Financial Market Intermediaries and Information Asymmetry in Equity Markets

Jun George Li

A dissertation submitted in fulfilment
of the requirements for the degree of

Doctor of Philosophy

Discipline of Finance, School of Business
Faculty of Business and Economics
University of Sydney

June 2010

Certificate

I certify that this thesis has not already been submitted for any degree and is not being submitted as part of candidature for any other degree. I also certify that the thesis has been written by me and that any help that I have received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

Signature of Candidate

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Jun George Li

Acknowledgements

I sincerely acknowledge the assistance provided by my principal supervisor, Dr Andrew Lepone, and my co-supervisors, Professor Alex Frino and Dr Reuben Segara. Without their continued support and ongoing input, this thesis and my PhD candidature would not have been possible. I am grateful for the financial support provided by the Capital Markets CRC Limited throughout my candidature. I thank the Securities Industry Research Centre of Asia-Pacific (SIRCA) and the Australian Securities Exchange (ASX) for the provision of data used in this dissertation. Sincere and heartfelt thanks go to my friends and colleagues, Angelo Aspris, James Cummings, Danika Wright, Steven Lecce, Abhishek Das, Dionigi Gerace, Kiril Alampieski, Jin Boon Wong, Mitesh Mistry, Peng He, Rizwan Rahman, and Anthony Flint for their objectivity and companionship. Among friends and colleagues, special thanks go to Jin Young Yang, Henry Leung, Bradley Wong, and Jennifer Kruk, whose insightful comments helped shape the direction and content of this dissertation. Finally, I extend my deepest thanks to my family and close friends and in particular my fiancée Jenny Hao, for their patience and understanding, especially in the final days of my candidature.

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Chapter 6

Lepone, A.; Leung, H.; and Li, J.G. (2011). “All Investors Are Created Equal: The Self-Evident Truth Between Equity Analysts and Information Asymmetry?”, Unpublished Manuscript.

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Synopsis

This dissertation examines the relationship between financial market intermediaries and information asymmetry. Chapters 5, 6, and 7 re-examines issues raised in the literature, but extends this research by using unique datasets not previously available to researchers. Overall, the results show that (i) market intermediaries help reduce information asymmetry in upstairs markets by filtering out information-motivated trades, (ii) market intermediaries produce information which is valuable to clients who are able to trade ahead of the market, and iii) market intermediaries are heterogeneously informed, and are therefore affected differently by a change in market structure.

The first issue examined is the role of brokers in the upstairs market. The literature argues that upstairs facilities are valuable to traders because they offer taps into unexpressed liquidity, and for their ability to filter out informed traders. The Australian Stock Exchange (ASX, a subsidiary of the Australian Securities Exchange) provides a unique setting to examine upstairs trades in the absence of 'fairness' rules, which allows upstairs trades to execute at greatly varied prices. When brokers have the freedom to trade at any negotiated price, they will be more willing to trade with the informed, provided they are sufficiently compensated for the risk they take on. This is in direct contrast to other studies, which only sample upstairs trades that occur close to the best spread.

Consistent with the literature, results indicate that upstairs markets are typically used when liquidity in the downstairs market is lacking, or when these costs are high.

Upstairs markets are especially useful for trades of greater complexity, that is, larger trades and trades in smaller stocks, which are often difficult to arrange in the downstairs limit order book. These findings are generally consistent with the widely held belief that upstairs markets allow for the execution of trades that would otherwise not have occurred. The results show that in the absence of 'fairness' rules a large number of upstairs trades do occur outside of the best downstairs spread. However, trades that are more likely to be informed receive poorer execution costs than those less likely to be informed. This provides evidence that upstairs brokers may use other information in addition to trader reputation (e.g. market conditions) to determine the information content of trades.

The second issue examined relates to the complex relationship between equity analysts and information asymmetry. The literature suggests that analysts help to reduce information asymmetry (and improve price efficiency) by bringing privately held information in the hands of management to the market, and through their superior ability in disseminating and analysing publicly available information. This study re-examines the role of equity analysts in information asymmetry by differentiating the information asymmetry between investors and the management (depth), and information asymmetry between shareholders (breadth).

Results suggest the presence of leakages in analyst recommendations, which are valuable to those that trade on them. Results also show that the clients of larger brokerage houses tend to be more sophisticated. That is, they make use of reports from a greater number of sources, possibly because they are better endowed and can afford to do so. Therefore even in the absence of leakages, certain clients have greater access to analyst reports. These results shed light on the complexity of the relationship between analysts and information asymmetry. While analysts may excel at bringing privately held information to the market, its distribution is unlikely to be equal. Thus, there is a likely trade-off in the information asymmetry between investors and the management (depth), and information asymmetry between shareholders (breadth).

The third issue examined relates to the effect of anonymous trading, using a unique dataset from the ASX which includes broker identifiers. While recent literature suggests that anonymity increases liquidity, these studies are conducted on a market-wide basis, despite brokers being the natural unit of analysis. This study aims to disentangle from a pool of averages the effect of anonymity on heterogeneously informed brokers.

While the results suggest that market execution costs decreases on average, the benefit of anonymity is skewed towards the large and reputable full-service brokers, who are more likely to be informed. In particular, results suggest that anonymity reduces the market's ability to infer information from trades. This results in a larger price reversal for the trades of large full-service brokers. However, the trades of the less informed brokers face a case of 'mistaken identity', and lose their ability to reduce price impact by signalling their identity to the market. Moreover, results suggest that the market share of large full-service brokers increases, with their trades having a greater contribution to price discovery. Overall, results highlight the complexity of the relationship between anonymity and market quality.

Chapter 1: Introduction

This dissertation examines the relationship between financial market intermediaries, and the cost of information asymmetry in equity markets. Using unique datasets from the Australian Stock Exchange (ASX, a subsidiary of the Australian Securities Exchange), this dissertation sheds light on issues raised in the literature, but with greater microscopy and accuracy than what was previously possible.

A majority of the classical works on markets are conducted under the assumption that participants have equal access to information. When optimal market conditions break down in classical economics, markets behave less effectively, reducing total welfare to their participants. In extreme cases, information asymmetry may lead to a breakdown of markets. For example, Akerlof (1970) examines the market for second-hand cars, in which buyers are able to identify neither the quality nor the reputation of the sellers. Under these conditions, car dealers take advantage of their information, while potential buyers, aware of the dealers' incentives, assume the worst. This leads to a market breakdown, and turns second-hand car markets into markets for 'lemons'.

Market intermediaries play no role in a perfect market. For example, under a Walrasian Auction (which is said to have been inspired by the Paris Bourse), all economic agents calculate their demand at every possible price. In a process of *tâtonnement*, the markets are cleared, with no excess demand or supply. The existence of market intermediaries suggests that market imperfections exist in some form. In an often cited example, real estate agents exist, presumably, because the search cost for real estate is non-zero. When market intermediaries are able to arrange property transactions at a lower cost, overall welfare is increased, even if these intermediaries charge some form of economic rent.

The economic literature presents two thoughts on why market intermediaries exist in equities markets, both of which are related to the presence of market imperfections. The first is that market intermediaries reduce liquidity search costs and transaction costs, when counterparties are not immediately available to trade. For example, full-service brokers are thought to offer superior execution for difficult trades (in comparison to discount brokers), especially when the cost of immediacy is likely to be high. By working the order over time, these market intermediaries reduce the impact of their trades on market prices by trading when liquidity becomes available. Grossman (1992) shows that upstairs brokers are repositories for unexpressed trading interests. These brokers leverage their relationship with their clients, which allows them to find latent liquidity at lower costs.

The second is that market intermediaries have access to information, or produce information at lower costs. Market makers, for example, are thought to mitigate adverse selection costs by differentiating informed and uninformed traders. These market intermediaries use information on trader reputation (e.g. Seppi, 1990; and Benveniste, Marcus and Wilhelm, 1992), and information on trade characteristics (e.g. Easley and O’Hara, 1987, 1992), to determine the likelihood of informed trading. Likewise, equity analysts are thought to reduce information asymmetry by bringing privately held information in the hands of management to the market, and through their superior ability in disseminating and analysing publicly available information.

The separation of these two roles is difficult, as market intermediaries such as brokers offer a multitude of services, some of which are related to information production (e.g. equity research), and others to liquidity provision and execution services (e.g. full-service broking, upstairs facilitation). While this dissertation covers both areas, its predominant focus is on the relationship between market intermediaries and information asymmetry. This dissertation makes use of a proprietary dataset from the ASX that displays the identity of brokers in each transaction. By differentiating the identities of different market intermediaries, this dissertation re-examines the issues surrounding market intermediaries and information asymmetry, but with greater detail than what was previously possible.

1.1 Upstairs Markets, Liquidity Provision, and Filtration of Informed Trades

The upstairs market is an over-the-counter network of brokers and institutional traders who negotiate large block trades of listed securities outside the normal trading venue of an exchange. Broker often acts as the intermediary to both buyers and sellers, but will take a position themselves when interest is lacking. On the ASX, these upstairs trades are called ‘block special crossings’, which have to exceed a trade value of $1 million.

There are two main schools of thought on why upstairs markets exist. Seppi (1990) argues that upstairs brokers have superior ability in differentiating between informed and uninformed traders through reputation certification, and are therefore able to offer uninformed traders lower costs. Grossman (1992) argues that upstairs brokers are repositories for “unexpressed” latent demand, commonly called ‘dark pools’, providing access to greater liquidity and reducing transaction costs. The upstairs market is therefore a facility typically used by liquidity-motivated investors to trade large parcels of shares. While evidence provided in many studies appears consistent with both theories, a relatively recent study by Fong, Madhavan and Swan (2004) does not find evidence consistent with information filtering on the ASX.

The aim of Chapter 5 is threefold. The first aim is an examination of liquidity conditions around upstairs trades to test the commonly held notion that upstairs markets facilitate trades that are difficult to arrange in the downstairs market. The second goal is to examine ASX’s lack of an upstairs pricing rule, and its effect on information filtering. The third aim is related to the first two, and seeks to model a trader’s choice between the upstairs and downstairs market.

Numerous studies examine the execution costs of upstairs and downstairs trades. Madhavan and Cheng (1997) examine the execution costs in upstairs and downstairs markets for Dow Jones stocks. While they find significantly better execution costs for large trades in upstairs markets, they argue that these benefits are economically small. They suggest that their results could be a product of floor traders and specialists offering liquidity in a similar manner to brokers in the upstairs markets. Additionally, they find that upstairs markets tend to be used by those who have a “reputation” for being uninformed; because they are reluctant to submit large limit orders in fear of offering free options to the market.

Smith, Turnbull and White (2001) examine upstairs block trades on the Toronto Stock Exchange. Consistent with Grossman (1992)'s predictions, they find that upstairs markets are typically used for small and less liquid stocks, or when the downstairs order book is thin. Consistent with Seppi (1990)'s filtering hypothesis, Smith, Turnbull and White (2001) find that information-motivated trades are more likely to be routed downstairs, while those that carry no information are handled upstairs.

Booth, Lin, Martikainen and Tse (2002) examine the price impact of upstairs trades on the Helsinki Stock Exchange. They find a smaller permanent price impact in upstairs trades, suggesting a lower level of information asymmetry in these trades. However, upstairs trades appear to have a higher temporary price impact, suggesting upstairs broker-dealers require a premium to cover the large liquidity risk. Overall they find lower total costs in upstairs markets when compared with downstairs markets.

Bessembinder and Venkataraman (2004) examine the execution costs of upstairs trades, in comparison with their costs if they are instead routed to the downstairs limit order book. On average, they find that upstairs execution costs are only 35% as large as downstairs costs. Consistent with Grossman (1992), they find that upstairs markets tend to be use when downstairs liquidity is lacking, which is especially valuable for large trades, and those in small and illiquid stocks. Consistent with Seppi (1990), they find significantly lower permanent price impact in the upstairs market in comparison to the downstairs market, suggesting that brokers actively filter out informed trades.

Despite empirical findings that are consistent with Seppi (1990)'s predictions on broker filtering, Fong, Madhavan and Swan (2004) find contrary evidence for the

ASX. They find that execution costs of upstairs and downstairs trades are similar, and carry similar information content. This suggests that informed traders participate in both market fragments equally, with no reputational filtering.

The ASX is an especially useful venue for a reputational filtering study, as upstairs trade prices are not restricted. Most markets have some form of 'fairness' rule to determine the price range in which upstairs trades can be executed. For example, on the NYSE, examined by Keim and Madhavan (1996) and Madhavan and Cheng (1997), upstairs trades are typically executed within the spread found in the downstairs market. While it is possible under NYSE rule 127 to execute outside of the spread, orders must first be exposed downstairs to a possible price improvement, which is costly, and consequently rare[1].

Likewise, the Toronto Stock Exchange (examined by Smith, Turnbull and White, 2001) also requires upstairs trades to be executed within the best downstairs spread. On the Paris Bourse (examined by Bessembinder and Venkataranman, 2004), upstairs trades are also typically executed within the best downstairs spread, with the exception of eligible active stocks, which have to be executed within the hypothetical VWAP of the limit order book, if it is instead routed downstairs. On the Helsinki Stock Exchange, upstairs trades must be executed at the 'best' price. While this rule isn't explicit, Booth, Lin, Martikainen and Tse (2002) believe this to be either within the best spread, or the VWAP when the best spread isn't possible.

