) argues that this should be particularly true in the case of "No News" company responses. Thus the effect on price is expected to be temporary, and a price reversal should be observed (given the lack of new information). Since PQs are triggered by large price changes, Gong (2007) argues investors should be suspicious of "No News" responses. Return persistence following "No News" responses may suggest information-based trading driven by informed agents.

Marsden and Poskitt (2009) focus on "No News" responses to PQs and find that informed trading, rather than speculation, is the primary cause of pre-query price movements. They show that prices of firms with "No News" responses do not revert to the pre-query price because the "market does not believe a company's no-news response". Their findings show that the average pre-query price increase (decrease) is 48.5% (-33.5) and that the post-query price only reverses by -4.6% (2.4%) in the short term; they also show that the price reversal in the long-term is minimal and statistically insignificant. Given that the price fails to meaningfully reverse despite the absence of new information, these results offer potential evidence that support information-based trading, rather than speculation, as the key driver of abnormal price changes around PQs. Interestingly, Marsden and Poskitt (2009) also find greater buying activity by institutional investors before a company receives a PQ and more institutional sellers when the pre-query price movement is negative, again suggesting that the pre-query abnormal trading activity is more likely to be driven by informed traders.

Gong (2007) investigates market responses to PQs and finds evidence of mean reversion among queried firms with price decreases (with an average 5 day CAR of 9.2%). On the other hand, firms queried after price increases did not exhibit a price reversal. Drienko and Sault (2011) also support the findings by Marsden and Poskitt (2009): by analysing pre-query and post-query price changes, they fail to identify any price reversals for "No News" PQ responses.

Outside of the context of PQs, a large number of studies have also investigated the return characteristics following general large price changes. Atkins and Dyl (1990) find that, on average, the overreaction caused by large stock prices changes is reversed; their evidence favours the argument that the stock market overreacts to both positive and negative news events. Similarly, Brown et al. (1988) illustrate that the market's reaction to abnormal price changes is efficient due to the significant and positive price reversals that are observed after large abnormal price changes. Finally, Bremer and Sweeney (1991) too explain that large stock price decreases are followed by significant price reversals in the following 10 trading days, suggesting that the market "reacts to uncertain information in an efficient, if not instantaneous, manner". In a study of the Australian market, Long et al. (2007) provide evidence of stock prices reversing in the short-term period (5 days), although they fail to observe price reversals in the long run (over 20 days). As such, a number of studies in the literature show that random abnormal price changes are followed by a price correction through price reversals, and thus the absence of price reversals after PQs can be used to expose events where abnormal price changes may be potentially driven by informed traders.

Given these results with regards to price reversals, this study investigates whether "No News" responses cause stock prices to mean revert or whether there is price persistence. Since PQs are issued for large movements (usually >20%), if a company does not reveal new information, the price change should be temporary, as argued by Long et al. (2007). Hence the

absence of a price reversal may indicate unusual price behaviour possibly caused by informed traders. This leads to the following hypothesis:

Hypothesis I: Firms that respond to PQs with "No News" should, on average, exhibit price reversals.

The absence of a price reversal will be used in conjunction with the results from the analysis of subsequent announcements to expose potential continuous disclosure breaches which may have been caused by informed trading.

3.4 Informed Trading and Probit Regressions

This thesis investigates whether abnormal price changes are driven by informed traders. Probit regressions are used to estimate the likelihood that a PQ is information-based. A number of company-specific factors, such as firm size, industry, profitability and trading behaviour are studied to investigate their effect on informed queries. The probit regressions are used to study how these company-specific factors change the probability of observing informed queries.

Probit regressions have been used extensively to identify the level of informed trading. Prior to corporate events such as mergers and earnings announcements, Yang (2009) uses a probit regression to test which order-specific factors (such as limit and market orders, relative spreads, order size and trading intensity) are determinants of informed trading around earnings announcements; Yang (2009) finds that informed traders use stealthy limit orders when further out from the event, while they switch to more aggressive market orders closer to the announcement. Baruch, Panayides and Venkataraman (2014) use probit regressions to analyse how informed traders behave to hide informed orders, and find that the probability of observing hidden informed orders increases when depth is high and with large order sizes.

A vast number of studies apply probit regressions to measure informed trading by analysing firm-specific factors. For instance Ke (2015) uses a probit regression to estimate the probability of informed trading around quarterly earnings guidance to find that smaller size and negative profitability increase the presence of informed traders. In studying the information asymmetry in the context of the Brazilian market, Martins and Paulo (2012) also use a probit model to estimate the probability of informed trading, and show that small resource and manufacturing firms are the most likely to suffer from informed trading.

This study focuses on understanding the determinants of information leakage. A range of company-specific factors are examined to determine the likelihood that a PQ is informationally-driven. The findings of Neagle and Tsykin (2001) and Gong (2007) suggest that PQs are more likely to be issued to i) smaller companies, ii) resource and biotechnology companies and iii) companies with negative earnings and zero revenues; this study will extend these findings by testing whether these characteristics increase the *likelihood of observing informed PQs*.

Hypothesis II: PQs in small firms are more likely to be driven by informed traders.

Hypothesis III: PQs in Materials and Health Care companies are more likely to be driven by informed traders.

Hypothesis IV: PQs in firms with no revenues are more likely to be driven by informed traders.

The price movement direction may be another explanatory variable able to affect the likelihood of informed queries. Lamont (2004) shows that small and illiquid stocks have greater short-selling constraints because these securities are more difficult to borrow, while Jones and Lamont (2002) also show that small stocks are usually more expensive to short. Due to the higher costs associated with short-selling, Commerton-Forde and Putnins (2009) conclude that short-sellers have, on average, a better information advantage in the trading of small stocks. At

the same time, small firms are also more likely to receive PQs, as shown by Neagle and Tsykin (2001) and Gong (2007). Combining these two observations, it may be argued that, given the short-selling constraints of smaller firms, it would be significantly more difficult for an external investor to cause an abnormal price change when the price movement is negative. As such, it may be hypothesized that a large negative price movement is more likely to be driven by a company insider or an existing shareholder. In comparison, given the absence of constraints for speculators ahead of potential price increases, PQs issued following price increases may be more likely to be driven by uninformed agents when compared to PQs issued following price decreases. This leads to the following hypothesis:

Hypothesis V: Firms who receive PQs due to negative price movements are more likely to be driven by informed traders.

3.5 PQs and Information Asymmetry

In addition to analysing size, industry and profitability as determinants of information asymmetry, market microstructure can also provide useful insights into the information asymmetry between traders. A range of metrics, such as bid-ask spreads and limit order book depth, can provide information on the level of informed trading. These indicators allow the direct analysis of the information content of single trades.

Bid-ask spreads are commonly used as a proxy for information asymmetry. Spreads compensate market makers for i) order processing costs, ii) inventory-holding costs and iii) adverse selection costs; the third component is of particular interest because it rewards market makers for transacting with informed traders. Informed traders are often impatient and as such utilise market orders, as shown by Angel (1997) and Harris and Hasbrouck (1996). Market orders lead to wider spreads as liquidity providers require higher compensation for transacting

with informed traders. This is formally illustrated by Glosten and Milgrom (1985), who argue that the adverse selection cost component on its own warrants the existence of a bid-ask spread.

Kim and Verrecchia (1994) suggest that information asymmetry is higher ahead of company announcements because agents have different information levels. Consistent with an increase in information asymmetry, Kanagaretnam et al. (2005) find that bid-ask spreads increase significantly ahead of earnings announcements in the US. Nonetheless, spreads around PQ events may not necessarily be expected to widen despite the presence of informed investors. Barclay et al. (1993) propose that informed investors engage in stealth trading, whereby orders are submitted gradually such that an investor can profit before his trades reveal information to other market participants. To apply stealth trading, Barclay et al. (1993) argue that if stealthy traders favour the use of limit orders to conceal their information advantage, then bid-ask spreads may not necessarily widen despite the presence of informed traders. Chakravarty (2001) explains that the stealth trading phenomenon occurs particularly in small and illiquid securities, where market makers play a reduced role. Given that queried firms are predominantly small and illiquid, it may be expected that the presence of stealthy informed traders may not necessarily lead to wider spreads, particularly in an environment where traditional market makers are likely to play a much smaller role in providing liquidity.

The depth of the limit order book is also investigated as a measure of information asymmetry. The extant literature shows that a deeper limit order book causes a narrower spread because, in the presence of adverse selection, market makers cancel existing limit orders. Menkhoff, Osler and Schmeling (2010) show that high buy-side depth levels generate a higher proportion of informed buy orders. Using evidence from the German pure limit order market, Beltran, Gramming and Menkveld (2012) find that the presence of informed traders forces market participants to withdraw orders and reduce the depth in the order book. In the context of corporate events, Kavajecz (1999) shows that limit order depth falls ahead of scheduled

corporate announcements because market makers want to minimize the exposure of trading with informed agents. Similarly, Lee et al. (1993) emphasize that wider spreads and lower depths, ahead of firm announcements, are more pronounced when company announcements lead to large price changes (as is the case for PQs).

Contrary to the consensus in the literature, Kaniel and Liu (2006) investigate the "relative informativeness" of order types and find that limit orders are actually more often used by informed traders. These findings, consistent with Bloomfield et al. (2005), suggest that limit order depth is actually higher with more informed traders. Firstly, their study is of particular relevance because they implement a similar research design to this paper by using a probit regression to test how order flow characteristics affect the likelihood of observing informed orders. More importantly Kaniel and Liu (2006) conclude that, given informed traders' propensity to use limit orders, their informational advantage can persist longer than previously anticipated. Their argument is consistent with that of stealth trading proposed by Barclay et al. (1993) and Chakravarty (2001), whereby stealthy traders believe that their information advantage can persist for a longer period. If this is the case, then i) narrower spreads and ii) a higher limit order depth are likely to be indicative of informed trading. Consequently, these two variables may increase the likelihood of observing an informed PQ. The following unconventional hypothesis is tested:

Hypothesis VI: Consistent with the practice of stealth trading, informationally-driven PQs are more likely to experience narrower spreads and higher limit order book depth.

4. Data

4.1 PQ Data

PQ responses are collected from the Securities Industry Research Centre of Asia Pacific (SIRCA) by searching for all documents that contained the title 'query' between January 2009 and February 2015. This search yielded >6,000 queries but also included technical queries, where the ASX questions companies about director's shareholdings or errors in financial reports, which were manually omitted, reducing the sample to 3,144 queries. A further 291 queries were eliminated because the company either released two versions of the same response (in which case the most recent response was used) or because the queries were ASX Aware Letters. Aware Letters are issued following an announcement preceded by a large price movement; in these cases, the ASX issues firms with a non-standardised letter questioning when the entity first became aware of the information, and were also discarded from the initial sample. Following these adjustments, the final sample consists of 2,853 PQs.