[1] Hasbrouck, Sofianos and Sosebee (1993) estimate that less than 0.5% of all NYSE volume occurs as upstairs trades outside of the best downstairs spread.

As Seppi (1990) proposes, brokers consistently filter out information-motivated traders from upstairs markets. However, these ‘fairness’ rules effectively censor cases in which the traders are deemed to be informed by the brokers. This emanates from the restrictive price range in which upstairs trades are executed. Brokers will therefore either accept trades, or reject them if the cost in information asymmetry exceeds the benefits. This makes an examination of their behaviour in the presence of information-motivated traders difficult.

Chapter 5 overcomes this hurdle by making use of a unique feature on ASX. No ‘fairness’ rules exist on the ASX and upstairs trades can be executed at any agreed price. Trades perceived as being more informed are therefore not immediately discarded, as is the case of markets with more restrictive rules. This allows for greater flexibility in studying upstairs broker behaviour in the presence of trades that are perceived as more informed.

1.2 Unequal Access to Analyst Research

Managers are in a privileged position when it comes to judging the true value of a firm. When information asymmetry of this nature is coupled with poor governance and disclosure, shareholders lose. In the case of Enron, tens of billions of dollars were wiped in shareholder value, while the management, the keepers of their fraudulent accounting practices, gained through insider trading. Along with similar cases, the near bankruptcy of the energy giant and the downfall of Arthur Anderson reshaped financial and accounting practices. Equity analysts are widely considered to be a market power that counteracts these negative forces.

Easley and O'Hara (2004) argue that analyst coverage is complementary to accounting standards, disclosure policies, and market microstructure in minimising the cost of capital. This notion is supported by other studies. Botosan (1997) finds that the relationship between company disclosure and the cost of equity capital is strong, but only in stocks without a strong analyst following. In stocks that already have a strong analyst following, additional disclosure does not appear to reduce the cost of capital. This suggests that analyst coverage may be a close substitute, or at least complementary to voluntary disclosure. Lang, Lins and Miller (2003) find a higher valuation for firms that choose to cross-list in the US by issuing ADRs. They attribute this largely to analyst coverage, which improves the information environment of the stock, thereby reducing the cost of capital.

Chapter 6 seeks to clarify the complex relationship between equity analysts and information asymmetry by examining the level of investor access to analyst reports. The existing literature suggests that analysts help to reduce information asymmetry (and improve price efficiency) by bringing privately held information in the hands of management to the market, and through their superior ability in analysing and disseminating publicly available information. While a consensus between the two views is still far away, numerous papers suggest that analysts have some information that is outside of the public domain.[2]

2 For example, by analysing the content of analyst reports and company annual reports, Rogers and Grant (1997) find that over half of the financial and operating data cited in analyst reports are not found in company reports. While papers that show evidence against analysts having private information are fewer in number, they do exist. For example, Easley, O'Hara and Paperman (1998) find that analyst following does not affect the probability for private information events. Consequently, they conclude that analysts do not create private information.

Frankel and Lee (2004) find that an increase in analyst following lowers information asymmetry by reducing the frequency and profitability of insider purchases. Roulstone (2003) finds a negative relationship between the number of analysts covering a stock and the adverse selection component of its bid-ask spread. Bowen, Davis and Matsumoto (2002) find that analysts who had access to conference calls with management provided more accurate forecasts, increasing the amount of information available on the firm.

Gomes, Gorton and Madureira (2007) examine the effect of Regulation Fair Disclosure (Reg FD) on the cost of capital. They discover an increase in the cost of capital in small stocks, which coincided with a reduction in analyst coverage. It is argued that Reg FD increases the cost for analysts to obtain private information from these small firms, thereby increasing information asymmetry and the cost of capital. Bowen, Chen and Cheng (2008) find lower SEO underpricing (implying lower information asymmetry) in stocks with higher analyst following. They find even lower underpricing when analyst coverage is provided by the lead underwriter. This is attributed to the underwriter's ability in obtaining information that would otherwise remain private, thereby reducing information asymmetry.

At the fundamental level, information asymmetry refers to one party having more or superior information to others. While the extant literature overwhelmingly suggests that equity analysis reduces a company's cost of capital, insufficient distinction is made with asymmetry between investor and the management, and asymmetry between investor groups. With regard to equity analysis, if the distribution of analyst reports is unequal, one cannot conclude that information asymmetry has decreased.

When a subset of clients receive more information, or information in a more timely manner, asymmetry between management and the shareholders as a group may reduce, but asymmetry between different shareholders may actually increase.

Confessions of Wall Street Analyst, an exposé by Dan Reingold on the analyst industry during the tech boom, highlights some of the issues that equity analysts face when bringing information to the market. The act of passing analyst information on to privileged clients prior to its public release is of particular interest, allowing these clients to trade ahead of the market. Leakages in analyst reports are often exacerbated by the regular breach of Chinese walls between the equity analysis and investment banking arms of the brokerage houses.

On 28 May, 2003, the NASD (now FINRA) charged Phua Young, a former analyst at Merrill, with giving advanced notices of rating changes to selected institutional clients, along with other misconducts.[3] Such incidents, however, are not isolated to the US. On 20 March, 2007, the UK's Financial Services Authority (FSA) fined an analyst for market misconduct while employed at Citigroup.[4] Similarly, the misconduct was in relation to the selective disclosure of a stock recommendation to four of his clients prior to its public release.

As rankings in Institutional Investor's All-American Research Team are based on the subjective opinions of buy-side firms, leaking analyst reports to favoured clients provides the potential for more favourable reviews in rankings. Since analyst

[3] "NASD Charges Former Merrill Lynch Managing Director with Issuing Misleading Research, Selectively Disclosing Material Non-Public Information and Improper Gift Giving to Tyco's CEO", available at http://www.finra.org/Newsroom/NewsReleases/2003/P002906.
[4] "FSA fines analyst for market misconduct", available at http://www.fsa.gov.uk/pages/Library/Communication/PR/2007/036.shtml.

remuneration is closely linked with their perceived quality (as judged by rankings, for example), a strong incentive therefore exists to establish and maintain a loyal client base through information leakage. From the brokerage firm's perspective, leakages to favoured clients will increase the likelihood of future trading business. There is therefore a natural tendency to encourage (or disregard the presence) of such activities.[5] This leads to an increase in information asymmetry in stocks where leakages occur regularly, and represents a breach of insider trading laws if the reports make use of material non-public information. However, in the absence of superior data or research methods, a discussion on the likelihood or extent of insider trading in analyst reports is extremely dangerous, and is therefore omitted.

Chapter 6 seeks to clarify the relationship between equity analysts and information asymmetry by examining the level of investor access to analyst reports. While undertaking the analysis, this chapter keeps in mind the differences between Merton's (1987) depth and breadth in information asymmetry. Namely, Chapter 6 differentiates the information asymmetry between investors and the management (depth) from information asymmetry between shareholders (breadth). By focusing exclusively on the asymmetry between shareholders, this chapter seeks to show that:

1) Some investors have early access to valuable analysts' reports that are selectively disclosed to them (leakages); and
2) More sophisticated investors make greater use of analyst reports, even in the absence of leakages.

[5] According to Reingold and Reingold (2006), such activities were quite prevalent during the tech boom of the later 1990s.

An impediment to research in this area is the lack of comprehensive data at the investment firm level. As the market buy volume will by definition be equal to the market sell volume, aggregated data is inappropriate for the task at hand. A key task is to isolate the investment firm providing the research report and examine any abnormal order flow prior to the report's release.

Chapter 6 overcomes this problem with a unique dataset provided by the ASX that documents the buying and selling broker for each transaction occurring between 1996 and 2008. To the best of my knowledge, the only other studies that examine the financial benefits in obtaining a research report early are Kim, Lin, and Slovin (1997), and Green (2006). The focus of these studies, however, is on the timing difference between the official release of an analyst report, and when that information is picked up by the rest of the market through word of mouth, or through the mass media. Chapter 6 represents an investigation into leakages in analyst reports prior to the official release, and therefore differs significantly from these studies.

1.3 Anonymity and Heterogeneously Informed Brokers

Broker identifiers originated in floor-traded markets where, given the nature of the business, remaining anonymous is virtually impossible. As floor-traded markets around the world head towards automation, broker identifiers are quickly disappearing. Broker IDs, or rather the removal of them has been a game of follow the leader for exchanges around the world. With the exception of the Korean market, which introduced broker identifiers, stock exchanges have been increasing anonymity, a move which is often linked to the decision of other markets.

The ASX is no exception followed suit by removing broker IDs on 28 November, 2005. While broker IDs naturally affect the execution ability of brokers, the extant empirical literature focuses predominantly on market-wide effects (e.g. bid-ask spreads), and finds that markets improve on average. This does not necessarily imply, however, that anonymity is Pareto-efficient, especially when a particular group of brokers benefit at the expense of others. Chapter 7 seeks to fill the literature gap by examining the effects of anonymity on brokers who are heterogeneously informed.

Contrasting predictions are made in the literature about the effects of transparency and opacity on the liquidity of markets. A significant portion of the literature supports the belief that transparency improves markets. Pagano and Roell (1996) argue that transparency reduces the level of information asymmetry for uninformed investors, thereby reducing transaction costs. Admati and Pfleiderer (1991) discuss the implications for uninformed traders who pre-announce the size of their orders (sunshine trading). This reduces the level of information asymmetry, and consequently the transaction costs for those who are able to pre-announce. Seppi (1990) argues that upstairs brokers are better equipped at differentiating the identity of informed and uninformed traders. This allows liquidity-motivated traders to execute their block trades at lower prices in the upstairs market. These predictions appear consistent with the findings of Boehmer, Saar, and Yu (2005) and Bessembinder, Maxwell and Venkataraman (2006), who find lower execution costs when markets improve their dissemination of trade information.

However, Bloomfield and O'Hara (1999) make opposite predictions regarding transparency and transaction costs. They argue that opaque markets increase the incentives for market makers to compete for order flow, and hence reduce the size of the bid-ask spread. Results obtained from their laboratory experiment appear to support these arguments. Foucault, Moinas and Theissen (2007) make two distinct predictions regarding anonymity (that is transparency regarding the identity of the trader), depending on the participation rate of informed traders. When this participation rate is low, a switch to the anonymous regime increases the aggressiveness of limit orders placed by the uninformed, who would otherwise abstain from action if markets are transparent, thereby reducing the size of the bid-ask spread. However, when the participation rate of informed traders is high, the opposite prediction is made. Using data from the Paris Bourse, Foucault, Moinas and Theissen (2007) find lower spreads for the anonymous regime.

Comerton-Forde, Frino and Mollica (2005) extend the work of Foucault, Moinas and Theissen (2007) to include markets in Paris, Tokyo, and Korea (which began showing broker IDs as opposed to removing them). Consistent with Foucault, Moinas and Theissen (2007), liquidity increases with anonymity and decreases with transparency. Comerton-Forde and Tang (2008) examine market quality of the ASX after switching to an anonymous regime. They find lower spreads and greater depth in anonymous markets, but only for the larger and more liquid stocks. Frino, Gerace and Lepone (2008) confirm these findings outside of equity markets by examining the removal of broker mnemonics on the Sydney Futures Exchange.

While exchanges have been quick to unite in anonymity on the grounds of greater market quality, a number of investors raised concerns regarding the removal of broker

IDs on the ASX, citing a competitive disadvantage in their absence.[6] Similar concerns are conveyed in the ASX Market Reform Consultation paper, where a majority of fund managers preferred more transparency over less. These concerns are have some validity, as the removal of broker IDs is likely to affect some brokers more than others. The recent empirical literature, however, focuses predominantly on the market-wide effects of anonymity, citing improved market quality indicators such as lower bid-ask spreads. However, this is a pool of averages that ignores the effects of anonymity on different market participants, and does not necessarily imply that a switch to anonymity is Pareto-dominant.

Chapter 7 aims at disentangling from a pool of averages the effect of anonymity on heterogeneously informed brokers. Brokers are the natural unit of analysis for broker IDs because they are the only ones that have legal access to them[7]. At the fundamental level, broker IDs affect the ability of brokers to work their order flow. If information asymmetry exists between brokers, then one would expect anonymity to have a greater effect on those with greater information.

Due to constraints on the availability of broker-level data, the extant empirical literature is limited to market quality indicators such as the bid-ask spread. This chapter makes use of a unique dataset made available from the ASX, which includes the identities of brokers in every trade. This allows Chapter 7 to circumnavigate the pool of market quality averages, and discern the identity of the winners and losers in the anonymity game, and the mechanisms at work. As a consequence of the approach used, this chapter is the first to examine the execution ability of brokers around

[6] “Blackout that caused an identity crisis”, *The Australian*, February 17, 2007.
[7] The SEATS Access Agreement prohibits the release of Broker ID information to any persons other than an ASX trading participant.

changes in anonymity, and possibly the first to examine broker execution ability in general.

1.4 Summary

The three studies in this dissertation re-examine the relationship between market intermediaries and information asymmetry from an alternative angle. The current chapter outlines the issues surrounding this complex relationship, and provides the motivation for the analyses.

The remainder of this dissertation is organised as follows. Chapter 2 reviews the literature from related topics, which includes insider trading (as a form of informed trading), market transparency and its effects on adverse selection, the perceived role of equity analyst reports, and alternative trading venues and their roles in liquidity provision and information asymmetry. Chapter 3 documents the institutional details, and specifically reviews the ASX market structure, available block-trading facilities, and its information dissemination process. Based on the literature review and institutional details, Chapter 4 develops the hypotheses to be tested by the current dissertation. Chapters 5, 6, and 7 provide the analyses in the topics previously mentioned, while Chapter 8 summarises these findings and indicates potential avenues for future research.

Chapter 2: Literature Review

This chapter reviews some of the results presented in the economic literature, both theoretical and empirical, on the relationship between equity market intermediaries, market microstructure, and information asymmetry. Specifically, this dissertation examines four particular areas of relevance:

1) Insider trading (as a form of informed trading) and market quality
2) Transparency, market quality, and the role of market intermediaries
3) Financial analysts and information asymmetry
4) Alternative trading venues

Insider trading has long been a contentious topic in economics. At one level, disagreements exist on the costs and benefits of insider trading. Consequently, some academics argue for the legalisation of insider trading, citing overall welfare improvements. There are also disagreements on the optimal form of insider trading regulation, and its effectiveness. Empirical studies on insider trading restrictions further highlight the difference between legislation and actual enforcement and prosecution of those that conduct illegal insider trading.

Market transparency is an optimal market design issue with implications for market quality. Transparency is the quality and quantity of information received by market participants on the market's activities. This includes the prices and volumes of orders and trades, but may also include information on the identity of market participants. It is a widely held belief in economics that market imperfections (one of them being a lack of market transparency), reduces the efficiency and quality of markets. Indeed, a majority of the classical works on markets are conducted under the assumption that participants have equal access to information. When these optimal conditions break down, markets behave less effectively, reducing total welfare to its participants. This is evident in Akerlof’s seminal work on markets for second-hand cars, where a lack of information relating to the quality of goods results in complete market failure. However, the recent theoretical and empirical literature finds startling results contradictory to these widely held beliefs. In particular, these studies argue that anonymity (opacity of participant identities) increases the incentives for less informed participants to trade, and therefore improves overall market liquidity.

Trading venues outside of the main markets are commonly referred to as alternative trading venues (or alternative trading systems/platforms). These platforms trade securities identical to those concurrently traded on main markets, but have different market structures. The literature is divided on the likely effects of these alternative venues on main markets. While consolidated markets naturally provide liquidity externalities, numerous studies argue that fragmented markets foster price and liquidity competition, improving overall welfare. Upstairs markets are one of these alternative trading venues that capture a significant portion of the total trading activity. The literature argues that upstairs facilities are repositories for unexpressed trading interests, and provide filtration of informed trades. While both theories suggest lower trading costs in upstairs markets, the latter implies that informed trades are routed downstairs, increasing the level of information asymmetry.

These four areas are discussed in the following sections. The remainder of this chapter is organised as follows. Section 2.1 reviews the literature on insider trading as a form of informed trading, while Section 2.2 examines transparency as an issue of optimal market design. Of particular interest is the level of transparency on the identity of market participants, and its effects on market quality. Section 2.3 reviews some of the literature on equity analysts, and their perceived role in the information environment of financial markets. Section 2.4 evaluates the literature on alternative trading venues, and their effects on primary markets. The role of brokers in upstairs markets is also examined.

2.1 Insider Trading

Insider trading, being a special case of informed trading, occurs when those with access to privileged non-public information trade. A number of studies show that insiders earn greater returns from their trades, or their trades have high predictive value on future prices. Jaffe (1974a) investigates the performance of insider trades published by the US SEC in the *Official Summary of Insider Trading*. A random sample of trading months is drawn from the 200 largest firms between 1962 and 1968, some of which have insider trading. While insiders do have higher returns, transaction costs account for about 40% of their gross profits. Profits net of transaction costs are only significant for the ‘intensive trading’ sample, where different insiders trade in the same direction. These results represent a puzzle, as outside traders with access to the *Official Summary* are able to replicate the strategies of the insiders, and therefore earn similar returns. This suggests that markets are inefficient and do not make full use of published insider trades. Rozeff and Zaman (1988) show that this perceived inefficiency is driven (at least in part) by the size and earnings/price ratio effects. When they control for these two effects, the size of insider profits drop by half.

Seyhun (1988) examines the extent to which insiders are informed by examining 60,000 insider trades between Jan 1975 and Oct 1981. They find that, in aggregate, trades by insiders predict future price movements in the market. Insiders increase aggregate purchases (sales) prior to an increase (decrease) in market-wide performance, with aggregate purchases (sales) falling after this market rise (fall). It is concluded that insiders fare poorly in distinguishing between firm-specific and systematic factors, and respond to some economy-wide factors as if they were firm-specific. Seyhun (1992b) finds that aggregate insider trading predicts up to 60% of the variation in aggregate stock returns, one year ahead of time. This is attributed to the insider's ability in predicting changes in business conditions and movements away from fundamentals.

2.1.1 Insider Trading Around Information Events

The literature also examines the performance of insiders in various situations, but in particular when information asymmetry is likely to be high. One source of information asymmetry arises when companies issue announcements. Keown and Pinkerton (1981) investigate the price run-up prior to merger announcements from 194 firms from NYSE, AMEX and OTC traded stocks. They find that 79% of firms have higher trading volume one week prior to the announcement (vs. benchmark volume), with the run-up accounting for approximately half of the total price movement (pre- and post-announcement). With this, they conclude that insider trading exists in merger announcements, and those that trade in the pre-announcement period earn abnormal returns. To the extent that speculation exists before takeover announcements, announcement dates represent a poor choice for the true 'event day'. For example, Aitken and Czernkowski (1992) show that unexpected returns prior to takeover announcements are reduced by one third when one controls for the presence of media reports. Likewise, Murray (1994) observes that in the absence of media speculation, no price run-ups exist prior to takeover announcements. However, Meulbroek (1992) finds that almost half of pre-announcement price run-ups occur on days with legal insider trading.

Similar results are also documented in other types of announcements. Penman (1982) shows, using the *Official Summary of Insider Trading*, that insiders trade ahead of annual earnings forecasts, and these earn insiders abnormal returns. Cheng and Lo (2006) investigate insider gains associated with a delay in trading. Using voluntary disclosure announcements between 1995 and 2002, they show that managers delay their purchases (sales) until the release of bad (good) news.

Other studies examine firm-specific attributes that drive insiders to trade. Aboody and Lev (2000) investigate the relationship between research and development (R&D) expenditure and the likelihood of insider trading. The cost of analysing R&D information for outsiders is likely to be higher than other types of information, as it requires from the outsider some form of technical understanding of what is being researched and developed. They find that gains to insider trading are substantially larger in R&D-intensive firms in comparison to firms without R&D. Insiders also appear to trade ahead of planned changes in R&D expenditure. Aboody, Hughes and

Liu (2005) examine insider trading profits when firms differ in their ‘earnings quality’. They use two measures: an estimate of abnormal accruals based on Dechow, Sloan and Sweeney (1995), and the extent to which working capital accruals eventuate into cash flow, based on Dechow and Dichev (2002). They find larger insider profits when firms have greater exposure to ‘earnings quality’ issues.

Seyhun (1990) shows that insiders are active traders around market-wide information events. Using the US market crash of 1987, they find large purchases from insiders following the crash, with the worst affected stocks being the ones most bought. A year following the crash, stocks purchased by the insiders experience large returns. These results suggest that insiders are better equipped at analysing the effects of market-wide shocks on the performance of their own stocks.

2.1.2 The Effect of Insider Trading

The literature identifies three areas in which insider trading affects equity markets, namely, its effect on price efficiency, on the allocative efficiency of capital, and the effects on firm value. A summary of the findings are examined in turn.

Price Efficiency

Using takeover announcements between 1980 and 1989, Meulbroek (1992) finds that the trades of insiders prior to official announcements are quickly detected by the market and impounded into prices. Abnormal returns on days of insider trading amount to 3%, and over half of the pre-announcement price run-up occurs on days where insiders participate. Therefore, it is argued that allowing insider trading may lead to more efficient prices. Modelling the effects of insider trading, Leland (1992) concludes that prices are more informative when no restrictions are placed upon insiders trading on their privileged information. Fishman and Hagerty (1992), however, show that insider trading can in certain circumstances lead to less efficient prices. They argue that this is influenced by two outcomes of insider trading: one involving a reduction in the incentives for outsiders to trade and acquire information, and another involving a larger skewness in the distribution of information.

Allocative Efficiency of Capital

Manove (1989) models the effect of insider trading on corporate investments. When insiders with privileged information gain at the expense of shareholders, corporate investment is discouraged and the efficiency of corporate behaviour is reduced. Ausbel (1990) models the 'investment stage' and 'trading stage' of capital markets. When outsiders expect insiders to trade on their privileged information at the 'trading stage', investments are reduced. A restriction on insider trading will therefore allow insiders to pre-commit to behaving fairly, improving allocative efficiency and overall welfare.

Bebechuk and Fershtman (1994) examine the manager's choice among investments under two regimes, one which allows, and another which prevents insider trading. It is reasoned that managers are risk-averse, which will lead to suboptimal (overly conservative) investment choices. Therefore, insider trading aligns the interests of management and owners, leading to a better allocation of capital. Bernhardt, Hollifield and Hughson (1995) model rational uninformed traders' choice between investment projects with different levels of insider trading. They find that insider trading distorts investment choice towards assets with lower levels of private information. However, when investments are information-elastic, that is, when the insider's information has high value to the investment decision, prices become more informative. This leads to Pareto-improvements in welfare.

Effect on Firm Value

Masson and Madhavan (1991) model simultaneously the effects of earnings, insider holdings, and insider trading on firm value. They find that, holding all else constant, insider trading lowers value while insider holdings increase value. Bhattacharya and Nicodano (2001) argue that insider trading improves the selling prices of assets and therefore improves the welfare of outsiders and their utility from consumption. This more than offsets any losses arising from adverse selection.

Noe (1997) argues that gains from insider trading represent a substitute to compensation packages used to align the interests of managers and owners. While insider trading may not be as effective as compensation packages, it is nevertheless less costly. Allowing insider trading will therefore increase firm value. Roulstone (2003) empirically examines firm-level restrictions on insider trading and its relationship to executive compensation. Consistent with Noe (1997) and the notion that insider trading represents a means to align the interests of managers and owners, Roulstone (2003) observes that firms with self-imposed restrictions on insider trading pay a premium in the total compensation paid to managers.

2.1.3 The Effect and Effectiveness of Regulation and Enforcement

Kyle (1985) argues that information asymmetry arises when insiders hide their trades in a sea of noise trading. Similarly, Fischer (1992) finds that insider trading represents a moral hazard issue, and its absence leads to Pareto-improvements in welfare. However, as commitments by insiders not to trade on privileged information are unlikely to be credible, government regulation is required. Interestingly, similar welfare outcomes are reached when insiders are required to register their trades. John and Narayanan (1997) find that insider trade disclosure does not necessarily bring about optimal outcomes. This comes from an increase in the insider's incentives to manipulate markets, and they will sometimes trade against their private information to move prices in their favour.

DeMarzo, Fishman and Hagerty (1998) argue that insider trading regulations reduce adverse selection costs, but enforcement is costly, and optimal regulation involves balancing the costs and benefits. They find that the optimal policy involves following trades with large volumes, those that make large financial gains, or both. Consistent with the notion that regulation is an effective tool in limiting insider trading, Marsden and Tung (1999) show, using experimental markets, that regulation and enforcement reduce the trading gains of insiders.

Numerous studies empirically examine the effectiveness of regulation and enforcement in insider trading. Jaffe (1974b) analyses the effect of case law on the volume and profitability of insider trades. After each of the three legal decisions between 1961 and 1966, no significant differences in insider activity are found.

Seyhun (1992a) investigates insider trades during the 1980s, a decade which witnessed significant increases in insider trading sanctions. New statutes in the 1980s include treble damages for insiders, a bounty program for informants, holding executives responsible for the insider trading compliance of their employees, and the creation of a right of action for those that lose to insiders. Despite these changes, Seyhun (1992a) finds that insider trading is more rampant and more profitable. Insiders earn 5.1% in abnormal returns (annualised) between 1980 and 1984, which increased to 7% after 1984, in comparison to 3.5% prior to 1980. Increases are likewise found in aggregate insider trading volumes.

Bhattacharya and Daouk (2002) investigate the cost of equity in 103 countries with stock markets, 87 of which have insider trading laws, and 38 with prosecutions. They find no evidence that introducing insider trading laws reduces the cost of equity. However, after the first prosecution, cost of equity falls significantly. Bushman, Piotroski and Smith (2005) examine the effects of insider trading enforcement on analyst following for 100 countries between 1987 and 2000. Analyst following is found to increase after initial enforcement of insider trading laws. These benefits, however, appear to be concentrated in emerging markets. This result suggests that enforcement significantly improves the incentives for outsiders to acquire information, which may have implications for the price efficiency of capital markets. Using data from 48 countries over 1980-2003, Fernandes and Ferreira (2009) find that enforcement improves price efficiency (measured by the variability of firm-specific stock returns), and reduces the cost of equity. Improvements in stock price informativeness are, however, concentrated in developed markets, and prices do not appear more efficient for countries with poor legal institutions. Fernandes and Ferreira

(2009) argue that insiders in developing countries represent an important source of information, which disappears upon the enforcement of insider trading.