For each PQ response, the following details are manually collected: company, dates of the query and response, price change and the answers to the four PQ questions. PQs represent 1,688 separate companies, such that on average firms received 1.7 PQs in the sample; the majority are issued following price increases, with only 15% issued after price decreases. As shown in Table 1, the median (mean) price increase is 37% (48%), while the median (mean) price decrease is -20% (-21%). The average duration of a pre-query price change is 4.4 days.

Table 1: Price Changes Inducing a PQ

Table 1 presents the descriptive statistics of price changes that induced the ASX to issue a PQ. The table separates positive and negative price movements and also presents descriptive statistics for the duration of a pre-query price movement (the duration consists of the time between which the pre-query price movement occurs).

Variable	Mean	Median	Q1	Q3	Std Dev
Price Increases	48.29%	36.90%	23.53%	56.98%	48.40%
Price Decreases	-21.30%	-19.76%	-25.80%	-14.50%	9.89%
Query Duration (Days)	4.4	3.0	1.0	6.0	4.8

Figure 2 illustrates that the majority of PQs are issued following significant price increases, with 40% of queries issued for price movements between 20% and 40%. A large proportion of the securities studied in the sample are 'penny stocks', with 85% of the firms sampled having a price of less than $1. This should be noted as a potential limitation of this paper, given that this study is based on a biased sample that consists primarily of small and illiquid stocks. Still, firms to be queried are exogenously selected by the ASX, such that the sample bias is not caused by the research design of this paper. Nonetheless, the conclusions that are drawn out of this thesis are predominantly applicable to firms with characteristics similar to queried firms.

Figure 2: Frequency Distribution of Price Changes Inducing a PQ

Figure 2 illustrates the distribution of price changes that induced the ASX to issue a PQ. The majority of queries are issued following price movements of 20% to 40%.

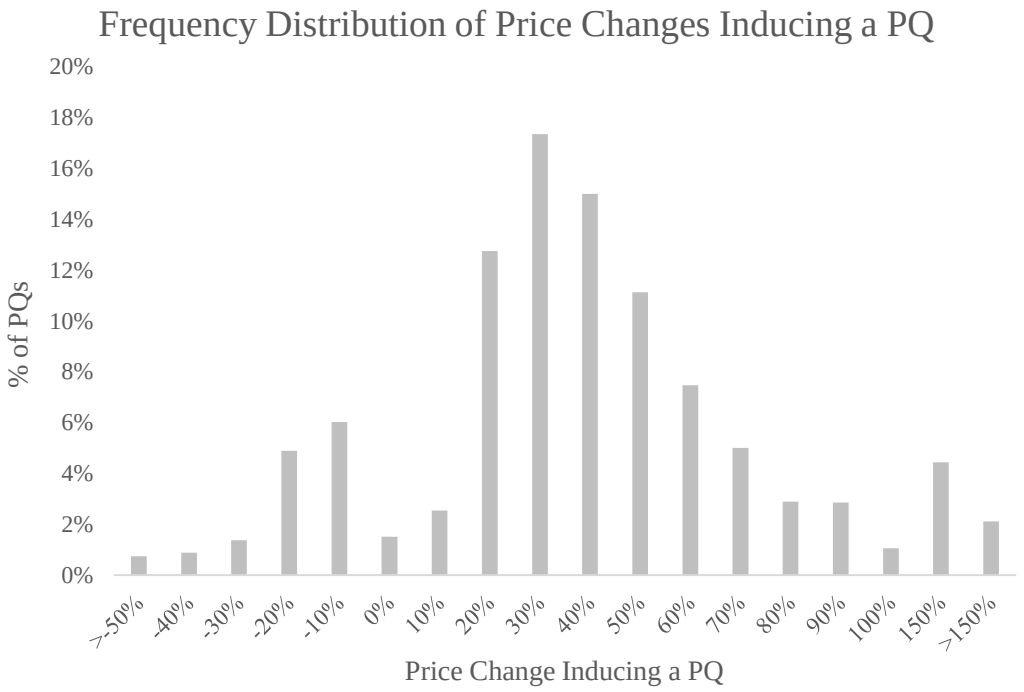


Table 2 presents the financial characteristics of queried firms. As expected, the majority of companies subjected to PQs are small in size: the median market capitalisation of queried firms in the 30-days prior to a PQ was $37m. The average market capitalisation is significantly skewed by larger companies subjected to PQ such as Rio Tinto, Wesfarmers and ANZ; notably, 81% of the firms in the sample have a market capitalisation of less than $200m. The majority

of firms reported negative earnings (defined as Net Profit After Tax), with less than 30% recording a positive NPAT, while over 40% reported no revenues. To ensure that these statistics are unaffected by post-query events, all financial metrics (except market capitalisation) are taken as at the financial year before a firm was issued a PQ.

Table 2: Financial Characteristics of Queried Firms

Table 2 presents descriptive statistics for the financial characteristics of queried firms. The market capitalisation of queried firms is taken 30 days before the PQ. Revenue, Net Profit After Tax (NPAT) and Assets are collected for the financial year before a firm experienced a PQ. Numbers in brackets indicate negative values.

Variable	Mean	Median	Q1	Q3	Std Dev
Market Capitalization	$342.9m	$36.9m	$12.1m	$123.8m	$2,469.2m
Revenue	$313.9m	$0.3m	$0.0m	$54.8m	$2,200.6m
NPAT	$38.4m	($1.6m)	($8.4m)	$15.8m	$415.5m
Assets	$1,015.4m	$33.3m	$8.0m	$160.4m	$15,960.5m

Consistent with Neagle and Tsykin (2001) and Marsden and Poskitt (2009), the majority of queried firms belonged to the Materials sector (predominantly Metals & Mining firms) and the Energy sector – Table 3 illustrates that these two sectors accounted for 67% of all companies issued with PQs. This partly reflects that the operations of exploration and resource firms are single-project oriented, making them more prone to information asymmetries and subsequent leakage and hence are more likely to experience a PQ.

Table 3: PQs by GICS Sector

Table 3 documents the breakdown of queried firms by GICS sector. GICS classifications are global and they are used to standardize industry definitions across different markets. Frequency represents the number of queried firms in each sector. The queries for this sample are between January 2009 and February 2015.

GICS Sector	Frequency	% of total
Materials	1,371	48.1%
Energy	541	19.0%
Health Care	242	8.5%
Industrials	173	6.1%
Financials	140	4.9%
Information Technology	134	4.7%
Consumer Discretionary	110	3.9%
Consumer Staples	63	2.2%
Utilities	49	1.7%
Telecommunication Services	30	1.1%
Total	**2,853**	**100.0%**

4.2 Announcement Data

The announcement data is also collected from SIRCA. All market announcements released by a firm within 60 days of a PQ are analysed; 316 firms failed to release an announcement within 60 days of being issued a PQ, as such the sample reduced to 2,537. The ASX identifies company announcements as price-sensitive or non-price sensitive company announcements, and they are also categorised using an announcement code, as shown in Table 4. The ASX also provides announcement sub-codes, such that a Periodic Report with code 3001 relate to Annual Reports while a 3004 is linked to a Half Yearly Financial Report. The report classification codes are used to study which announcement types are released directly after a PQ, as discussed in Sections 5 and 6.

Table 4: ASX Announcements by Report Class

Table 4 presents the top level category codes used by the ASX for all announcements. Each category class has a number of sub-classes, for example 1000 deals with takeovers, however 1001 indicates a bidders takeover statement, whilst 1002 indicates a targets response to a takeover offer.

ASX Report Code	ASX Report Class
1000	Takeover Announcements
2000	Security Holder Details
3000	Periodic Reports
4000	Quarterly Activities Report
5000	Quarterly Cash Flow Report
6000	Issued Capital
7000	Asset Acquisition & Disposal
8000	Notice Of Meeting
9000	Asx Announcement
10000	Dividend Announcement
11000	Progress Report
12000	Company Administration
13000	Notice Of Call (Contributing Shares)
14000	Other
15000	Chairman's Address
16000	Letter To Shareholders
17000	Asx Query
18000	Structured Products
19000	Commitments Test Entity Quarterly Reports

4.3 Price and Intra-day Data

Daily price data used in the calculation of Cumulative Abnormal Returns (CARS) is accessed from the Thomson Reuters Tick History (TRTH) database for a window of [-30, +60] around the PQ. This window is chosen to study both the pre-query and post-query price behaviour and to observe whether there is evidence of a price reversal even in the long run. Although numerous factors continuously influence stock prices, it is nonetheless important to study longer-term price performance because if a firm's price fails to return to the pre-query level even in the long-run, this is indicative of permanent information. A post-event window of 60 days also captures the price effect of subsequent announcements released by each firm. A negligible limitation is the absence of price and intra-day data for a small number of queried firms due to the lack of trading volume, trading halts or suspensions from the ASX.

Finally, the intra-day quote and trade data is accessed from TRTH. Bid/ask prices and bid/ask limit orders are collected to the closest millisecond for a window of [-30,+30] around a PQ. This data is used to compute trading behaviour metrics such as the quoted spread and the limit order book depth. Table 5 illustrates that in the post-query period the average quoted spread is higher but the average (median) dollar value of depth available at the best bid and best offer is lower (higher) compared to the pre-query dollar depth.

Table 5: Descriptive Statistics on Trading Activity

Table 5 presents the quoted spread and limit order book depth for queried firms for an event window of [-30, +30] around a PQ. Pre-query observations are taken before a PQ, post-query observations after a PQ. Quoted spreads are expressed in basis points while depth is expressed as the time-weighted dollar value available at the best bid and best offer.

	Pre-Query			Post-Query		
Variable	**Mean**	**Median**	**Std Dev**	**Mean**	**Median**	**Std Dev**
QuotedSpread	230bps	172bps	311bps	261bps	185bps	350bps
LimitOrderDepth	$71,457	$25,692	$150,214	$65,568	$27,115	$213,839

5. Methodology

5.1 Response Codes

Company responses to PQs vary considerably, and range from a definitive "no" to ambiguous explanations for price moves. In this study, responses are manually recorded and allocated to three separate groups according to the categories outlined below. PQs are categorised using a criteria consistent with previous studies in this field (Neagle and Tsykin, 2001; Gong, 2007; Marsden and Poskitt, 2009).

- "No News Responses": responses were classified as containing no news when a firm clearly offered no explanation for the pre-query price move (that is, a 'No' or 'N/A' response to each question). These responses were unqualified, meaning that if a firm responded with a no, but offered a possible reason for the potential price move, then the response was not allocated to this group. If a company did not provide an explanation for the abnormal price change, the response was classified as "No News".

- "New Information Responses": responses were classified as containing new information when a company's justification for the abnormal price change contained information previously undisclosed to the market. Examples included new contract announcements, project progress updates, confirmation of market speculation, upgraded/downgraded company guidance, and other types of operational updates. If a firm did not specifically announce the news in the PQ response, but advised that a market announcement was to be released imminently, or had been released on the same day of the query, such a response was also categorised as a "new information response".