2.2 Information Asymmetry, Transparency, and the Role of Market Intermediaries

Transparency is the quality and quantity of information received by market participants on the market's activities. This includes the prices and volumes of orders and trades, but may also include information on the identity of market participants. A majority of the classical works on markets are conducted under the assumption that participants have equal access to information. Information available to transparent markets can be considered a subset of all available information from which traders make their decisions. When optimal market conditions break down in classical economics, markets behave less effectively, reducing total welfare to their participants.

In extreme cases, information asymmetry may lead to a breakdown of markets. Akerlof (1970) examines the market for second-hand cars, in which buyers are unable to identify the quality or the reputation of the sellers. Under these conditions, car dealers take advantage of their information, while potential buyers, aware of the dealers' incentives, assume the worst. This leads to a market breakdown, and turns second-hand car markets into markets for 'lemons'.

A few thoughts have surfaced in the economic literature regarding market transparency and transaction costs. From an optimal market design perspective, a large number of studies advocate transparency as a means of mitigating information asymmetry costs. Previous literature also highlights the importance of market intermediaries and the role of reputation in differentiating between heterogeneously informed parties. Despite these findings, a number of studies advocate greater opacity, and specifically anonymity (the opacity of participant identities). The central arguments in these studies involve the relationship between transparency and incentives for liquidity provision. It is argued that lower incentives exist for market participants to provide liquidity in transparent markets, increasing liquidity costs. These arguments are reviewed in turn.

2.2.1 Transparency and Lower Adverse Selection Costs

Uninformed investors bear the burden of costs when markets suffer from information asymmetry. This idea has long been conveyed in market microstructure models such as those by Kyle (1985) and Glosten and Milgrom (1985). A bid-ask spread allows intermediaries such as market makers to recoup losses they make on informed traders from uninformed traders. Such mechanisms exist when market makers are unable to perfectly differentiate between the identities of the informed and the uninformed.

Presumably, when market makers perfectly identify informed traders, adverse selection costs become a non-issue. The market maker may either refuse the trades of the informed party, or charge them differential spreads in comparison with uninformed traders. While the identification of informed traders may be imperfect, the literature shows this action to be value adding for uninformed traders, who receive better transaction costs. For example, Easley and O’Hara (1987) show that trade size is an important signal to the likelihood of an information-motivated trade. As informed traders prefer to trade larger quantities, market makers will give large trades poorer execution costs, while smaller trades (which are less likely to be informed) will receive lower costs.

Numerous studies examine transparency from a market design perspective. One school of thought advocates transparent markets because this results in a separating equilibrium of informed and uninformed investors. This reduces the adverse effects of information asymmetry and therefore provides uninformed market participants with lower trading costs. These studies are generally consistent with the notion that market imperfections (which include market opacity) are counterproductive to the effectiveness of markets.

Pagano and Roell (1996) model and examine the effects of pre-trade transparency in various auction and dealer markets. When markets are transparent with respect to order flow direction and size, they find lower transaction costs for uninformed traders on average. Consistent with these predictions, Flood, Huisman, Koedijk and Mahieu (1999) find lower spreads and higher volumes for an experimental market with high pre-trade transparency.

The literature makes comparisons between markets with different levels of transparency. For example, Barclay, Hendershott and McCormick (2003) examine the cost of trading with NASDAQ dealers in comparison to trades on electronic communication networks (ECNs). As ECNs are completely anonymous, they are more likely to be used when information asymmetry or market volatility is high. They find lower transaction costs on the NASDAQ, as dealers can preference or internalise less informed trades. Harris and Piwowar (2006) find substantially higher transaction costs for trades in municipal bond markets compared with similar-sized trades in equity markets. They attribute this to a lack of transparency in OTC bond markets. Domowitz, Glen and Madhavan (1998) model the relationship between inter-market price transparency and market quality for cross-listed stocks. When prices are transparent between linked markets, cross-listings reduce transaction costs by increasing the total number of trading participants. However, the opposite is true for stocks with poor inter-market transparency.

Studies have also examined markets that change their level of transparency. Herndershott and Jones (2005) study the reduction of pre-trade transparency on the Island ECN, which stopped displaying its limit order book in the three most actively traded ETFs. They find a decrease in Island’s market share, and an increase in trading costs, which is attributed to larger adverse selection costs. When Island subsequently reversed the decision, trading costs improved. Boehmer, Saar and Yu (2005) investigate the introduction of OpenBook on the NYSE, which made order book information available to traders outside the exchange floor. This increase in pre-trade transparency resulted in lower trading costs, and an increase in the level of price efficiency.

The literature also investigates changes in the level of transparency on bond markets. Bessembinder, Maxwell and Venkataraman (2006) examine the effects of an increase in post-trade transparency for US corporate bond markets, which introduced a mandatory reporting system called TRACE for certain eligible bonds. Those eligible for TRACE had their execution costs halved, and experiencd a decrease in the market share and cost advantage for large dealers. In similar studies that examine the introduction of TRACE, Edwards, Harris and Piwowar (2007) and Goldstein, Hotchkiss and Sirri (2007) find lower execution costs associated with an increase in post-trade transparency.

2.2.2 The Role of Market Intermediaries and Reputational Transparency in Information Asymmetry Costs

The literature highlights the importance of market intermediaries and the role of reputation in mitigating information asymmetry, especially in markets with a high degree of transparency. Seppi (1990) examines the role of reputation and trading costs in upstairs markets. When upstairs brokers are able to observe the identity of traders, they price-discriminate between the informed and uninformed traders based on their reputation. Therefore, the large degree of transparency in upstairs markets reduces adverse selection costs, and improves the welfare of uninformed traders. Admati and Pfleiderer (1991) model the effects of ‘sunshine trading’, or the act of pre-announcing order size, on transaction costs. Consistent with Seppi (1990), it is shown that pre-announcement by liquidity traders improves transaction costs they receive from market makers.

Benveniste, Marcus and Wilhelm (1992) model the long-run relationships between specialists and floor brokers. It is argued that knowledge of brokers’ reputations allows specialists to differentiate between informed and uninformed brokers, mitigating adverse selection costs. Battalio, Ellul and Jennings (2007) investigate the effects of NYSE trading floor relocations on reputation and transaction costs. While specialists move to new trading locations, brokers typically do not. They find noticeable increases in liquidity costs, which are larger for stocks with greater adverse selection. Brokers that move together with the specialist appear to have lower costs in comparison to those that stay behind. These results are attributed to broker reputations, which have to be re-learnt by specialists when they move to a new location.

2.2.3 Transparency and Higher Liquidity Costs

In an alternative school of thought, it is argued that transparency increases liquidity costs by reducing the incentives for liquidity provision. Bloomfield and O'Hara (1999) find larger bid-ask spreads in experimental markets with transparent transaction prices in comparison to opaque markets. This is attributed to a reduced incentive for market makers to compete for order flow. Frutos and Manzano (2002) model the relationship between transparency and the level of order aggressiveness from liquidity providers in dealer markets. Consistent with Bloomfield and O'Hara (1999), they find reduced incentives for order flow competition in the transparent regime, leading to higher liquidity costs.

A number of studies examine specifically the relationship between transparency of trader identities and market quality. Simaan, Weaver and Whitcomb (2003) find an increase in the likelihood of odd-tick quotes (and lower resulting spreads) on the NASDAQ when dealers are able to post anonymous quotes on ECNs. Foucault, Moinas and Theissen (2007) model the effects of anonymity on bid-ask spreads. When the participation rate of informed traders is low, a move to anonymous trading increases the aggressiveness of limit orders placed by the uninformed. Using data from the Paris Bourse which removed broker identifiers, Foucault, Moinas and Theissen (2007) find lower spreads in the anonymous markets.

Comerton-Forde, Frino and Mollica (2005) extend the work of Foucault et al. (2007) to include markets in Paris, Tokyo, and Korea (which began showing broker IDs as opposed to removing them). Consistent with order aggressiveness predictions, they find higher liquidity in markets that move to anonymous trading. Comerton-Forde and Tang (2008) investigate the market quality of the ASX after the removal of broker identifiers. They find lower spreads and greater depth in anonymous markets, but only for the larger and more liquid stocks. Frino, Gerace and Lepone (2008) confirm these findings outside of equity markets by examining the removal of broker mnemonics on the Sydney Futures Exchange.

2.3 Equity Analysts and Information Asymmetry

Equity analysts add value by bringing privately held information in the hands of management to the market, and through their superior ability in disseminating and analysing publicly available information (e.g. Asquith, Mikhail and Au, 2005). The literature documents the value of equity research by examining its immediate impact on stock prices, and as predictors to future earnings and prices. However, equity research is often marred by the presence of systematic biases and errors, with a number of reasons cited as the driving forces behind these errors.

Equity analysts are thought to reduce information asymmetry by increasing the amount of information available in the public domain. There is, however, some concern regarding the privileged nature of relationships between analysts and company management. In particular, conference calls prior to company announcements are thought to provide analysts (and their clients) an unfair advantage in acquiring private information. To curb the potential consequences of these conference calls, the US SEC instigated Regulation Fair Disclosure (Reg FD), requiring information disseminated to be made available to all market participants simultaneously. There is, however, considerable contention in the economic literature regarding the efficacy and effectiveness of such regulations.

Furthermore, analyst reports are not equally distributed among all market participants. This is not surprising, as reports are typically provided to customers of broker-analysts, in exchange for soft-dollar brokerage commissions, which is prohibitively expensive for small retail traders. The literature provides evidence that those with access to research reports have a profitable short-run information advantage, and institutions and other large traders make greater use of information disseminated through equity analysts.

2.3.1 Value of Analysts' Research

Literature examines the value of research by analysing its effect on asset prices and consequently their investment value. Using monthly NYSE data, Givoly and Lakonishok (1979) investigate the effects of analyst earnings forecasts on stock prices. Those that trade on these earnings forecasts can potentially earn abnormal returns of 2.7% in a two-month holding period. Lys and Sohn (1990) find that analyst earnings forecasts affect stock prices, even when they are preceded by forecasts by another analyst, or by company earnings announcements.

Similar results are documented in analyst stock recommendations. Bjerring, Lakonishok and Vermaelen (1983) examine the investment value of recommendations issued by a Canadian brokerage house. After controlling for non-synchronous prices, they find significant abnormal returns for those who heed the advice of equity analysts. Womack (1996) examines recommendation changes issued by the largest US brokerage firms. On average, these recommendations move prices significantly, and are therefore valuable to those who have access to them. Furthermore, analysts appear to have stock picking abilities, evident from the large post-recommendation drift in stock prices. Howe, Unlu and Yan (2009) show that aggregate analyst recommendations predict market excess returns after controlling for other determinants. Aggregate industry recommendations also appear to predict future industry performance.

The literature finds greater predictive power in the earnings forecasts of equity analysts in comparison to time series models, for the purpose of predicting future earnings (e.g. Brown and Rozeff, 1978; Collins and Hopwood, 1980; Brown, Hagerman, Griffin and Zmijewski, 1987; and Conroy and Harris, 1987). Conroy and Harris (1987) argue that the apparent advantage of equity analysts exists only in short horizons of less than one year. Brown, Hagerman, Griffin and Zmijewski (1987) attribute this to information that equity analysts obtain between company earnings announcements. Consistent with the above evidence, Lobo (1992) shows that analyst forecasts are superior to time series models. However, greater predictive power is obtained by combining time series forecasts with analyst forecasts, especially when dispersion in analyst forecasts is large.

Studies also compare the usefulness of analyst reports in predicting future prices, and the value of including recommended stocks in portfolios. Fried and Givoly (1982) show that forecasting errors of equity analysts are better predictors of stock price movements than time series models. They attribute this advantage to equity analysts' richer information set, which may already incorporate some of the historical information used in time series models. Jegadeesh, Kim, Krische, and Lee (2004) find value in the quarterly change of consensus recommendations, and information that is orthogonal to other predictors. Barber, Lehavy, McNichols, and Trueman (2001) show the value of adding recommended stocks to diversified portfolios. In conjunction with daily rebalancing, purchasing stocks with the most favourable recommendations and (short) selling stock with the least favourable recommendations yield annual abnormal returns in excess of 4%. However, as high-frequency portfolio rebalances erode profits, such strategies are unlikely to net any realised returns.

2.3.2 Analyst Bias and Predictive Errors

Despite the value of equity research, the literature also documents the presence of analyst bias and other systematic forecasting errors. This casts doubt on the effectiveness of analysts as a channel of information dissemination. A number of reasons are cited as possible sources of bias. These include the 'management relationships', 'conflicts of interest', and 'selection bias' hypotheses.