- "Ambiguous Responses": responses were classified as "Ambiguous" when the company did not deny knowledge of information nor claimed to be aware of information that could potentially justify the price move. These responses were typically similar to "No News", but they were usually qualified, since these responses were typically followed with a *but* or *however* leading to further discussion. In these responses, firms would deny knowledge of any information but then provided reasons for the pre-query price move; some firms in this category stated to be unaware of any information affecting their share price but still provided a potential explanation for price move. Although some "Ambiguous" responses may have contained new information, if firms failed to acknowledge that this information was the reason for the abnormal price move, the response could not be classified as "New Information"; nor could it be classified as "No News" because the firms still attempted to provide a reason for the price move.

The emphasis of this study is on "No News" responses in order to question whether some firms with "No News" responses are really unaware of information affecting the price, or if the "No News" responses are simply an effort by a company's management to deny the loss of confidentiality that may have led to informed trading.

5.2 Price Reversals

An event study is used to analyse the price behaviour before and after a PQ response. The date of a PQ response is treated as the event date, at *t=0*; in the event that a response to a PQ is announced after-market (or after 4p.m. AEST), the event date used is the following trading day.

To understand the magnitude of a price reversal, an event window of [-30,+60] days is used. Using this window, it is possible to capture i) the price behaviour prior to the event [-30,

-1], ii) the market reaction to the PQ between [0,+1], [+1,+2] and [+2,+5] days and iii) the longer-term price pattern after the event for [+5,+30] days and [+30, +60] days. It is important to emphasize that price movements in the longer-term may be affected by other systematic and idiosyncratic factors. As such, the focus of the event study is on the short-term price pattern. A pre-query window of 30 days is used to gauge any pre-emptive price movements; if there is evidence of information leakage that leads to informed trading, it does not need to be restricted to only the few days before the PQ.

To calculate abnormal returns, a net-of-market-return model is used, whereby abnormal returns (*ARs*) are calculated as follows, where $P_{i,t}$ is the price of stock *i* at time *t*, and $P_{m,t}$ is the price of *m*, the ASX200 market index, at time *t*.

$$AR = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} - \frac{P_{m,t} - P_{m,t-1}}{P_{m,t-1}} \quad (1)$$

Gong (2007) shows that a net-of-market-return model is more appropriate to calculate *ARs* than a market-model in the context of PQs because the profile of queried firms may change before and after the event. For example, in the sample used there were episodes where small mining companies changed their business nature to biotechnology or internet companies. As such, the use of a net-of-market-return model, as argued by Gong (2007), "avoids the complication of having a difference between the pre-event and post-event estimation periods for the beta and alpha parameters". The *ARs* are then used to calculate Cumulative Abnormal Returns (CARs) for the event window [-30, +60] which can then be used to identify the degree or absence of price reversals following a PQ.

5.3 Informed Queries

To distinguish between informed and uninformed queries, two factors are considered: the types of company announcements subsequent to responses to PQs and the delay between PQs and subsequent announcements.

Analysing the types of company announcements that follow a PQ helps to understand the behaviour of queried firms. This can be illustrated with an example: if, within days of being issued a PQ, a firm announces a takeover or the discovery of new mining resources, this newly released information will already be partially reflected in the market price (because of the abnormally higher or lower price of queried firms). Therefore subsequent announcements are classified as potentially informed based on their announcement type. The information-based subsequent announcements consist of: Takeover Announcements (code 1000), Issued Capital (code 6000), Asset Acquisition & Disposal (code 7000) and Progress Reports (code 11000). These announcement types are non-routine and they are the most likely to contain material information. In addition, for a query to be classified as informed, the subsequent announcements have to be released within 10 days of a PQ – the proximity of the firm's announcement to the abnormal price movement may imply that the price change was information related. Although a post-query window of 10 days may not capture all information-related announcements, the majority of subsequent announcements are released within 10 days (as presented in Section 6).

While the reasoning above is solid, to further mitigate the risk of the results being driven by the subjective distinction between informed and uninformed queries, a robustness test is implemented to test an alternative definition for an informed query. This is done by assessing the price behaviour of a queried security following a PQ – this alternate approach follows the criteria implemented by Marsden and Poskitt (2009) to determine if a PQ is informed or

uninformed. This simple criteria classifies a PQ as informed if there is no price reversal following a PQ response. According to Marsden and Poskitt (2009), the lack of a price reversal may indicate that the abnormal price change is neither speculative nor liquidity driven, implying that it is driven by informed traders instead. Using this definition of an informed PQ, if a price reversal is not observed within 10 days, then the query is classified as informed. This is a reasonable time-frame for a price reversal considering that Long et al. (2007) finds that, on average, prices mean revert within 5-10 days. For the purposes of this test, a price reversal is defined as the price of a security returning within 10% of its pre-query price level; a buffer of 10% is chosen as security prices are affected by factors that may be observed after a PQ. The robustness test examines whether the determinants that increase the likelihood of informed queries are consistent across different definitions for 'informed queries'.

5.4 Regression Analysis

To investigate the effect of firm-specific characteristics on the likelihood of observing informed queries, a probit regression model is implemented. The dependent variable takes the value of 0 for uninformed queries and 1 if the query is classified as informed. The effect of firm characteristics is then observed using the models outlined below.

5.4.1 Industry

Because some industries may have a higher predisposition to informed queries, a regression is run to observe the effect of specific GICS sectors on the probability of observing informed queries. The model takes the form outlined below, where each sector represents a dummy variable equal to 1 if the queried firm belongs to the GICS sector (for illustration purposes, the abbreviated model below only includes 3 out of the 10 possible GICS sectors).

$$PQ_{it} <_0^1= \alpha_0 + \beta_1^D \text{Industrials}_t + \beta_2^D \text{ConsumerStaples}_t + \beta_3^D \text{Energy}_t + \cdots + \varepsilon_{it} \qquad (2)$$

Neagle and Tsykin (2001) and Gong (2007) show that firms that belong to the Materials and Health Care industries are more likely to receive a PQ. The model above is used to show whether firms in these industries are also more likely to have informed queries. In line with Hypothesis III, the probability of observing a queried firm that belongs to the Materials and Health Care sectors may increase the likelihood that the query is informed.

5.4.2 Control Variables

As outlined in the Hypotheses Development section, a number of firm-specific characteristics are studied in this thesis to identify their effect on informed queries. The regression below illustrates the variables analysed: size, revenue, price direction, quoted spreads and limit order book depth.

$$PQ_{it} <_0^1 = \alpha + \beta_1 Ln(MktCap)_{it} + \beta_2^D NoRevenue_t + \beta_3^D PositiveQuery_t + \beta_4 QuotedSpread_{it} + \beta_5 Ln(LimitOrderDepth)_{it} + \varepsilon_{it} \quad (3)$$

Ln(MktCap) represents the natural logarithm of a firm's market capitalisation, which is used as a proxy for firm size. *NoRevenue* is a dummy variable which takes the value of 1 if a firm has no revenues or 0 if it has positive revenues. *PositiveQuery* is another dummy variable which takes the value of 1 if the pre-query abnormal price movement is positive or 0 if the price movement is negative.

In addition, two market microstructure metrics are considered: limit order book depth and quoted spreads. As outlined in Hypothesis VI, Kaniel and Liu (2006) show that informed traders typically use limit order book depth when they believe their information advantage will not disappear immediately. Thus *LimitOrderDepth* represents a continuous variable for the depth in a security's limit order book. Secondly, the use of quoted spreads may expose the behaviour of market makers when faced with traders that hold an information advantage. In the model above, *QuotedSpread* represents a continuous variable for the quoted spread between

bid and ask prices. The quoted spread is expressed in basis points in order to account for differences in tick sizes and prices. The quoted spread is calculated as:

$$Quoted\ Spread = \frac{(Ask\ Price - Bid\ Price)}{Midpoint\ Price} \quad (4)$$

The models outlined above is used to study whether queried firms with no revenues, with positive/negative price movements, those larger in size, with wider spreads or with more orders in the limit order book have a higher probability of experiencing informed queries.

5.4.3 Response Codes

Thirdly, the classifications of PQ responses may also affect the probability of observing an informed query. On average the model is expected to show that "New Information" responses exhibit the highest likelihood of informed trading. This is tested using 2 dummy variables, where *Q1 "No News"* takes the value of 1 if a PQ response is classified as "No News" while *Q1 "New Information"* takes the value of 1 if a PQ response is classified as containing "New Information". This simple regression returns the likelihood of observing an informed query in either of the two Groups when compared to an "Ambiguous" response.

$$PQ_{it} <_0^1 = \alpha + \beta_1^D \mathrm{Q1NoNews}_t + \beta_2^D \mathrm{Q1NewInfo}_t + \varepsilon_{it} \quad (5)$$

Lastly, the robustness of the relationships between the probability of an informed query and the explanatory variables is tested through a regression that includes all variables – industry dummy variables, control variables and response codes.

6. Results

6.1 Information Content of Price Queries

Firm responses to PQs are allocated to one of three groups contingent on the information released in each PQ response. Consistent with findings of Neagle and Tsykin (2001), Gong (2007) and Marsden and Poskitt (2009), the majority of the sample (77.3%) falls into the category of "No News" responses, whereby firms do not provide any explanation for the abnormal price move. As illustrated in Table 6, only 1.8% of responses explicitly acknowledge new information as a cause for the pre-query abnormal price change. These proportions are similar for both price increases and price decreases.

Table 6: Firm Responses to ASX PQs

Table 6 presents the number and percentage of PQs by response codes. Each PQ response is allocated to only one of the three possible response codes. The table displays the frequency distribution between price increases and price decreases.

Response Code	Price Increases		Price Decreases		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
"No News" Responses	1,863	77.1%	342	78.1%	2,205	77.3%
"New Information" Responses	44	1.8%	8	1.8%	52	1.8%
"Ambiguous" Responses	508	21.0%	88	20.1%	596	20.9%
Total	**2,415**	**84.6%**	**438**	**15.4%**	**2,853**	**100.0%**

It is important to note that the ASX PQ system only seems to prompt 1.8% of firms to release an announcement containing new information, although a significantly higher proportion of PQs are likely to be information-driven. Interestingly, in response to the fourth question posed in a PQ, asking firms whether they are in compliance with the ASX Listing Rules and continuous disclosure, 2,851 out of 2,853 responses, or 99.9% of firms confirmed that they were in compliance with their continuous disclosure requirements.