Francis and Philbrick (1993) present analyst over-optimism as a means of maintaining a favourable relationship (which is colloquially referred as 'currying favour') with the management of the stocks they cover. Given the relationship between management compensation and stock prices, managers prefer optimistic analysts' reports. A negative report may reduce the analysts' level of access to management information. Analysts therefore attempt to curry favour with managers, trading off bias for greater forecast accuracy. Lim (2001) models the utility of analysts with respect to forecast bias and accuracy. Consistent with the predictions of Francis and Philbrick (1993), he finds bias in optimal forecasts with respect to accuracy, illustrating the trade-off analysts often encounter. Given the incentives for currying favour, Das, Levine and Sivaramakrishnan (1998) posit a greater demand for non-public information when company earnings are hard to predict. They find greater earnings forecast bias for stocks that are predicted poorly by past earnings and returns.

Irvine (2001) investigates the relationship between analyst research coverage and brokerage volume. On average, brokerage market share for covered stocks is 3.8% higher than uncovered stocks. Irvine (2004) finds larger broker-analyst market share in stocks after the release of forecasts or recommendations. Kim and Lustgarten (1998) examine the relationship between brokerage incentives to boost trading and the extent of bias in analyst earnings forecasts. As brokerage revenue is directly related to trading activities, incentives exist for analysts to sensationalise forecasts to stimulate trading activity. Given this assertion, they predict positive bias in buy recommendations in comparison to neutral recommendations, and a corresponding negative bias in sell recommendations. Contrary to these predictions, they find higher optimism in sell and hold recommendations in comparison to buy recommendations.

Dugar and Nathan (1995) examine the effects of investment banking relationships on analysts' forecasts and recommendations. They find greater optimism (in both forecasts and recommendations) when analysts are concurrently underwriters for the same stock. Lin and McNichols (1998) find greater optimism in growth forecasts and stock recommendations when their affiliated investment firms are lead underwriters. Likewise, Michaely and Womack (1999) show that buy recommendations issued by underwriter analysts underperform those issued by unaffiliated brokers. Furthermore, markets do not appear to take full account of these biases. O'Brien, McNichols and Lin (2005) examine investment banking relationships and their effects on the speed with which analysts release negative news. Affiliated analysts are found to be faster in upgrades, but slower in downgrading stocks. These analysts are also less likely to drop coverage in comparison to unaffiliated analysts.

Rajan and Servaes (1997) find analyst overoptimism in the prospects of recent IPOs. They find superior long-run stock performance when analysts refrain from overhyping IPOs. James and Karceski (2006) attribute analyst bias following IPOs to conflicts of interest. Banking-analysts provide price-boosting services to stocks which they underwrite. Following poor performance, these stocks are given higher target prices, with a greater likelihood for a strong buy recommendation.

McNichols and O'Brien (1997) show the presence of a selection bias in an analyst's choice to initiate stock coverage. Equity analysts tend to initiate coverage in stocks they view favourably, and discontinue coverage for stocks with unfavourable views. While equity analyst forecasts and recommendations may not be inherently biased, their tendency to cover favourable stocks creates an apparent bias when measuring consensus values.

Other potential sources of bias and analyst forecast errors are also examined. For example, Graham (1999) models the analysts' incentives to herd in their stock recommendations. Graham (1999) hypothesises a greater likelihood to herd when analysts have low ability or high reputation, or when their private information is inconsistent with strong public information. Empirical results appear consistent with these hypotheses. Consistent with Graham (1999), Welch (2000) finds a positive correlation between an analyst's revision and the two following revisions by other analysts. The prevailing consensus recommendation also appears to influence an analyst's subsequent revision. Furthermore, the influence of the prevailing consensus appears stronger when market conditions are bullish, creating large biases in recommendations. Consistent with the notion that herding creates forecast errors, Clement and Tse (2005) find lower accuracy in forecasts that herd, in comparison to bold forecasts.

Gu and Wu (2003) relate observed analyst bias to a statistical distribution artefact. They assert that analysts seeking to minimise mean absolute forecast errors (i.e. an attempt to maximise forecast accuracy) will use median earnings rather than mean earnings. However, when earnings are skewed, means and median earnings differ significantly, causing observed mean bias. Therefore, one reason for these reported 'biases' emanates from efforts made by analysts to correct for earnings skewness.

2.3.3 Equity Research and Information Asymmetry

Easley and O'Hara (2004) argue that analyst coverage is complementary to accounting standards, disclosure policies, and market microstructure in minimising the cost of capital. Like disclosure, analyst research increases the total amount of information available to market participants, by either obtaining private information from the relationship they hold with the management; or by analysing and interpreting publicly available information that may be difficult to digest in its absence. Consistent with the notion that analysts have access to private information, Rogers and Grant (1997) show that over half of all financial and operating data cited in analysts' reports do not appear in company reports.

The literature presents equity analysis as complementary or as a close substitute to company disclosure in reducing information asymmetry. Lang and Lundholm (1996) find greater analyst following in firms with more informative disclosure. Further, these stocks have lower analyst forecast errors, lower forecast dispersion, and less variability in forecast revisions. Using a new implied cost of capital measure, Gebhardt, Lee and Swaminathan (2001) show a positive relationship between the dispersion in analyst forecasts, and a company's cost of capital.

Frankel and Li (2004) examine the relationship between analyst coverage and the frequency and profitability of legal insider trades. They find fewer insider trades for firms with greater analyst following, and these trades are on average less profitable. Consistent with the notion that analyst coverage is complementary to voluntary disclosure, they also find a negative relationship between disclosure quality and the frequency of insider purchases. Bushman, Piotroski and Smith (2005) conduct an international study on insider trading restrictions and its effects on analyst coverage. They find an increase in analyst coverage after the initial enforcement of insider trading laws. However, this increase in analyst coverage appears concentrated in emerging markets which do not have a strong information environment. For markets with strong investor protection mechanisms already in place, insider trading enforcements lead to a less intense increase in analyst coverage. While the studies mentioned above illustrate the relationship between analyst coverage and the information environment in which companies operate, these do not show a causal relationship between equity analysts and information asymmetry. For example, if equity analysts prefer stocks with greater disclosure and those less prone to insider trading, it is unclear whether increased analyst presence actually leads to lower adverse selection costs.

A number of studies examine specifically the role equity analysts play in the production of information, and its effects on market quality. Botosan (1997) finds a strong relationship between company disclosure and the cost of equity capital, but only in stocks without a strong analyst following. In stocks that already have a strong analyst following, additional disclosure does not appear to reduce the cost of capital. This suggests that analyst coverage plays a similar role in the information dissemination process when compared to voluntary company disclosure, both of which reduce information asymmetry.

Lang, Lins and Miller (2003) investigate the relationship between a company’s decision to cross-list in the US, its effects on analyst coverage, and the resulting effects on firm value. They find an increase in analyst coverage and forecast accuracy following listings in American Depository Receipts (ADRs). Of the ADRs that experience an increase in analyst coverage, firm value increases. Analyst coverage is therefore argued to improve a stock's information environment, thereby reducing its cost of capital, and enhance shareholder value. Bowen, Chen and Cheng (2008) analyse the effects of analyst coverage on the level of information asymmetry in seasoned equity offerings (SEOs). To the extent that SEO underpricing reflects the presence of information asymmetry, analyst coverage appears to alleviate some of these costs. In comparison to firms without analyst coverage, firms followed by eight or more analysts have 60% lower SEO underpricing.

Roulstone (2003) examines the characteristics of analyst following, and its relationship with market liquidity. Roulstone (2003) finds a positive (negative) relationship between the number of analysts following a stock (analyst forecast dispersion) and market liquidity (proxied by the bid-ask spread, depth, and the adverse selection component of the spread). Granger causality test results suggest that analyst characteristics lead those of market liquidity characteristics. These results are therefore consistent with the notion that analysts increase the total amount of information available to investors, reducing adverse selection, and therefore improve the liquidity of markets.

2.3.4 Analysts and their Access to Privileged Information

Despite evidence that suggests equity research is beneficial to markets (e.g. by reducing information asymmetry), concerns are raised regarding analysts' privileged access to managers, and their ability to obtain private information. In particular, the US SEC is wary of conference calls where companies selectively disclose non-public information to certain equity analysts. This places those without access to conference calls at a competitive disadvantage, which includes retail investors. The SEC subsequently introduced Regulation Fair Disclosure (Reg FD) in August 2000, which restricted company disclosure of material information unless it was made available to all market participants at the same time.

Significant debate exists on the effects of conference calls (or in general, analysts receiving privileged information) on information asymmetry. Proponents of Reg FD argue that certain analysts (and therefore their clients) have unfair access to material non-public information, which provides them with a significant advantage over other analysts and investors without similar access. By removing this privilege, a level playing field is created, boosting investor confidence, and hence market liquidity.

However, opponents of Reg FD are concerned that this move may increase the analysts' costs in acquiring information, which may reduce the total amount of available information in the market place. This increases the value of private information held in the hands of management, and may therefore lead to higher adverse selection costs. For example, Bowen, Davis and Matsumoto (2002) show that conference calls reduce analyst forecast errors and reduce analyst forecast dispersion. Contrary to the intentions of Reg FD, they argue that conference calls are more beneficial to analysts with weaker forecasting abilities, and therefore create a level playing field among analysts. Brown, Hillegeist and Lo (2004) investigate the cross-sectional and time-series relationship between conference calls and information asymmetry. Using the PIN measure, they find significantly lower costs to information asymmetry for stocks that regularly employ conference calls.

Empirical results generally agree that Reg FD has improved the level of fairness in information dissemination. Some studies show that, consistent with its intentions, Reg FD has reduced the competitive disadvantage of retail investors, resulting in an increase in retail holdings. Bushee, Matsumoto and Miller (2004) find an increase in the level of retail trading after the introduction of Reg FD, possibly as a result of improved fairness. Ke, Petroni and Yu (2008) investigate institutional trading in growth stocks that break from a series of earnings increases. They find significant selling by transient institutional traders in the quarter preceding bad news breaks, for firms that held conference calls. This abnormal selling disappears after the introduction of Reg FD, suggesting that markets have become fairer. Consistent with the above evidence, Chen, Dhaliwal and Xie (2009) find higher retail trading (lower institutional trading) under Reg FD, especially in the period preceding company announcements.

However, little consensus exists on the effects of selective disclosure, and the efficacy of its restriction in improving the information environment of stocks, and its intended effect of reducing information asymmetry. Some studies document a reduction in analyst forecast accuracy and an increase in forecast dispersion (e.g. Bailey, Li, Mao and Zhong, 2003; and Agrawal, Chadha and Chen, 2006), both of which indicate a reduction in the effectiveness of analyst reports as a channel for information dissemination.

Other empirical results appear consistent with these observations. Štraser (2002) finds that while the quantity of information (measured by the number of disclosures) has increased post Reg FD, its quality has significantly reduced. Overall, Reg FD results in higher information asymmetry costs, as proxied by the adverse selection component of the bid-ask spread, and the PIN. Consistent with Štraser (2002), Chen, Matsumoto and Rajgopal (2006) find poor price performance among stocks that have renounced EPS guidance to equity analysts. While Reg FD results in a larger number of company press releases regarding earnings, it also reduces analyst forecast accuracy and increases its dispersion.

Sidhu, Smith, Whaley and Willis (2007) investigate the effects of Reg FD on the adverse selection components of the bid-ask spread. To avoid confounding effects of decimalisation on NYSE, they find, for a sample of NASDAQ stocks, an increase in the adverse selection of approximately 36%. Duarte, Han, Harford and Young (2008) find a modest increase in the cost of capital for NASDAQ stocks of 10-19 basis points. No significant change is found for NYSE or AMEX stocks.

Gomes, Gorton and Madureira (2007) find a loss of information in small stocks as a result of Reg FD (measured as the quantity voluntary pre-announcement disclosure), which is especially significant for firms that communicate complex information. Furthermore, the loss of analyst-disseminated information in these cases does not appear to be compensated through other means. This results in higher cost of capital for small firms, while costs for larger firms do not change significantly.

Examining price and volumes effects surrounding quarterly earnings announcements, Ahmed and Schneible (2007) find similar results. While they document the effectiveness of Reg FD in curtailing selective disclosure, results do not indicate an increase in the average quality of information. Following Reg FD, they find lower information quality for small-to-medium and technology stocks, while no significant difference is found in other stocks. Likewise, they attribute these effects to a reduction in the amount of information disseminated through equity analysts, which may be especially important for small firms, or those that are more difficult to value.

Taken as a whole, the studies cited above illustrate the differences between information quantity and information quality, and differences between information fairness and information asymmetry. They show that while access to information may be fairer after the introduction of Reg FD, there is a reduction in the quality of information produced by equity analysts, resulting in greater information asymmetry. However, it is unclear to which extent these results are attributable to Reg FD, rather than an artefact of methodology or data, especially when data used in these studies coincide with large volatilities experienced surrounding the tech boom/bust.

In particular, a significant number of studies present results contrary to those mentioned previously, and use different methodologies, or examine the Reg FD issue from another perspective. For example, Sunder (2002) examines bid-ask spreads, as opposed to its adverse selection component. Prior to Reg FD, companies that held open conference calls (available to all investors) had lower bid-ask spreads in comparison to those that held restricted conference calls (available to selected analysts and institutions). Following Reg FD, this difference in information asymmetry ceases to exist, with no observable increase in the level of bid-ask spreads in general. Therefore, contrary to Štraser (2002) and Brown, Hillegeist and Lo (2004), Sunder (2002) argues that conference calls increase information asymmetry; and with the introduction of Reg FD, information dissemination becomes fairer, leading to lower adverse selection costs.