PQs issued following abnormal price increases also largely outnumber PQs issued following abnormal price decreases, as seen in Table 6. An explanation for this may be the difficulty involved in short-selling queried stocks, which are predominantly small, illiquid

securities. Jones and Lamont (2002) show that it is more expensive to short small and illiquid firms, as such it is more costly to trade ahead of price decreases. Further, naked short-selling is illegal in Australia, with stock needing to be "borrowed" prior to any short sale. While it is usually possible to find "borrow" in liquid securities, it is often impossible in less liquid securities (Lecce and Lepone, 2012). Due to this restriction on non-owners from trading on negative information, abnormal price decreases occur less often, and they are more likely to be caused by current shareholders attempting to sell-down a portion of their stakes to avoid losses. Conversely, it is significantly easier to profit from a positive news event given investors are not constrained by short-selling. Similarly, it would also be less costly for uninformed traders to speculate ahead of positive news events than negative news events, as such it is unsurprising that PQs are predominantly issued following abnormal price increases.

6.2 – Price Reversals

Table 7 illustrates the Cumulative Abnormal Returns (CARs) of queried firms for an event window of [-30,+60] days, with Panel A (Panel B) showing the results for price increases (decreases). In the pre-query event window of [-30,-1] days, the mean CAR for price increases is 38.3%, illustrative of the strong price run-ups that eventually lead to the issuance of a PQ; similarly, the mean CAR for price decreases in the pre-query event window is -18.3%, consistent with sellers facing more binding constraints. Both CARs are statistically significant at the 1% level. While 77.3% of firms claim to be unaware of any information driving the price movement, the magnitude of the average CAR suggests that there may be new price-sensitive information available. The majority of the pre-query CARs are driven by the price behaviour in the [-1,0] event window, when the mean CAR for price increases (decreases) is 15.0% (-5.04%).

Table 7: Mean CARs for Queried Firms

Table 7 presents the Cumulative Abnormal Returns (CARs) for queried firms for an event window of [-30, +60] days, where the event date of *t=0* is the date of the PQ. Panel A displays the results from the sample of positive pre-query price movements, while Panel B illustrates the CARs for the sample of negative pre-query price movements. Within each panel, the CARs are displayed for sub-samples depending on a company's response to a PQ. The t-statistics are displayed in brackets. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Panel A: Price Increases

Event window	*Full Sample*	*'No News' Responses*	*'New Information' Responses*	*'Ambiguous' Responses*
[-30,0]	53.28	51.62	42.58	54.18
	(4.54)***	(4.55)***	(4.61)***	(4.43)***
[-5,0]	36.21	35.92	31.87	37.74
	(2.59)**	(2.60)**	(3.41)***	(2.14)**
[-1,0]	15.00	15.68	19.79	13.51
	(2.42)**	(2.37)**	(2.87)**	(2.51)**
[0,+1]	-0.08	0.02	-1.83	-0.25
	(-0.78)	(-0.81)	(-0.97)	(-0.58)
[0,+5]	-0.20	-0.13	-1.14	-1.36
	(-1.94)*	(-1.68)*	(-1.43)*	(2.57)**
[0,+30]	2.63	3.04	-2.69	1.45
	(2.53)**	(2.74)**	(-1.95)*	(1.63)*
[+30,+60]	0.98	0.62	5.70	1.82
	(3.20)***	(2.72)**	(2.14)**	(2.47)**
Number of Observations	2,415	1,863	44	508

Panel B: Price Decreases

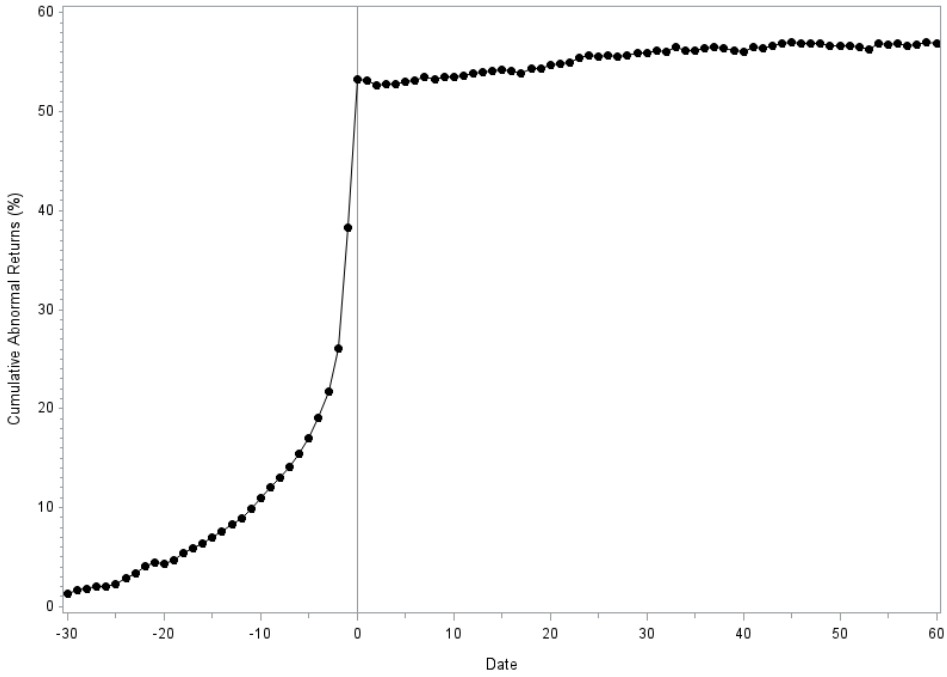
Event window	*Full Sample*	*No News' Responses*	*'New Information' Responses*	*'Ambiguous' Responses*
[-30,0]	-23.33	-22.89	-38.48	-23.53
	(-4.39)***	(-4.32)***	(-3.01)**	(4.59)***
[-5,0]	-16.53	-16.53	-22.87	-15.90
	(-2.61)**	(-2.51)*	(-2.02)*	(-2.88)**
[-1,0]	-5.03	-4.38	-14.39	-6.72
	(-2.67)**	(-2.34)*	(-1.68)*	(-0.52)
[0,+1]	2.41	2.38	14.46	1.26
	(0.35)	(0.39)	(1.51)*	(0.41)
[0,+5]	4.85	4.76	13.99	4.24
	(1.43)	(1.5)	(1.43)*	(1.21)
[0,+30]	4.99	4.71	8.85	5.79
	(4.73)***	(4.45)***	(2.40)**	(3.48)***
[+30,+60]	1.30	0.78	11.64	2.28
	(2.54)**	(2.79)**	(2.46)**	(2.17)**
Number of Observations	438	342	8	88

Immediately after a PQ, in the [0,+1] event window, small reversals averaging -0.83% (2.41%) for price increases (decrease) are observed. Over the next 30 days, in the [0,+30] window, there is evidence of a small price reversal in the sample of price decreases, with a mean CAR of 5.00%. Still, as presented in Figure 3, the price remains at a substantially lower level given that the CARs after price decreases only show a small price reversal. As illustrated in Figure 3, the price reversal is not observed in the sample of queried firms following abnormal price increases, with CARs rising a further 2.63% in the [0,+30] window. These results are consistent with Gong (2007) and Marsden and Poskitt (2009) and indicate the absence of a price reversal among the majority of queried firms.

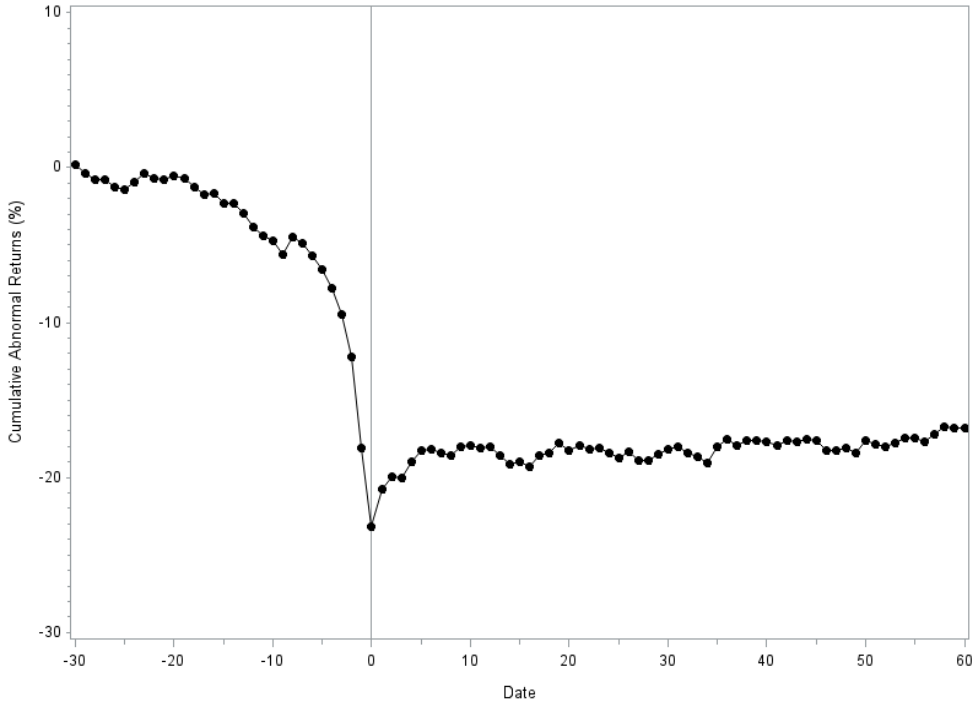
Figure 3: Means CARs for Queried Firms

Figure 3 illustrates the Cumulative Abnormal Returns (CARs) for queried firms for an event window of [-30, +60] days, where the event date of *t=0* is the date of the PQ. The figure shows the significant price movements that are experienced by queried firms before the event, as well as the lack of price reversals following the issuance of a PQ. The first figure presents the CARs for price increases; the second for price decreases.

Panel A: CARs for Price Increases



Panel B: CARs for Price Decreases



The lack of a price reversal suggests that the post-query price remains elevated because it is driven by informed traders, rather than speculators. This indicates that the reason for the price movement is permanent, consistent with information based trading and inconsistent with a temporary liquidity shock.

The absence of a price reversal is particularly interesting for the "No News" responses, displayed in the second column of Table 7. In the post-query period of [0, +5], the mean CAR for price increases (decreases) among "No News" responses is -0.13% (4.76%), while after 30 days, the CARs are 3.04% (4.71%) for price increases (decreases). If a firm's "No News" response fails to reduce the price of a security to return to a pre-query level, the new price level likely reflects new private information being impounded into the price. As argued by Marsden and Poskitt (2009), the absence of a price reversal after "No News" responses "suggests that trading activity is not being primarily driven by uninformed speculators".

The CARs for "New Information" and "Ambiguous" responses are larger in magnitude than "No News" responses. Given that these firms make some attempt to provide an explanation to the market for the price move, this result is expected. Overall the results contradict Hypothesis I that PQs with "No News" responses should be followed by price reversals.