Eleswarapu, Thompson and Venkataraman (2002) find that trading costs (as measured by the effective bid-ask spread and price impact) are reduced following Reg FD. Contrary to Ahmed and Schneible (2007) and Gomes, Gorton and Madureira (2007), they find a greater improvement in trading costs for small and illiquid stocks. Gintschel and Markov (2004) find lower price impact on average after Reg FD, with growth stocks experiencing the largest fall in trading costs. Likewise, Chiyachantana, Jiang, Taechapiroontong and Wood (2009) find a reduction in spreads on average, and spreads around quarterly earnings announcements. They find that this is related to a reduction in the participation rate of institutional investors in the pre-announcement period, since they are more likely to be informed in the pre-Reg FD period. Comparing the cost of equity capital for US listed stocks and ADRs (which are exempt from Reg FD), they find a reduction in the cost of capital for US stocks, but no significant change in the ADRs.

2.3.5 Unequal Access to Analyst Reports

Institutional investors are widely considered to be more informed in comparison with retail investors. Literature shows that returns on stocks with higher institutional holding leads those with lower institutional holding (Badrinath, Kale and Noe, 1995), that institutional traders move prices more often (Chakravarty, 2001), that their trades predict future returns (Yan and Zhang, 2009), that institutional investors are more likely to purchase stocks (sold by retail investors) that eventually outperform (Griffin, Harris and Topaloglu, 2003), and they appear to have ability in predicting a break from a series of earnings increases, at least one quarter ahead of the break (Ke and Petroni, 2004).

One advantage that institutional investors hold is their ability to use a wider range of information.[8] This is arguably related to the amount of resources available at the institution's disposal, either allowing them to acquire and process their own information, or to obtain information from a fee-based source such as those provided by equity analysts. The literature shows that certain investor groups make greater use of analyst reports. For example, Walther (1997) examines whether institutional investors rely more on analyst forecasts than time series models in forming their view on expected earnings. Stocks with greater institutional ownership are found to place a greater weight on analyst forecasts, rather than simple time series models.

Battalio and Mendenhall (2005) find that small and large traders behave in a manner consistent with the two groups having different information sets. While large traders make use of time series models in addition to analyst forecasts, small traders tend to ignore earnings signals contained in analyst forecasts. These results suggest that small/retail investors have less access to information disseminated by equity analysts, and consequently make poorer economic decisions. This is possibly related to the cost of obtaining analyst research, which is prohibitively high for smaller retail traders.

[8] There may be other reasons why institutional investors outperform retail investors. For example, institutional investors may be more disciplined and therefore face less behavioural bias in their investment decision process. See Barber and Odean (2000).

In addition to the evidence provided on unequal access, the literature also shows the financial benefits for those with analyst research subscriptions. Kim, Lin, and Slovin (1997) examine the price reaction of initial buy recommendations. Using a sample of initial recommendations that are released prior to the market open, they find the presence of short-run profit opportunities. This provides those with analyst subscriptions a means to trade for abnormal profits. Green (2006) investigates the value of obtaining an analyst recommendation after its official release, but ahead of other investors who do not have direct access to them. Short-term profit opportunities persist for roughly two hours following the release of analyst recommendations, with two-day abnormal holding returns of 1.02% on upgrades, and 1.50% on downgrades. These results, when considered in conjunction with those obtained from other studies, show that investor access to analyst research is unequal, which creates profitable trading opportunities for those with access.

2.4 Alternative Trading Venues and Market Fragmentation

Despite the benefits of having a consolidated market, identical securities are often traded on different venues with different market structures. This is especially true for the US, where stocks concurrently trade on the NYSE, AMEX, NASDAQ, electronic communication networks (ECNs), crossing networks (CNs), and upstairs markets. Alternative trading venues such as ECNs, CNs, and upstairs markets represent an important source of liquidity, and are commonly referred to as ‘dark pools’, or non-displayed liquidity.

Three competing theories exist on the likely effects and reason behind market fragmentation. One school argues that fragmentation increases liquidity search costs, reducing the quality of markets overall. The second school hypothesises a clientele effect, where market fragments exist to cater for different investor groups. The final school posits fragmentation as a means of fostering competition among markets for liquidity, reducing the size of transaction costs. The latter two theories predict that market fragmentation is valuable, while the former predicts lower liquidity in fragmented markets. Empirical results on market fragmentation are mixed, with results appearing to support any of the three theories.

A number of studies specifically examine the trading costs of these alternative trading venues in comparison to the main downstairs market. They find that ECNs and CNs offer lower execution costs in certain cases, by increasing the level of competition in downstairs liquidity providers. Upstairs brokers are thought to have greater information on the location of non-displayed liquidity (reducing liquidity costs), and have the ability to filter out information-motivated trades (and thereby reduce information asymmetry costs).

2.4.1 Theory on Market Fragmentation

Three competing theories exist on the likely effects of market fragmentation, these are the 'liquidity cost effects', 'clientele effects', and the 'competition effect'. The first predicts lower overall market performance in fragmented markets, while the latter two hypothesise that fragmentation is valuable. Mendelson (1987) argues that consolidated markets offer lower search costs and therefore greater liquidity and price efficiency. Modelling the trade-off between fragmented and consolidated markets, he finds a lower total number of shares traded in fragmented markets, having price signals of lower quality (higher price volatility), and lower expected gains from trade. However, fragmented markets may improve the quality of price signals when information is aggregated and disseminated.

Seppi (1997) models the competition between a specialist and a limit order book market. A hybrid specialist market is found to offer better liquidity for small retail and large institutional trades, while a pure limit order market is better suited to medium-sized trades. This appears to suggest the presence of specific clienteles in the choice of trading venue, and the existence of market fragments as a means of fulfilling different demands. Madhavan (1995) investigates the relationship between market fragmentation and trade disclosure, and finds evidence that supports both the liquidity consolidation and clientele theories. Consistent with Mendelson (1987), Madhavan (1995) finds higher price volatility and lower price efficiency in fragmented markets. Large traders, however, prefer to trade in fragmented markets when their trades are not disclosed, resulting in lower execution costs, which appear to support Seppi (1997).

Hendershott and Mendelson (2000) model the competition between dealer markets and a passive crossing network. Price competition from crossing networks is argued to attract new traders that would otherwise have abstained from trading. However, competition may also increase the risks associated with market making (crowding-out effects), resulting in larger bid-ask spreads on the main market. They argue that the negative effects are small when securities have sufficient ‘critical mass’ to begin with, and when crossing networks only attract a small portion of the total order flow.

Parlour and Seppi (2003) model the competition between a hybrid market and a pure limit order book market. Consistent with Hendershott and Mendelson (2000), Parlour and Seppi (2003) show that fragmentation can, in certain cases, reduce transaction costs. While fragmentation may reduce total depth overall, competition also reduces the size of the spread, which is beneficial to traders who trade small amounts. They also conclude that neither market is competition-proof, and both can exist in equilibrium. Consistent with the clientele effect, they show that different investors may prefer one market structure over the other.

With little consensus on the expected impact of greater market fragmentation (or consolidation), empirical results are also mixed. Battalio (1997) examines the issue of fragmentation in third market broker-dealers. Madoff Securities (which later became NASDAQ) began paying brokers for order flow in small retail trades. These trades are guaranteed to be executed at no worse than the National Best Bid and Offer. Contrary to the belief that fragmentation reduces liquidity in the main market, Battalio (1997) finds no change in trading costs on the NYSE as a result of Madoff Securities. This suggests that market fragmentation may improve competition. Battalio, Greene and Jennings (1997) investigate the effects of greater market fragmentation arising from the internalisation of orders from the Boston Stock Exchange and the Cincinnati Stock Exchange. Consistent with Battalio (1997), they find no increase in the effective bid-ask spreads on the NYSE.

Mayhew (2002) studies the effects of market competition in fragmented options markets. Options listed on multiple exchanges appear to have lower bid-ask spreads in comparison with those listed on a single exchange. Moreover, when a competing exchange de-lists an option, spreads in other markets increase. These results are consistent with the notion that market fragments improve competition for liquidity, which reduces transaction costs. De Fontnouvelle, Fishe and Harris (2003) investigate the relationship between payments for order flow in options markets, and the size of bid-ask spreads. Consistent with Mayhew (2002), they find a reduction in bid-ask spreads following greater competition from fragmented markets.

Foucault and Menkveld (2008) analyse the effects of fragmentation in the Dutch market. With the introduction of EuroSETS, an electronic limit order book market set up by the London Stock Exchange in direction competition to Euronext, bid-ask spreads fell. Surprisingly, they also find an increase in depth of the incumbent market, which they attribute to a fee reduction from Euronext on limit orders. Taken as a whole, these results show that market fragmentation may improve the liquidity of markets by fostering competition.

Contrary to empirical studies showing the value of fragmentation, Amihud, Lauterbach and Mendelson (2003) find greater liquidity in consolidated markets. When examining deep-in-the-money warrants that are exercised upon expiry, they find an increase in the liquidity of underlying markets, and an associated rise in asset prices. This is attributed to a consolidation of trading interests upon the expiry of warrants. Bennett and Wei (2006) investigate the effects of order flow fragmentation on market quality. Order flow on NYSE listed stocks is typically less fragmented than those listed on the NASDAQ, which has more trading venues. When NASDAQ stocks switch their listing to the NYSE, an increase in market consolidation results in greater market quality and price efficiency.

2.4.2 Electronic Communication Networks and Crossing Networks

A number of studies investigate specifically the effects of electronic communication networks (ECNs) and crossing networks (CNs) on traditional markets. The vast majority of these studies show that ECNs and CNs induce competition from traditional markets, resulting in lower transaction costs. Using a proprietary dataset from a large US investor, Næs and Skjeltorp (2003) show that competition from CNs appears concentrated in large and liquid stocks. While trading in CNs increases the risk of non-execution, they show using simulations that a strategy of trying to cross all shares is optimal. Using the same dataset, Næs and Ødegaard (2006) show that while execution costs on CNs are lower, this is offset by higher costs of non-execution, which is difficult to quantify in traditional measures of transaction costs.

Gresse (2006) investigates the competition between the London SEAQ quote-driven market and a CN. Dealer market spreads are found to be negatively related to CN volumes. Given the significant participation of dealers in CNs, CNs are argued to improve risk sharing among dealers. Degryse, Van Achter and Wuyts (2009) model the competition between a CN and a dealer market under three different transparency regimes. Consistent with Hendershott and Mendelson (2000), they show that the introduction of a CN creates new liquidity from traders that would otherwise have abstained from trading. However, the CN also exerts a negative crowding-out effect on the dealer’s willingness to provide liquidity. Overall welfare is shown to increase when the spread is high to begin with, but decrease when spreads are already low.

Barclay, Hendershott and McCormick (2003) find significantly lower execution costs on ECNs in comparison to the NASDAQ, if and when this liquidity is actually present. However, dealers are argued to provide lower ex-ante execution costs for small traders, due to their preferencing arrangements. Furthermore, they find greater information asymmetry in ECNs, especially around periods of high volume and stock price volatility.

Huang (2006) compares the quoting behaviour of ECNs in comparison to the NASDAQ. Consistent with the empirical evidence on CNs, quoted spreads in ECNs are often lower than those quoted by dealers. Moreover, quotes are provided more frequently on the ECNs, causing ECNs to be price leaders (Instinet and Island in particular). These results suggest that ECNs promote quote quality, and improve the liquidity of markets. Fink, Fink and Weston (2006) make similar comparisons between ECNs and NASDAQ. They find that an increase in ECN activity is associated with lower quoted, effective and relative spreads, and find no deterioration in depth.

Conrad, Johnson and Wahal (2003) compare the execution costs of CNs, ECNs, and orders filled by brokers (e.g. on the NYSE, NASDAQ or upstairs markets). After controlling for endogeneity in the choice of trading venue, they find lower execution costs on CNs and ECNs. These lower costs are partially attributed to lower tick sizes on alternative trading systems, which have since equalised.

2.4.3 Upstairs Markets

There are two competing theories on why upstairs markets exist. Seppi (1990) argues that upstairs dealer-brokers keep track of trader reputations. When traders have a reputation for being informed, they receive poorer execution costs in comparison to those with superior reputation, resulting in a separating equilibrium between the two trader groups. Upstairs markets are therefore free from informed traders, resulting in lower average execution costs. Grossman (1992) argues that upstairs market brokers are repositories for unexpressed trading interests. Upstairs markets are therefore able to facilitate large trades at relatively lower costs compared to downstairs markets.

While both theories predict lower transaction costs in upstairs markets, the overall welfare effect of upstairs markets is unclear. If upstairs markets force informed traders into the downstairs market as implied by Seppi (1990), then downstairs markets will experience an increase in adverse selection costs. Therefore, upstairs markets may ‘cream-skim’ the most profitable trades from downstairs markets, leaving little benefit to overall welfare. The empirical evidence is ambiguous with regard to these ‘cream-skimming’ effects. While no studies suggest outright that upstairs markets may harm the downstairs market, some do show evidence consistent with broker filtering.