6.3 – Firm Behaviour around Subsequent Announcements

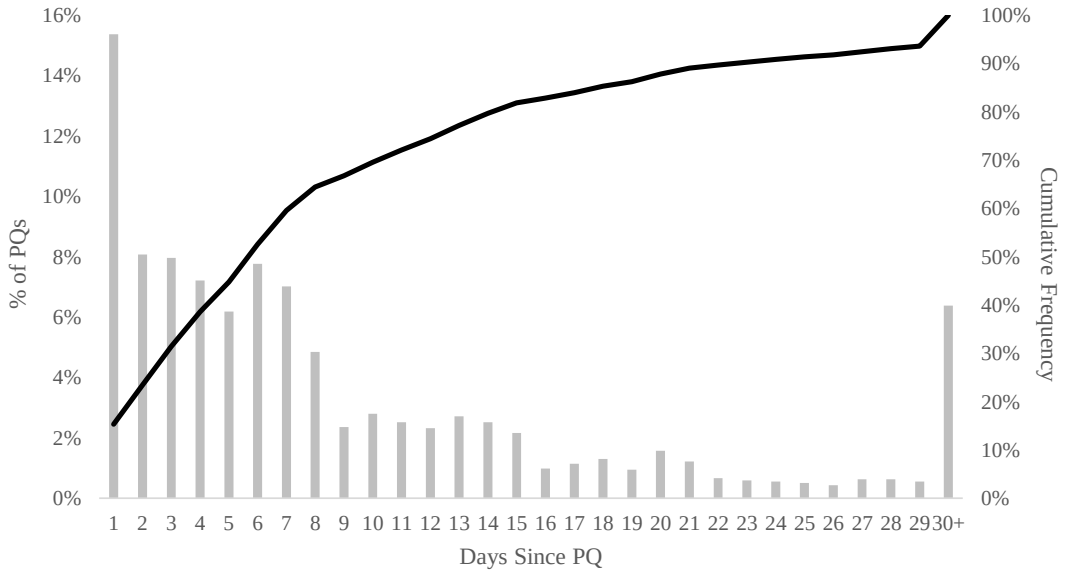
The absence of a price reversal, particularly for queried firm with "No News" responses is not sufficient to conclude that PQs are driven by informed traders. To complement this result, two other information signals are examined to help determine whether PQs are driven by informed traders: i) the time taken for a firm to release a subsequent announcement and ii) the type of subsequent announcement issued.

As shown in Figure 4, more than 15% of queried firms release a new announcement on the first day following a PQ response and over 45% of firms made an announcement within 5 days. Following a "No News" PQ response with another ASX announcement appears counter-intuitive: if 77.3% of firms respond to PQs by announcing they are not aware of any information that could be driving the pre-query price change, it seems unlikely that nearly half of all queried firms would identify new material information within 5 days. This observation, illustrated in Panel A of Figure 4, is evidence either of firms coincidentally uncovering new information worth announcing to the market within days of issuing a PQ response, or of non-disclosed information. Panel B of Figure 4 also shows that firms that receive informed queries appear to release subsequent announcements more quickly than firms in receipt of uninformed queries: 50% of firms with informed queries release a subsequent announcement within 5 days, compared to only 40% for firms with uninformed queries. These results, which are consistent with the observations by Neagle and Tsykin (2001), raise suspicion that compliance with the continuous disclosure regime amongst firms issued with PQs may be potentially weak.

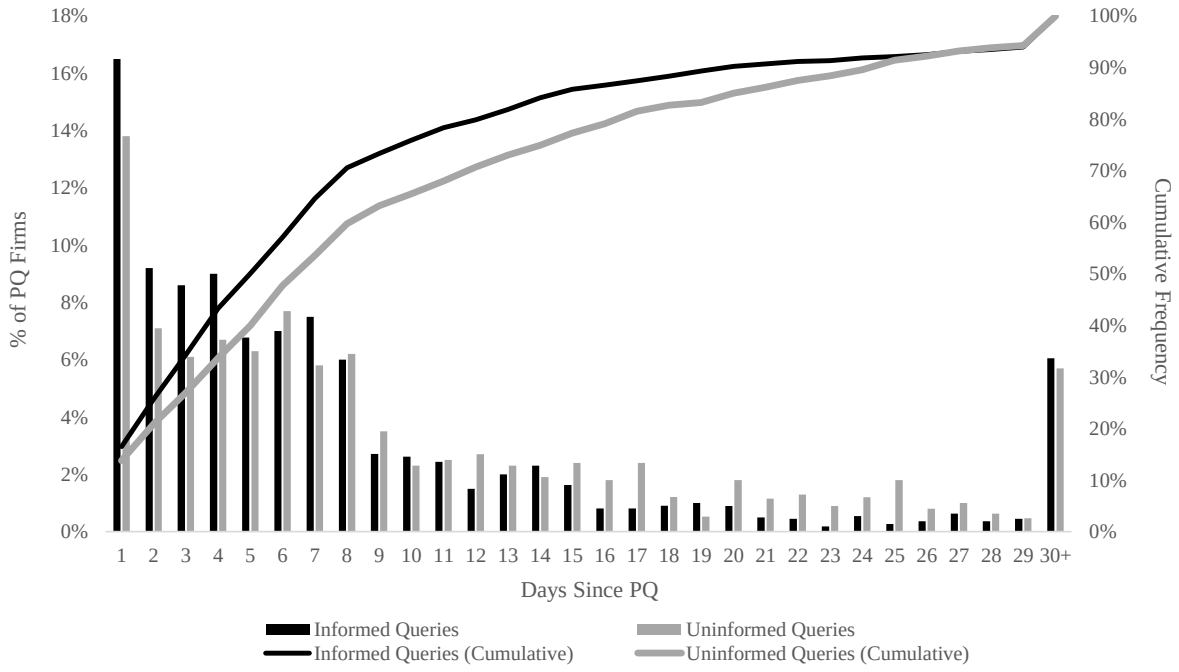
Figure 4: Delay Between PQs and Subsequent Announcements

Figure 4 illustrates the time elapsed between a firm's PQ response and its subsequent public announcement. The left-hand vertical axis expresses the percent of all queries which release any announcement from 1-60 days after their PQ. The right-hand vertical axis displays the cumulative frequency of all queries that release a subsequent announcement. In Panel B, informed queries represent those queries with information-driven subsequent announcements; these include ASX class codes 1000, 6000, 7000 and 11000. Queried firms whose subsequent announcement is not one of these types are classified as uninformed.

Panel A: Delay Between PQs and Subsequent Announcements



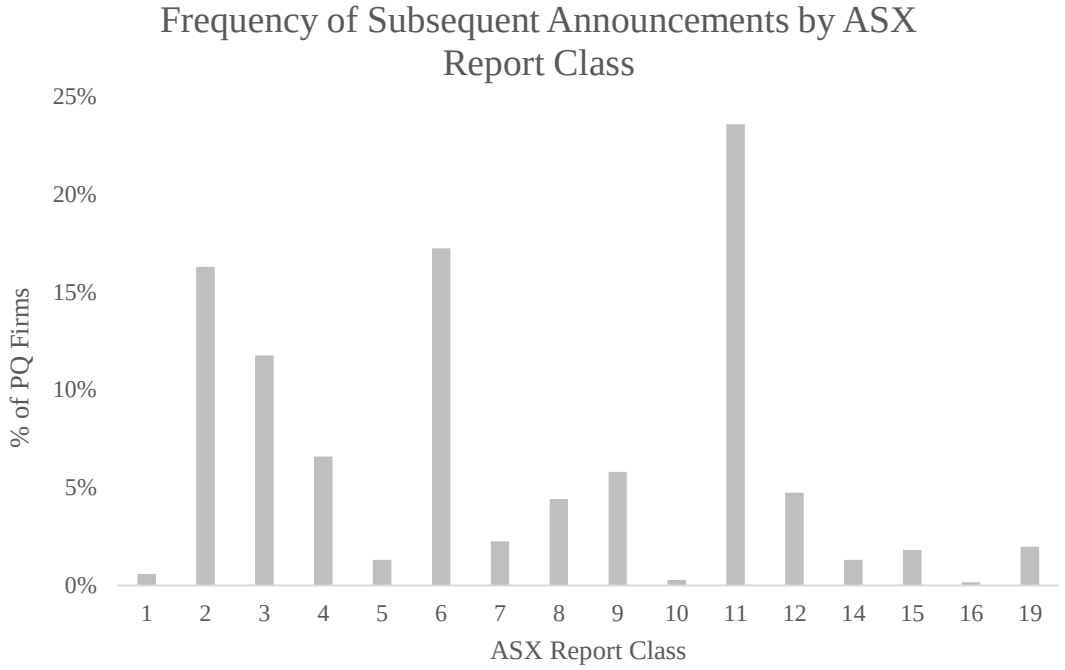
Panel B: Delay Between PQs and Subsequent Announcements – Informed vs Uninformed Queries



Further, an examination of the types of firm announcements released directly after a PQ, presented in Figure 5, shows that over 24% of queried firms released a Progress Update (ASX class 11) directly after a PQ, while 17% reported an announcement of Issued Capital (ASX class 6). These findings are curious since the two most common types of subsequent announcements (Progress Updates and notices of Issued Capital) are both sensitive, non-routine and contain material information.

Figure 5: Frequency of Subsequent Announcements by ASX Report Class

Figure 5 shows the frequency distribution of subsequent announcements by ASX report class (released within 60 days of a PQ). The ASX report classes are: Class 1 - *Takeover Announcements;* Class 2 - notices of *Security Holder Details;* Class 3 - *Periodic Reports;* Class 4 - *Quarterly Activities Reports;* Class 5 - *Quarterly Cash Flow Reports;* Class 6 - notices of *Issued Capital*; Class 7 - *Asset Acquisitions & Disposals;* Class 8 - *Notice of Meetings;* Class 9 - *Other ASX Announcements;* Class 10 - *Dividend Announcements*; Class 11 - *Progress Updates;* Class 12 - notices of changes to *Company Administration;* Class 13 - *Notices of Call (Contributing Shares);* Class 14 - *Other Announcements*; Class 15 - *Chairman's Address;* Class 16 - *Letters to Shareholders;* Class 17 - *ASX Queries;* Class 18 - announcements on *Structured Products;* and Class 19 - *Commitments Test Entity Quarterly Reports.*



The release of non-routine announcements directly after PQs suggests that queried firms are likely to suffer from information leakage, given that only company insiders (who are usually subject to trading window restrictions) should be aware of upcoming unexpected firm announcements. Yet an abnormal pre-query price change ahead of a progress update or a notice of issued capital suggests that some market participants may use an information advantage to

profitably trade ahead of these important firm announcements. This behaviour is particularly concerning when queried firms respond to PQs with "No News": despite assuring the market that there is no new information the firm is aware of, "No News" respondents i) release a subsequent announcement within days of the query responses and ii) the announcements contain material information. This raises questions on the efficacy of PQs as an enforcement mechanism for the continuous disclosure regime.