In an experimental study on the behaviour of off-floor (upstairs) trading, Campbell, LaMaster, Smith and Van Boening (1991) find that these trades often occur inside the spread, providing consistency with empirical results that show lower off-market execution costs. They also find that off-floor trading is more likely when their experimental trading floor experiences higher spreads.

Keim and Madhavan (1996) model and examine the price effects of upstairs trades. For a small sample of upstairs trades in illiquid stocks, they find significant permanent price impact in both buyer- and seller-initiated trades, with a price continuation in the larger block trades. They also find a significantly positive relationship between trade size and the temporary price impact of seller-initiated trades. Keim and Madhavan (1996) argue that the optimal number of counterparties to the trade depends on the size of the block. Increasing the number of counterparties minimises the price impact of the block trade, but results in an increase in the cost associated with information leakages. This leads to a trade-off, and therefore a non-linear relationship exists between the number of shares traded and the temporary price impact. In addition, they report significant movements in pre-trade prices, which they attribute to information leakages prior to the upstairs trade.

Madhavan and Cheng (1997) examine the execution costs in upstairs and downstairs markets for Dow Jones stocks. While they find significantly better execution costs for large trades in upstairs markets, they argue that these benefits are economically small. Consistent with Seppi (1990) and the notion that upstairs brokers screen for informed trading, they find that reputation is an important determinant of execution costs. Madhavan and Cheng (1997) further argue that upstairs markets are especially beneficial to institutional liquidity providers, who are reluctant to offer free trading options in the downstairs market. By acting as the counterparty to trades that have been pre-screened by brokers, upstairs markets facilitate trades that would not otherwise have occurred in the downstairs market.

Smith, Turnbull and White (2001) examine upstairs block trades on the Toronto Stock Exchange. Consistent with Grossman (1992)'s predictions, they find that upstairs markets are typically used by small and less liquid stocks, or when the downstairs order book is thin. While upstairs trades have lower variable costs, they also find higher fixed costs. Trades that exceeded 24% of mean daily trading volume have lower execution costs upstairs. They also investigate brokers' choice of executing an order on a principle basis upstairs, on an agent basis, or routing it downstairs. Consistent with Seppi (1990)'s filtering hypothesis, Smith, Turnbull and White (2001) find that information-motivated trades are more likely to be routed downstairs, while those that carry no information are handled upstairs. While they conclude that upstairs markets are typically used for liquidity reasons, the welfare effects of routing informed trades downstairs are unclear.

Booth, Lin, Martikainen and Tse (2002) examine the price impact of upstairs trades on the Helsinki Stock Exchange. Consistent with Seppi (1990), they find a smaller permanent price impact in upstairs trades, suggesting a lower level of information asymmetry in these trades. However, upstairs trades appear to have a higher temporary price impact, suggesting upstairs broker-dealers require a premium to cover the large liquidity risks. Overall they find lower total costs in upstairs markets in comparison to downstairs markets, which is consistent with the prediction of Grossman (1992).

Bessembinder and Venkataraman (2004) examine the execution costs of upstairs trades, in comparison with their costs if they are instead routed to the downstairs limit order book. Consistent with Grossman (1992), upstairs markets tend to be used when downstairs liquidity is lacking, which is especially valuable for large trades, and those in small and illiquid stocks. On average, they find that upstairs execution costs are only 35% as large as downstairs costs. Consistent with Seppi (1990), they find significantly lower permanent price impact in the upstairs market in comparison to the downstairs market, suggesting that brokers actively filter out informed trades.

Fong, Madhavan and Swan (2004) examine and compare execution costs of upstairs and downstairs markets, and a crossing network in Australia. Contrary to prior evidence, they find similar execution costs in upstairs and downstairs trades. Furthermore, upstairs trades in Australia do not appear less informed in comparison with similar downstairs trades. These results provide evidence against Seppi (1990)'s prediction that upstairs markets are information-free. Moreover, Fong, Madhavan and Swan (2004) find no evidence of upstairs trades harming downstairs markets by increasing their trading costs and bid-ask spreads. Swan and Westerholm (2004) examine the market microstructure of 38 exchanges around the world. Overall, upstairs markets tend to be beneficial, but only for the smaller and less liquid stocks, where liquidity provision is most valued.

Chapter 3: Institutional Details

This chapter provides background information on the Australian equities market. In particular, this chapter covers the market structure for trading and clearing, facilities for block-trading, (along with its reporting procedures), and routes of information dissemination.

3.1 ASX Market Structure

The Australian Stock Exchange (ASX) is the largest of the three exchanges[9] operating in Australia. The ASX results from the amalgamation in 1987 of the six regional exchanges in Melbourne, Sydney, Hobart, Brisbane, Adelaide and Perth. In 1996, the ASX demutualised and became a listed entity within itself in 1998. As of 30 June, 2009, there are 2,198 stocks listed on the ASX, with a total domestic market capitalisation of $1.09 trillion. According to the World Federation of Exchanges (as of June 2009), the ASX is the 16th largest stock market in the world by domestic capitalisation, 17th in terms of turnover, and 9th in the number of listed stocks.

[9] The other exchanges are the National Stock Exchange of Australia (NSX, formerly known as the Newcastle Stock Exchange) and the Bendigo Stock Exchange (which is wholly owned by the NSX), each of which maintains a very small listing of stocks and related securities. Trading in these two exchanges represents a very small portion of the total activity for Australia. For example, in 2009, turnover on the NSX was less than $4.5 million Australian dollars. The Asia Pacific Exchange is another entity that operates in Australia. However, it has only one listed security, which has yet to see any trading.

3.1.1 Trading Procedures and Platform

From 19 October, 1987, trading on the ASX gradually moved from the trading floor onto the automated trading system known as Stock Exchange Automated Trading System (SEATS), and by 1 October, 1990, trading on all stocks was automated. This was superseded by the Integrated Trading System (ITS) during November, 2006. With the introduction of ITS, undisclosed orders were due to replace iceberg orders. However, due to technical issues, this never eventuated, and currently neither iceberg nor undisclosed orders are available at the ASX.

The ASX currently allows for two kinds of orders, market orders and limit orders. Limit orders may be placed with a specified expiry date, which upon expiry are purged from the system. Other order types, such as stop loss orders, are not provided by the exchange, and are instead provided at the discretion of brokers on their proprietary systems. The ASX has three minimum price step categories based on stock prices: $0.001 for shares valued lower than $0.10, $0.005 for shares valued between $0.10 and $1.995, and $0.01 for shares with a value greater than or equal to $2.00.

3.1.2 Market Phases

There are five market phases on the ASX: pre-open, opening auction, normal trading, pre-close, and closing auction. The pre-open takes place between 7am and 10am, during which orders are allowed to be entered, amended or deleted, but with no trades executing. At 10am, stocks enter the opening auction in batches, with the last batch opening at approximately 10:09am. Normal trading occurs for the rest of the trading day, until the pre-closing at 4:00pm, at which point orders are allowed to be entered, amended or deleted, but not executed. A single closing auction occurs between 4:10pm and 4:12pm. These times are subject to a random adjustment of up to +/- 15 seconds by the trading platform.

3.1.3 Market Participants

As of 2010, there are 43 registered brokers operating at the ASX, 10 of which offer discount internet and/or telephone broking services, and 34 of these offer full-service brokerage, providing additional value-added services such as research and execution. The largest full-service brokers at the ASX (in terms of turnover) are Macquarie Bank, Goldman Sachs JBWere, UBS, Citigroup, Merrill Lynch, CSFB, ABN AMRO (currently owned by RBS), Morgan Stanley, and JP Morgan. Two large discount brokers also have significant market share: Commonwealth Securities, a wholly owned subsidiary of the Commonwealth Bank of Australia, and E-Trade, owned by the Australia and New Zealand Banking Group.

3.1.4 Share Registration and Settlement

Shares on ASX listed entities are registered through two means, via the broker-sponsored Clearing House Electronic Subregister System (CHESS), or through an issuer-sponsored subregister. Issuer-sponsored subregisters are typically shares that have never traded in secondary markets, for example, shares obtained from an IPO allocation. Before trades can be settled, the ASX requires issuer-sponsored holdings to be transferred to CHESS. As such, all trades conducted at the ASX are settled through CHESS, typically on a T+3 basis. CHESS provides shareholders with a unique Holder Identification Number (HIN) for each broker they trade through. This allows the ownership of stock portfolios to be tracked and, when necessary, facilitates the transfer of holdings between brokers.

3.1.5 Broker ID Removal

As a part of the 'ASX Market Reforms', a consultation paper[10] was released by the exchange in November 2003 that proposed amendments to the current broker ID reporting regime. Three options are provided, one involving the full visibility of IDs to brokers and investors (option A), another involving complete anonymity (option B), and a hybrid system allowing brokers to choose whether or not to disclose their identity (option C). An excerpt from the consultation paper raises the issue of transparency and it's adverse effects on front running:

> *"Broker IDs are an additional piece of information that can, in some circumstances, be useful in predicting future market activity. It is apparent that some traders attempt to second-guess future price movements based on trading by particular brokers, ... possibly even assuming a particular client is involved, and then attempting to trade ahead of those further orders."*

It is argued that front running increases the costs for limit order traders, reducing their incentives for liquidity provision. An anonymous market mitigates these costs, and is

[10] ASX Consultation Paper (2003), "ASX Market Reforms - Enhancing the Liquidity of the Australian Equity Markets".

therefore expected to have greater liquidity. The ASX also cites anonymity as the international best practice, with numerous markets around the world moving to anonymous trading. Furthermore, empirical evidence from academia appears consistent with the predictions regarding anonymity and liquidity.

Despite an overwhelming majority of fund managers preferring more transparency, the ASX removed broker identifiers from SEATS on 28 November, 2005. In place of the broker ID, a generic ‘7777’ masks all orders and trades on the trading platform.

As a replacement to the loss of post-trade transparency, the ASX introduced three additional reports. The first report aggregates the daily value of trades conducted by each broker for each stock, without differentiating between purchases and sales. It is therefore difficult to infer from this information the net direction of a broker’s trades. Another report is similar to the first, but instead of reporting turnover, reports the total number of trades. These two reports are available approximately one hour after the closing auction, typically at 5pm. A third report details every trade conducted by each broker at the ASX, and is available at 7am on a T+3 basis.

3.2 Block-Trading Facilities

3.2.1 Block-Trading on the ASX

The ASX has no explicit trading mechanisms for executing block trades on the limit order book. A trader wishing to trade a large amount on the trading platform simply places a large market or limit order. However, a broker may assist in the search for counterparties outside of the limit order book through various means, for example, by calling institutions that have an undisplayed interest in trading. These quasi-OTC markets are commonly referred to as upstairs markets. There are four classes of upstairs trades at the ASX: Block Special Crossings (BSC), Facilitated Specified Size Block Special Crossings (FSSBSC), Portfolio Special Crossings (PSC), and Index Replicating Special Crossings (IRSC). The first two classes involve a large trade in a single security, while the latter two involve a basket of securities.

The most common type of upstairs trade by far is the Block Special Crossing (BSC), which is a block trade negotiated by a broker on behalf of two clients in a single security. For stocks, these must have a trade value exceeding $1 million; a fixed threshold independent of stock characteristics. Upon entering into an agreement, BSC trades are reported immediately to the trading platform. The exception is when a trade occurs during or after the single price closing auction. When they occur during the closing auction, they are to be reported immediately following the auction. When BSCs occur after the market close (or prior to the opening), reporting can be delayed, and they are instead reported no later than 15 minutes prior to the opening of the next trading session.

There is another subclass of single-security upstairs trades called Facilitated Specified Size Block Special Crossings (FSSBSC). These essentially differ from BSCs when a broker chooses to act as the counterparty to a block trade. While these are less common than BSCs, they represent an important source of liquidity provision, especially when no immediate counterparties are available to trade with. Depending on the liquidity of the stock and historical patterns in upstairs trading, the ASX categorises stocks into four bands: A, B, C, and others, with respective thresholds of $15, $10, $5, and $2 million. From time to time, the ASX may choose to recategorise stocks into a higher band; in particular, when FSSBSCs approach or exceed 20% of the value of all BSCs (over a period of one week) in that stock.

Unlike BSCs, FSSBSCs are reported with a delay. When these trades occur before 1pm, then they must be reported to the trading platform no later than 15 minutes prior to the opening of the next trading session. If they occur after 1pm, trades are to be reported no later than 1pm on the following trading day. This is done, presumably, with the intention of reducing the adverse effects of front running, providing brokers with an opportunity to manage their inventory. The broker may then choose to offload their position gradually into the limit order book, or with other counterparties when interest for trading arises.

The ASX also allows the execution of a portfolio of stocks which are called Portfolio Special Crossings (PSC). These involve the sale and/or purchase of at least 10 equity securities, with each security having a value no less than $200,000, and the total value of the portfolio having a value no less than $5 million. Reporting requirements for PSCs are identical to those for the BSCs and FSSBSCs, depending on whether a broker had acted as the counterparty. Index Replicating Special Crossings (IRSC) are a special case of PSCs, and occur when the traded portfolio contains 90% of the securities in an approved index, and must exceed a value of $1m. IRSCs are reported in the same manner as FSSBSCs.