An abnormal price change ahead of scheduled company announcements (such as periodic and quarterly reports) could be caused by speculative trades from uninformed investors, since the date of the announcement is publicly available. This could explain an abnormal price change directly before the release of a scheduled announcement. However unscheduled announcements such as Progress Updates and notices of Issued Capital are more difficult to justify. Examples of Progress Updates are commencements of drilling programs, expansions of oil and gas operations or the approval for a new drug, while notices of Issued Capital typically refer to announcements of equity raisings. Only company insiders should be aware of the information contained in these types of announcements, and as such, abnormal price changes ahead of these non-scheduled announcements warrant closer examination.

Figure 5 also shows that the third most popular type of subsequent announcement is a notice of Security Holder Details (ASX Class 2). These are provided to the ASX when a shareholder acquires a significant stake in a public company or when an entity ceases to be a substantial shareholder. Given that PQs are preceded by large price movements, the entity driving the change in price is likely to have become (or ceased to be) a substantial shareholder. These are likely to be causing abnormal price movements due to liquidity imbalances. This is an example of a subsequent announcement that is unlikely to be information based.

PQs are classified as informed if a material announcement is issued within 10 days of a PQ response. Consequently, if a firm's subsequent announcement is either a Takeover Announcement, a notice of Issued Capital, an Asset Acquisition or Disposal or a Progress Update (ASX Report Classes 1000, 6000, 7000 or 11000), a query is classified as informed. Applying this criteria, 43.1% of all PQs are classified as informed. Table 8 shows that the proportion of informed queries is similar for price increases and decreases.

Table 8: Informed Queries

Table 8 presents the percentage of informed and uninformed queries, broken down by price increases and decreases. Note that the total number is lower than the full sample of queries. This is due to a small number of firms failing to release a subsequent announcement in the 60 days following a PQ.

	Informed		Uninformed		Total
	Number	Percentage	Number	Percentage	Number
Price Increases	940	43.2%	1,237	56.8%	2,177
Price Decreases	153	42.5%	207	57.5%	360
Total	**1,093**	43.1%	**1,444**	56.9%	**2,537**

6.4 – Determinants of Informed Queries

This section presents the results from the study of firm characteristics on the likelihood of observing informed queries. The dependent variable *PQ* takes the value of 1 if a query is classified as informed and 0 otherwise; this reveals the directional effect of firm characteristics on the probability of observing informed queries,

6.4.1 Industry

Table 9 illustrates that a number of GICS sectors received a higher proportion of information based queries, with firms in the Utilities and Telecommunications Services sectors most likely to receive an informed query.

Table 9: Informed Queries by GICS Sector

Table 9 presents the percent of informed queries for each GICS sector. The Telecommunication Services, Utilities and Health Care sectors received the highest proportion of informed queries. Frequency represents the number of all queried firms in each sector. The second column presents the percentage of queries that were classified as informed in each sector.

GICS Sector	Frequency	% Informed
Telecommunication Services	30	50.0%
Utilities	49	49.5%
Health Care	242	49.1%
Consumer Staples	63	44.0%
Energy	541	43.4%
Consumer Discretionary	110	40.4%
Materials	1,371	35.7%
Financials	140	32.1%
Information Technology	134	28.4%
Industrials	173	26.0%
Total	**2,853**	**43.1%**

Table 10 presents the results of the probit regression. As revealed by Columns 7 and 8 in Table 10, the industry regressions included 9 dummy variables for the 10 GICS sector classifications. Regression 7 is presented using the Materials industry as the base dummy variable, while regression 8 uses the Health Care industry as the base case. Table 10 illustrates that queried firms in the Energy, Consumer Staples, Health Care, Utilities and Telecommunications sectors are all more likely to be informed than firms in the Materials sector. Although Materials firms are more likely to receive a PQ, they are not necessarily more likely to experience *informed* queries. This contradicts Hypothesis III, which states that Materials firms are more likely to be the subject of informed queries due to the project-based nature of their business. When Health Care is used for the base case, only Utilities and Telecommunications firms have a higher likelihood of experiencing an informed query. These results indicate that Health Care firms (which predominantly consist of Biotechnology firms in the sample of this study) are more likely to experience informed queries.

Table 10: The Impacts of Firm Characteristics on Informed Queries

Table 10 presents the findings from the probit regression. The dependent variable, *PQ* is 1 for informed queries or 0 for uninformed queries. *Log(MktCap)* represents a continuous variable of a firm's market cap; *NoRevenue* is a dummy variable equal to 1 for firms with no revenues and 0 otherwise. *PositiveQuery* is a dummy equal to 1 if the pre-query price change is positive and 0 if negative. *Q1 No News* and *Q1 New Information* are dummy variables equal to 1 depending on the response code allocated to each PQ. *QuotedSpread* and *LimitOrderDepth* are continuous variables of a firm's quoted spread and limit order book depth. The remaining variables are dummy variables that take the value of 1 if a firm belongs to the specific sector. Coefficients are expressed as percentages. Robust standard errors are displayed in brackets. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively. Note: the number of observations falls from 2,853 to 2,537 due to some companies not releasing a subsequent announcement within the chosen event window.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*
Log(MktCap)	-0.54***	-0.27***	-0.85***					
	(0.0013)	(0.0109)	(0.0013)					
NoRevenue	31.07***	31.63***		27.58***				
	(0.0055)	(0.0049)		(0.0046)				
PositiveQuery	8.74***	2.75***			5.81***			
	(0.0060)	(0.0057)			(0.0054)			
Q1 - Group 1	-18.36***	-19.28***				-15.74***		
("No News")	(0.0064)	(0.0062)				(0.0060)		
Q1 - Group 2	40.92***	21.65***				35.22***		
("New Information")	(0.0188)	(0.0184)				(0.018)		
QuotedSpread	-5.68***	-2.42**						
	(0.0080)	(0.0076)						
LimitOrderDepth	4.10**	4.06***						
	(0.0021)	(0.0021)						
Consumer Discretionary	-35.37						41.80	-107.63
	(0.0141)***						(0.0126)***	(0.0150)***
Consumer Staples	67.50						49.22	-16.61
	(0.0218)***						(0.0211)***	(0.0226)***
Energy	39.06						39.68	-26.15
	(0.0060)***						(0.0056)***	(0.0099)***
Health Care	85.95						65.83	-
	(0.0100)***						(0.0093)***	
Industrials	-59.48						-80.30	-146.13
	(0.0119)***						(0.0111)***	(0.0138)***
IT	-16.55						-3.13	-68.96
	(0.0188)***						(0.0167)	(0.0186)***
Utilities	102.64						92.00	26.17
	(0.0219)***						(0.0214)***	(0.0229)***
Telecommunication Services	113.66						101.66	35.83
	(0.0251)***						(0.0245)***	(0.0258)***
Financials	-15.66						-28.01	-93.84
	(0.0179)***						(0.0176)***	(0.0194)***
Materials	-						-	-65.83
								(0.0093)***
Intercept	73.60***	-2.94***	-19.35***	-30.31***	-13.56***	-2.90***	-25.56***	40.27***
	(0.0239)	(0.0109)	(.0057)	(.0035)	(.0026)	(0.0054)	(0.0032)	(0.0087)
Observations	2,537	2,537	2,537	2,537	2,537	2,537	2,537	2,537
Pseudo R-squared	15.67%	14.33%	11.86%	10.31%	9.45%	13.46%	8.51%	7.07%

Firms in the Utilities and Telecommunications sectors are more likely to receive informed queries than both firms in the Materials and Health Care sectors. This effect is unexpected considering that firms in the Utilities and Telecommunications sectors tend to be less volatile and are less susceptible to speculation (McDonald et al. 2010 show that firms in these sectors have betas lower than 1). Although firms in these two sectors receive fewer queries, when they occur they are more likely to be informed because large abnormal price changes in these sectors signals the existence of material information. This is a possible justification for the result that firms in the Utilities and Telecommunications sectors are more likely to experience informed queries.

6.4.2 Control Variables

Column 2 of Table 10 presents the results from the regression containing control variables relating to firm characteristics (size, revenue, directional price movement, quoted spreads and limit order book depth).

Larger firms experience fewer informed queries, as presented in Column 3 of Table 10. This implies that smaller firms in the sample have a higher probability of being the subject of an informed query. More importantly, the effect of firm size on the likelihood of observing informed queries is robust to the inclusion of control variables (Column 2) and industry variables (Column 1). These results are consistent with Hypothesis II and illustrate that abnormal price changes of smaller firms are more likely to be driven by informed traders. This is likely due to these firms having a higher degree of information asymmetry, as they are more heavily dependent on the outcomes of single projects, such as the outcome of drug trials or drilling results. On the other hand, large companies are much less likely to depend on the outcome of any one project due to a broader pipeline of projects.

Table 10 also reveals that firms without revenues are more likely to experience informed PQs compared to firms with positive revenues. Firms with no revenues, such as mining exploration companies or pharmaceutical firms developing new drugs, usually have project-oriented operations that rely on a new discovery. The project-oriented nature of these businesses enhances the opportunity for insiders to profit from information, especially in the case of new discoveries; Poskitt (2005) shows mining-exploration and mining-production firms are more likely to be the subject of informed trading than other resources firms. The relationship between *NoRevenue* and the probability of informed trading is robust to the inclusion of all other control variables. These findings support Hypothesis IV – firms with no revenues are more likely to experience informed queries.

Consistent with the practice of stealth trading, Table 10 documents that informationally-driven PQs are more likely to experience narrower quoted spreads. Column 1 of Table 10 shows that narrower quoted spreads increase the likelihood of an informed query. Consistent with Hypothesis VI, Table 10 reports a positive relationship between informed queries and the depth in the limit order book. These results are statistically significant and consistent across all three regressions that use *LimitOrderDepth* as an explanatory variable. As highlighted by Kaniel and Liu (2006), higher depth among informed queries suggests that informed agents are more likely to use limit orders, indicating that these traders either do not appear to be impatient or fear exposing their information through aggressive trading. This is contrary to the conventional literature which argues that informed traders are more likely to use market orders, and thus reduce limit order book depth (Angel, 1997; Harris and Hasbrouck, 1996). The results from the full panel show that lower spreads and higher limit order book depth increase the likelihood of informed queries; these two observations provide support for the argument that informed traders ahead of PQs are more likely to engage in stealth trading rather than executing orders immediately. Aggressive trading given thin limit order book depth

is likely to signal the traders' private information to the market more rapidly, reducing the value of that information.

Finally, positive pre-query price movements are more likely to be driven by informed traders than negative pre-query price movements, as illustrated by the positive coefficients of the *PositiveQuery* explanatory variable. This result is statistically significant at the 1% level and is robust to the inclusion of all other variables. This result contradicts Hypothesis V, which stated that informed queries were more likely to occur when the pre-query price movement is negative due to the high costs associated with short-selling illiquid securities.

6.4.3 Response Codes

The results from the regressions of the response codes, displayed in Column 6 of Table 10, showed that firms with "New Information" responses are more likely to be informed than firms with "Ambiguous" responses. On the other hand, "No News" responses are less likely to be informed compared to "Ambiguous" responses. These statistically significant results are in-line with expectations – queries with "New Information" responses are expected to have a higher probability of being informed because these responses are accompanied by the disclosure of new information. Conversely, "No News" responses are less likely to be informed than "New Information" and "Ambiguous" responses given that a proportion of "No News" queries are likely to be speculative or driven by liquidity imbalances, rather than new information. Nonetheless, a proportion of "No News" responses are still likely to be informed (due to their subsequent disclosure behaviour and due to the absence of price reversals), despite firms failing to providing explanations for the abnormal price moves when prompted by the ASX.

6.4.4 Overall Results

These results indicate that smaller firms, firms with no revenues, firms with positive pre-query price movements and firms with a higher limit order book depth all have a higher probability of experiencing an informed query. Additionally, firms with "New Information" responses are more likely to be informed than "Ambiguous" responses, while "No News" responses are less likely. These results are statistically significant and robust to the inclusion of all explanatory variables.

To measure the goodness-of-fit of the regressions, McFadden's (1974) pseudo R-squared measure is computed, which measures the proximity between the models and the observed data. McFadden (1974) shows that a pseudo R-squared of over 20% represents an excellent fit; the pseudo R-squared from Table 10 indicate that the independent variables explain a significant amount of the variation in the informed variable, particularly regressions 1 and 2 which have pseudo R-squared coefficients of 15.67% and 14.33%.

6.5 – Robustness Test

An alternative definition of informed query is used to test the robustness of the results. This alternate definition is based on the price behaviour after a PQ: if the price of a queried firm returns to within 10% of its pre-query price within 10 days, the query is classified as uninformed, while no such reversion is classified as informed. Table 11 shows that over 90% of PQs receive the same classification regardless of the definition used.

Table 11: Comparison of *Informed* Classifications

Table 11 presents the percent of informed queries using the two separate definitions. The main definition of informed queries is based on the time and types of subsequent announcements release by a queried firm; the alterative definition is based on whether the price of a queried firm experiences a reversal.

		Main Definition		
		Informed	*Uninformed*	*Total*
Alternative Definition	*Informed (%)*	41.5%	7.7%	49.2%
	Informed (#)	1,053	196	1,249
	Uninformed (%)	1.6%	49.2%	50.8%
	Uninformed (#)	40	1,248	1,288
	Total (%)	43.1%	56.9%	100.0%
	Total (#)	1,093	1,444	2,537

Table 12 replicates the analysis from Table 10 using the new definition of information based queries. Overall, the effects of the explanatory variables on the likelihood of informed queries are robust to the alternative definition for informed queries. Nonetheless, there are some exceptions, as presented in table 12. In the robustness test, the depth in the limit order book and of the quoted spreads have the opposite effect on informed queries, implying that firms with wider spreads and higher depth are more likely to experience informed queries. This robustness test fails to support the hypothesis that informed traders use limit orders and engage in stealth trading in order to conceal their information advantage. The pseudo r-squared, proxies for the goodness-of-fit of the regressions, are also lower for all models in the robustness test, suggesting that the explanatory variables have less predictive power than in the original regression. Overall, the robustness test confirms the direction and significance of the following explanatory variables: size, revenue, price direction and response codes.

Table 12: Robustness Test

Table 12 presents the findings from the probit regression from the robustness test, using an alternative definition of an informed query. The dependent variable, *PQ* is 1 for informed queries or 0 for uninformed queries. *Log(MktCap)* represents a continuous variable of a firm's market cap; *NoRevenue* is a dummy variable equal to 1 for firms with no revenues and 0 otherwise. *PositiveQuery* is a dummy equal to 1 if the pre-query price change is positive and 0 if negative. *Q1 No News* and *Q1 New Information* are dummy variables equal to 1 depending on the response code allocated to each PQ. *QuotedSpread* and *LimitOrderDepth* are continuous variables of a firm's quoted spread and limit order book depth. The remaining variables are dummy variables that take the value of 1 if a firm belongs to the specific sector. Coefficients are expressed as percentages. Robust standard errors are displayed in brackets. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*	*PQ*
Log(MktCap)	-0.43***	-0.03*	-1.44***					
	(0.0015)	(0.0014)	(0.0014)					
NoRevenue	25.34***	35.53***		26.84***				
	(0.0060)	(0.0054)		(0.0051)				
PositiveQuery	3.15***	4.70***			0.91***			
	(0.0065)	(0.0062)			(0.0059)			
Q1 - Group 1	-9.12***	-10.13***				-43.17***		
("No News")	(0.00190)	(0.00185)				(0.0172)		
Q1 - Group 2	16.27***	60.41***				21.55***		
("New Information")	(0.0182)	(0.0177)				(0.0179)		
QuotedSpread	4.11***	10.73**						
	(0.0111)	(0.0105)						
LimitOrderDepth	-0.13	-4.74***						
	(0.0023)	(0.0022)						
Consumer Discretionary	-61.33						-61.18	-80.32
	(0.0187)***						(0.0158)***	(0.0179)***
Consumer Staples	85.63						69.94	50.81
	(0.0219)***						(0.0212)***	(0.0228)***
Energy	62.04						60.71	-41.57
	(0.0063)***						(0.0059)***	(0.0104)***
Health Care	48.98						19.14	-
	(0.0105)***						(0.0099)***	
Industrials	-53.26						-71.99	-91.13
	(0.0142)***						(0.0133)***	(0.0158)***
IT	79.50						122.10	21.14
	(0.0278)***						(0.0273)	(0.0286)***
Utilities	52.13						121.00	101.86
	(0.0212)***						(0.0205)***	(0.0222)***
Telecommunication Services	10.28						1.74	17.39
	(0.0264)***						(0.0255)	(0.0269)***
Financials	-28.80						-43.19	-62.33
	(0.0218)***						(0.0213)***	(0.0229)***
Materials	-						-	19.14
								(0.0099)***
Intercept	-9.28***	-30.48***	92.23***	73.44***	-41.55***	14.53***	97.29***	78.15***
	(0.0211)	(0.0204)	(.0062)	(.0033)	(.0019)	(0.0068)	(0.0036)	(0.0092)
Observations	2,537	2,537	2,537	2,537	2,537	2,537	2,537	2,537
Pseudo R-squared	13.79%	12.02%	8.45%	10.33%	7.31%	9.48%	8.77%	8.91%

7. Conclusion

This study uses PQ events to examine the efficacy of the continuous disclosure regime in minimising the level of information-based trading in the Australian market. The evidence suggests that informed trading appears to be occurring in almost half of all PQs, implying that compliance with the continuous disclosure regime does not seem to be well enforced.

Company responses to PQs and the subsequent disclosure behaviour of queried firms raises important questions. Despite reporting no knowledge of any reason for large price changes, queried firms often release company announcements within days of a PQ response and which contain material information. This occurs in spite of failing to provide an explanation for the abnormal price move when prompted to do so by the ASX, and when exemptions to the disclosure obligation are no longer available. This is particularly unusual due to the absence of price reversals following PQs, which might be expected if there was really no news. This raises two fundamental questions: why do security prices of queried firms remain at a substantially higher level after a PQ, even after "No News" responses? And why are PQ responses immediately followed by the release of sensitive and non-routine announcements? The imminent release of company announcements after PQs may indicate that some firms are aware of new and undisclosed information at the time of the PQ response. As such, companies seem to have poor disclosure behaviour: firms should proactively distribute the material information when becoming aware of it, rather than announcing the information only after being prompted by the ASX.

In addition to identifying PQs which appear to be driven by informed traders, this paper examines a number of firm-specific characteristics that increase the likelihood of observing informed queries. In particular, the results demonstrate that small firms, firms with no revenues

and firms with positive pre-query price movements have a higher likelihood of experiencing informed queries; these results are significant and robust to alternative definitions of informed queries. Further, it appears that informed queries are more likely to occur when spreads are narrower and when limit order book depth is high; this finding is supportive of the argument outlined by Barclay et al. (1993) and Chakravarty (2001) that informed traders are more likely to use limit orders and engage in stealth trading in order to conceal their informational advantage. Finally, there is no evidence that firms in the resource or health care sectors experience more informed trading.

There are a number of caveats on the findings of this thesis. Firstly, this study is subject of a sample bias because PQs are more likely to be issued to small and illiquid securities. As previously outlined, 85% of queries were issued to firms with a price lower than $1. Still, queried firms are exogenously selected by the ASX, such that the sample bias is not caused by the research design of this paper. Consequently, the conclusions that are drawn out of this research are predominantly applicable to firms with characteristics similar to queried firms. Secondly, although this paper suggests that a number of queries are likely to be informed, the evidence is not able to prove beyond reasonable doubt (unless resorting to full legal action) whether these queries are in fact driven by informed traders. Nonetheless, given the research on abnormal price changes in a reasonably efficient market like Australia's, price movements of this sort do not occur in the absence of new information being released. The aim of this thesis is to raise the question of whether these abnormal price movements are a mere coincidence, especially when material information is soon after re leased by queried firms.

When a company responds to a PQ with "No News", there is reason to be sceptical given the firm's price has just experienced an unusual price change. If an abnormal price movement is caused by information that has ceased to be confidential then firms should be

required to immediately disclose any material information; alternatively, firms should request trading halts until the potentially material information can be disseminated without providing an opportunity for insiders to profit from their information.

Due to the recurring behaviour of firms responding to PQs with "No News" but then releasing announcements containing material information shortly after, it may be necessary to implement stricter surveillance mechanisms in the Australian market. In addition to monitoring abnormal price movements more closely, it may be beneficial to introduce targeted education for company directors on the compliance with the continuous disclosure regime. Ultimately this may lead to better disclosure practices and reduce information leakage. An area that may warrant further consideration is the monitoring of unusual price behaviour in the derivative markets, since informed traders have been shown to trade options ahead of significantly positive and negative news events (Blasco et al., 2010). Another area of future research may be to study the disclosure behaviour of queried firms and compare it to a matched sample of similar non-queried firms.

This paper has a number of policy implications for regulators. As argued by Neagle and Tsykin (2001), "non-disclosure is a very real threat to the efficiency and integrity of the Australian market", and if companies are delaying the delivery of information to the market, investors are likely to lose confidence in both the continuous disclosure system and the market itself, reducing participation and increasing the cost of capital. The behaviour of queried firms needs to be analysed more closely, particularly around the potential presence of informed traders, and it is vital that the supervision of non-compliant firms continues to evolve and improve, whether this is done through more rigorous PQs or alternate monitoring mechanisms. Ultimately, an efficient and informed market should be the key priority for Australian regulators and companies, and a continuous disclosure system is critical to maintaining market

integrity and investor confidence. It is the enforcement and monitoring of the continuous disclosure system, rather than the system itself, that requires closer scrutiny.

References

Andersen, A., Gilbert, A. and Tourani-Rad, A., 2013, 'Breach of Continuous Disclosure in Australia', *FINSIA Journal of Applied Finance* 4, 21-26.

Angel, J.J., 1997, 'Tick Size, Share Prices and Stock Splits', *Journal of Finance* 52, 655-681.

Atkins, A.B. and Dyl, E.A., 1990, 'Price Reversals, Bid-Ask Spreads, and Market Efficiency', *Journal of Financial and Quantitative Analysis* 25, 535-547.

Australian Securities Exchange, *ASX Listing Rules: Guidance Note 8 – Continuous Disclosure: Listing Rules 3.1 – 3.1B*, May 2013, 20-78

Australian Securities Exchange, *ASX Listing Rules: Guidance Note 8 – Continuous Disclosure: Listing Rules 3.1 – 3.1B*, April 2015, 15-47.

Australian Securities Exchange, *ASX Listing Rules: Chapter 4 Periodic Disclosure*, December 2013, 401-412.

Barclay, M.J., Dunbar, C.G. and Warner, J.B., 1993, 'Stealth and Volatility: Which Trades Move Prices?', *Journal of Financial Economics* 34, 281-306.

Baruch, S., Panayides, M. and Venkataraman, K., 2014, 'Informed Trading Before Unscheduled Corporate Events: Theory and Evidence', Working paper, University of Pittsburgh.

Beltran, H.L., Grammig, J. and Menkveld, A.J., 2012, 'Limit Order Books and Trade Informativeness', *European Journal of Finance* 18, 737-759.

Blasco, N., Corredor, P. and Santamaria, R., 2010, 'Does Informed Trading Occur in the Options Market? Some Revealing Clues', *Accounting & Finance* 50, 555-579.

Bloomfield, R., O'Hara, M. and Saar, G., 2005, 'The "Make or Take" Decision in an Electronic Market: evidence on the evolution of liquidity, *Journal of Financial Economics* 75, 165-199.

Bremer, M. and Sweeney, R.J., 1991, 'The Reversal of Large Stock-Price Decreases', *Journal of Finance* 46, 747-754.

Brown, K.C., Harlow, W.V. and Tinic, S.M., 1988, 'Risk Aversion, Uncertain Information and Market Efficiency', *Journal of Financial Economics* 22, 355-385.

Brown, P., Taylor, S.L. and Walter, T.S., 1999, 'The Impact of Statutory Sanctions on the Level of Information Content of Voluntary Corporate Disclosure', *Abacus* 35, 138-162.

Cassidy, A. and Chapple, L.J., 2003, 'Australia's Corporate Disclosure Regime: Lessons from the US Model', *Australian Journal of Corporate Law* 15, 1-24.

Chakravarty, S., 2001, 'Stealth-Trading: Which Traders' Trades Move Stock Prices?', *Journal of Financial Economics* 61, 289-307.

Chapple, L.J. and Truong, T.P., 2013, 'Statutory-Backed Continuous Disclosure Regime and Corporate Disclosure Behaviour: Does Corporate Governance Matter?', Working paper, Queensland University of Technology.

Christensen, P.O., Leonidas, E.R. and Feltham, G.A., 2010, 'Information and the Cost of Capital: An Ex Ante Perspective', *Accounting Review* 85, 817-848.

Commerton-Forde, C. and Putnins, T.J., 2009, 'Are Short Seller Manipulating the Market?', Working paper, University of Sydney.

Corporations Act 2001, (Cth), *Obligation of Entity to Provide Information to Market Operator*, s674(2).

Diamond, D.W. and Verrecchia, R.E., 1991, 'Disclosure, Liquidity, and the Cost of Capital', *Journal of Finance* 46, 1325-1359.

Di Lernia, C., 2013, *Faith/less? Market Integrity and the Enforcement of Australia's Continuous Disclosure Provisions*, Ph.D., University of Sydney, Australia.

Di Lernia, C., 2014, 'Empirical Research in Continuous Disclosure', *Australian Accounting Review* 24, 402-405.

Drienko, J. and Sault, S.J., 2011, 'The Impact of Company Responses to Exchange Queries on the Australian Equity Market', *Accounting & Finance* 51, 923-945.

Fama, E., 1970, 'Efficient Capital Markets: A Review of Theory and Empirical Work', *Journal of Finance* 25, 383-417.

Glosten, L.R. and Milgrom, P.R., 1985, 'Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders', *Journal of Financial Economics* 14, 71-100.

Golding, G. and Kalfus, N., 2004, 'The Continuous Evolution of Australia's Continuous Disclosure Laws', *Company and Securities Law Journal* 22, 385-426.

Gong, N., 2007, 'Effectiveness and Market Reaction to the Stock Exchange's Inquiry in Australia', *Journal of Business Finance & Accounting* 34, 1141-1168.

Harris, L. and Hasbrouck, J., 1996, 'Market vs Limit Orders: the SuperDot Evidence on Order Submission Strategy', *Journal of Financial and Quantitative Analysis* 31, 213-231.

Healy, P.M. and Palepu, K.G., 2001, 'Information Asymmetry, Corporate Disclosure, and the Capital Markets: A Review of the Empirical Disclosure Literature', *Journal of Accounting and Economics* 31, 405-440.

Hsu, G.C., 2009, 'Impact of Earnings Performance on Price-Sensitive Disclosures under the Australian Continuous Disclosure Regime', *Accounting and Finance* 49, 317-339.

Johnstone, D., 2013, 'A Bayesian Understanding of Information Uncertainty and the Cost of Capital', Working paper, University of Sydney Business School.

Jones, C.M. and Lamont, O.A., 2002, 'Short-Sale Constraints and Stock Returns', *Journal of Financial Economics* 66, 207-239.

Kanagaretnam, K., Lobbo, G.J. and Whalen, D.J., 2005, 'Relationship Between Analyst Forecast Properties and Equity Bid-Ask Spreads and Depths Around Quarterly Earnings Announcements', *Journal of Business Finance & Accounting* 32, 1773-1799.

Kaniel, R. and Liu, H., 2006, 'So What Orders Do Informed Traders Use?', *Journal of Business* 79, 1867-1913.

Kavajecz, K.A., 1999, 'A Specialist's Quoted Depth and the Limit Order Book', *Journal of Finance* 54, 747-771.

Ke, Y., 2015, 'Unintended Consequences of Voluntary Disclosure: Evidence from Informed Trading after Firms' Initiation of Quarterly Earnings Guidance', Working paper, Brock University Goodman School of Business.

Kim, O. and Verrecchia, R., 1994, 'Market Liquidity and Volume Around Earnings Announcements', *Journal of Accounting and Economics* 17, 41-67.

Lambert, R., Leuz C. and Verrecchia, R., 2006, 'Accounting Information, Disclosure, and the Cost of Capital', *Journal of Accounting Research* 45, 385-420.

Lamont, O.A., 2004, 'Go Down Fighting: Short Sellers vs Firms', Working paper, Yale School of Management.

Lecce, S. and Lepone, A., 2012, 'The Impact of Naked Short Selling on the Securities Lending and Equity Market', *Journal of Financial Markets* 15, 81-107.

Lee, C., Mucklow, B. and Ready, M., 1993, 'Spreads, depths and the impact of earnings information: an intraday analysis', *Review of Financial Studies* 6, 345-374.

Leuz, C. and Verrecchia, R.E., 2000, 'The Economic Consequences of Increased Disclosure', *Journal of Accounting Research* 38, 91-124.

Leuz, C. and Wysocki, P.D., 2008, 'Economic Consequences of Financial Reporting and Disclosure Regulation: A Review and Suggestions for Future Research', Working paper, University of Chicago Booth School of Business.

Long, P.T., Nguyen, T. and Thuy-Duong, T., 2007, 'Abnormal Returns After Large Stock Price Changes: Evidence from Asia-Pacific Markets', *International Finance Review* 7, 205-227.

McDonald, J.B., Michelfelder, R.A. and Theodossiou, P., 2010, 'Robust Essmation with Flexible Parametric Distributions: Estimation of Utility Stock Betas', *Quantitative Finance* 10, 375-387.

Marsden, A. and Poskitt, R., 2009, 'An Analysis of ASX PQs', *Australian Accounting Review* 19, 217-230.

Martins, O.S. and Paulo, E., 2012, 'Information Asymmetry in Stock Trading, Economic and Financial Characteristics and Corporate Governance in the Brazilian Stock Market', *Accounting & Finance Review,* Forthcoming.

Mayorga, D., 2013, 'Managing Continuous Disclosure: Australian Evidence', *Accounting, Auditing & Accountability Journal* 26, 1135-1169.

McFadden, D., 1974, 'Conditional Logit Analysis of Qualitative Choice Behaviour', in P. Zarembka, ed., *Frontiers in Econometrics* (Academic Press).

Menkhoff, L., Osler, C.L. and Schmeling, M., 2010, 'Limit-Order Submission Strategies under Asymmetric Information', *Journal of Banking & Finance* 34, 2665-2677.

Neagle, A. and Tsykin, N, 2001, 'Please Explain: ASX Share PQs and the Australian Continuous Disclosure Regime', Working paper, University of Melbourne Law School.

North, G., 2011, 'Continuous Disclosure in Australia: The Empirical Uncertainties', *29 Company and Securities Law Journal 394*, UWA Faculty of Law Research Paper.

O'Shea, P.D., 2008, 'Patterns of Disclosure and Volatility Effects In Speculative Industries', *Journal of Financial Regulation and Compliance* 16, 261-273.

Poskitt, R., 2005, 'Are Mining-Exploration Stocks More Prone to Informed Trading than Mining-Production Stocks?', *Australian Journal of Management* 30, 201-227.

Raykovski, E., 2004, 'Continuous Disclosure: Has Regulation Enhanced the Australian Securities Market', *Monash University Law Review* 30, 269-302.

Seamer, M., 2014, 'Does Effective Corporate Governance Facilitate Continuous Market Disclosure?', *Australian Accounting Review* 24, 111-126.

Verrecchia, R.E., 1983, 'Discretionary Disclosure', *Journal of Accounting and Economics* 37, 233-247.

Verrecchia, R.E., 2001, 'Essays on Disclosure', *Journal of Accounting and Economics* 32, 97-180.

Yang, H.F., 2009, 'So What Orders Do Informed Traders Use? Evidence from Quarterly Earnings Announcements', Working paper, University of Wisconsin.