One key difference exists in the pricing of ASX upstairs trades in comparison to other equity markets. Other markets have fairness rules, with upper and lower bounds in which upstairs trades are allowed to execute. Upstairs trades in other markets are therefore typically executed within the best downstairs bid-ask spread, or within the theoretical volume-weighted average price of routing the trade downstairs. A fairness rule does not exist on the ASX for upstairs trades. There is therefore greater room for negotiation on the ASX, which may encourage trades which otherwise would not have occurred (should they be forced instead to execute within a restrictive price bound).

3.2.2 Other Venues for Block-Trading

For a short period in late 1999, the ASX trialled an automated off-market block trade system called BLOX. This operated from 22 November, 1999 to 26 November using dummy orders, and from 29 November to 17 December using real orders. BLOX allows for greater pre- and post-trade anonymity, reducing the risk of information leakages in upstairs trades. While the trial showed a degree of success, anecdotally, it failed due to a high level of resistance from the brokers, as institutions were given direct market access.

Currently, there are a number of institutions that provide on-market crossings on ASX listed shares. These include POSIT (ITG), Liquidnet (which recently received ASIC approval), UBS PIN (UBS), Crossfinder (part of Credit Suisse's Advanced Execution Service, AES), and BlocSec (Hong Kong based CLSA). These typically provide non-continuous crossings at predetermined times. Continuous crossings are difficult on the

ASX in the presence of the ‘10 second rule’, which requires all crossing orders to be exposed to the market for at least 10 seconds. This reduces the execution certainty of crossing networks. However, in late 2009 the ASX recently removed this rule, which is expected to increase the proliferation of crossing networks in the Australian market.

A number of alternative trading venues (in particular ECNs) have signalled their intention to compete with the ASX on block trades. These include the AXE-ECN (partly owned by the New Zealand Stock Exchange, and five other major Australian brokers), Liquidnet and Chi-X. On 23 July, 2007, the Australian Securities and Investments Commission (ASIC) released a consultation paper regarding the applications of AXE-ECN. Some of the concerns relayed in the ASX response include a reduction in pre- and post-trade transparency, a reduction in price efficiency, and an increase in transaction costs arising from the internalisation of trades.

The alternative platforms argue that competition generally improves the pricing of the incumbent exchange, and therefore improves the wellbeing of financial markets. This argument appears reasonable, as the ASX soon reduced exchange fees on crossings, on which the alternative platforms compete. In response to the potential conflicts of interest arising from supervision by the ASX, ASIC announced on 24 August, 2009 that the majority of supervision will be transferred to ASIC, with the ASX maintaining supervision related to listing and disclosure rules. Currently Chi-X is the only ECN to receive in principle support from ASIC for their application to enter the Australian market, and is yet to begin trading.

3.3 Information Dissemination in Australia

3.3.1 ASX Reporting Requirements and Company Announcements

In additional to bi-annual company reports, section 674 of the Corporations Act requires public Australian companies to continuously disclose. Furthermore, ASX listing rule 3.1 (with certain exceptions) requires the disclosure of:

> *"information which may affect security values or influence investment decisions, and information in which security holders, investors and ASX have a legitimate interest… Once an entity is or becomes aware of any information concerning it that a reasonable person would expect to have a material effect on the price or value of that entity's securities, the entity must immediately tell ASX that information."*

When information is submitted to the ASX, a member of staff (an ASX Company Advisor) first determines whether this information is likely to be price-sensitive. When a price-sensitive announcement is released by the ASX, a trading halt of no less than ten minutes is introduced. This aims to provide the market with sufficient time to digest the information, prior to their trading decisions. Historically, approximately 25% of all announcements are classified by the ASX as being market-sensitive.

From time to time, the ASX may query companies regarding information that has appeared in the media or broker research reports, but has not been announced. This is also true when the ASX market surveillance department detects abnormal price movements in stocks. In these cases, the ASX may require the companies to clarify the matter to the market, if only to ensure that markets do not respond to misinformation.

3.3.2 Other Avenues for Information Dissemination

In addition to company announcements and bi-annual reports, the 2008 Australian Share Ownership Study identifies several additional sources of information and investment advice. These include information available in the media (e.g. from newspapers, magazines, investment newsletters, the radio, television), but also advice from 'experts', in particular brokerage firms which offer research services. ASX survey statistics show that in 2008 approximately 21% of all retail investors surveyed made use of analyst reports (1% for error). While no statistics are provided for institutional investors, it is likely that they use analysts to a greater extent when making financial decisions, given their higher level of endowment.

ASIC and the ASX forbid the release of price-sensitive information to equity analysts that is not already in the public domain ('selective briefings'). Companies that wish to disclose non-public information to analysts must first release this information to the markets via an announcement. In the event that information is inadvertently passed on, companies must immediately file a notice with the ASX.

Institutional and high-wealth investors typically rely on an information service such as First Call (a subsidiary of Thompson Corporation) to receive analyst reports from their brokers. The less appealing alternative is to check the websites of various brokers at regular intervals. This is time-consuming and may cause delays in receiving valuable information, possibly forgoing the advantage of early trading. Upon receiving a report from a broker, First Call simultaneously sends it to all clients who have been granted access rights by the brokerage house. Those who do not have access rights may find out about the report at a later time and may purchase the report from First Call.

While analyst reports are typically issued simultaneously to all investors with subscriptions[11], anecdotal evidence from non-academic sources suggests otherwise. For example, *Confessions of a Wall Street Analyst*, an exposé by Dan Reingold on the analyst industry during the tech boom, highlights some of the issues that equity analysts face when bringing information to the market. In particular, the act of passing analyst information on to privileged clients prior to its public release allows certain clients to trade ahead of the market.

[11] Analyst firms typically have their own internal controls to ensure the simultaneous dissemination of reports to all subscribers.

Chapter 4: Hypotheses

In this chapter, hypotheses are developed based on the literature review and institutional details.

4.1 Hypotheses on Upstairs Markets

Grossman (1992) posits upstairs brokers as repositories for unexpressed trading interests. These facilities allow for trades that would otherwise not have occurred. Given this notion, this dissertation hypothesises that:

Hypothesis 5.1: Upstairs markets are typically used when liquidity in the downstairs markets is lacking, or trading costs are prohibitively high.

As block trades in small stocks are particularly difficult to arrange in the downstairs market, the literature documents the disproportionate use of upstairs markets in small and illiquid stocks (e.g. Smith, Turnbull and White, 2001; and Bessembinder and Venkataraman, 2004). Therefore, this dissertation hypothesises that:

Hypothesis 5.2: Upstairs markets are more beneficial for block-trading in small stocks, in comparison with large and liquid stocks.

If upstairs markets are typically used when downstairs liquidity is lacking, then an improvement in downstairs liquidity is expected to reduce the reliance on upstairs markets. Over time, markets naturally become more liquid, therefore this dissertation hypothesises that:

Hypothesis 5.3: As downstairs markets become more liquid over time, upstairs markets become less important as a source of liquidity provision.

Unlike other markets, ASX upstairs trades can be executed at any price and do not have to be exposed to the downstairs market. Seppi (1990) argues that upstairs brokers have a greater ability to filter out informed trading by observing a trader's reputation. If the informed trader's presence is an indication of future price movements, then one would expect the upstairs brokers to refuse their trades. Alternatively, they could charge the informed traders a premium that is sufficient to cover the additional risk. However, this can only occur when upstairs brokers have complete freedom to negotiate prices, which is true for the ASX. Therefore, this dissertation hypothesises that:

Hypothesis 5.4: Trades that execute far away from the best bid and ask prices have higher information content.

4.2 Hypotheses on Equity Analysts

Equity research represents a way of developing favourable relationships with clients, which adds to revenue. Literature shows that equity analysts add value to their investment banking business (Michaely and Womack, 1999) and to their brokerage business (Irvine, 2001, 2004; Jackson, 2004; Strauss and Zhu, 2004). Investment firms that provide good research encourage investors to trade through them, and therefore earn higher commissions. Strauss and Zhu (2004) find that both quantity and perceived quality of research contribute to the generation of brokerage revenue. Indeed, it is entirely irrational for a financial institution to spend large sums of money on an activity which nets them no gain.

The market for information literature presents two reasons why brokers prefer to “sell” their information, rather than using the information to trade directly. One reason, as argued by Admati and Pfleiderer (1988), is optimal risk sharing by brokers with their clients. When differences in risk aversion are sufficiently large, it may be optimal for the informed broker not to trade, and act solely as an information vendor. Brokers may also wish to sell their information when they are competing against other informed parties with the same information. Fishman and Hagerty (1995) show that a broker is able to maximise his/her profit by selling information to others, thereby increasing the number of competing (and informed) parties. While this may reduce the profits of the individual traders, it increases the broker’s share of total profits.

When those seeking analysts’ reports demand different levels of service, the market for these reports becomes segmented. Some may be willing to pay additional fees in return for better or more timely information, while others may not have the means to do so. Information leakage is provided to favoured clients in exchange for additional trading business (soft dollar). As both parties have financial incentives to live up to their side of the bargain, in the absence of regulation, relationships are likely to be long-lasting. When their ‘favoured clients’ represent a large part of their brokerage business (and presumably large buy-side institutions are their largest customers), incentives to leak information are even greater.

The literature on insider trading shows that those with access to non-public information often trade ahead of information releases, which earns them abnormal returns. The literature shows that analyst recommendations have investment value (e.g. Bjerring, Lakonishok and Vermaelen, 1983; and Womack, 1996); that is, they contain information regarding the value of stocks. To the extent that analyst recommendations can be considered one form of information release, this dissertation hypothesises that:

Hypothesis 6.1: Leakages exist in analyst recommendations, and certain customers of broker-analyst firms trade on these leakages, which nets them abnormal profits.

As equity research is not free, it is not expected to be distributed evenly across the market. For example, Green (2006) shows that those with subscriptions to analyst research are able to trade profitably on their short-run information advantage. Institutions and other large traders are more likely to have research subscriptions, given their larger endowment. Empirical evidence appears consistent with this view. For example, Walther (1997) shows that stocks with higher institutional ownership place more weight on analysts' forecasts over forecasts that can be obtained from a simple time series model. Consistent with Walther (1997), Battalio and Mendenhall (2005) show that small traders ignore earnings signals from analyst earnings forecasts, while large traders do not. Given these results, this dissertation hypothesises that:

Hypothesis 6.2: If customers of more reputable analysts are more sophisticated, then they will make investment decisions based on a larger number of analyst forecasts.

4.3 Hypotheses on Anonymity

Foucault, Moinas and Theissen (2007) predict lower bid-ask spreads in anonymous markets overall, which is supported empirically by Comerton-Forde, Frino and Mollica (2005), Comerton-Forde and Tang (2008), and Frino, Gerace and Lepone (2008). To the extent that lower bid-ask spreads reduce actual transaction costs (other things being equal), one would expect lower transaction costs in anonymous markets. Therefore this dissertation hypothesises that:

Hypothesis 7.1: Transaction costs are lower (on average) in anonymous markets.

However, market microstructure models suggest that informed traders hide their trades among liquidity-motivated traders (e.g. Kyle, 1985). If the removal of broker IDs reduces the market's ability to detect informed trading, then one would expect lower trading costs and greater market share for informed traders, but not for the uninformed. Therefore, this dissertation hypothesises that:

Hypothesis 7.2: The large full-service broker-analysts have a greater reduction in their transaction costs in anonymous markets, when compared to the trading costs of less informed brokers.

Hypothesis 7.3: Anonymity results in greater market share for the large full-service broker-analysts, and they contribute to a greater portion of price discovery.

Chapter 5: Upstairs Markets, Liquidity Provision, and Filtration of Informed Trades

5.1 Introduction

The upstairs market is an over-the-counter network of brokers and institutional traders that negotiate large block trades of listed securities outside the normal trading venue of an exchange. On the ASX, upstairs trades are typically conducted through 'Block Special Crossings', which have to exceed a trade value of $1 million.

Chapter 5 examines the role of brokers in the upstairs market. There are two main schools of thought on why upstairs markets exist. Seppi (1990) argues that upstairs brokers have superior ability in differentiating between informed and uninformed traders through reputation certification, and are therefore able to offer uninformed traders lower costs. Grossman (1992) argues that upstairs brokers are repositories for 'unexpressed' latent demand, commonly called 'dark pools', providing access to greater liquidity and reducing transaction costs. In general, the empirical literature finds evidence consistent with the predictions of both theories. However, a relatively recent study by Fong, Madhavan and Swan (2004) does not find evidence consistent with information filtering on the ASX.

The ASX provides a unique setting to examine upstairs trades in the absence of 'fairness' rules, which allows upstairs trades to execute at greatly varied prices. When brokers have the freedom to trade at any negotiated price, they will be more willing to trade with the informed, provided they are sufficiently compensated for the risk they take on. This is in direct contrast to other studies, which only sample upstairs trades that occur close to the best quoted spread.

The aim of this Chapter is threefold. The first aim is an examination of liquidity conditions around upstairs trades to test the commonly held notion that upstairs markets facilitate trades that are difficult to arrange in the downstairs market. Block trades are difficult to arrange downstairs when the limit order book is low on liquidity or has high trading costs (Hypothesis 5.1), which increases its value to small and illiquid stocks (Hypothesis 5.2). Moreover, if liquidity naturally improves downstairs over time, the reliance on upstairs markets is expected to decrease (Hypothesis 5.3). The second goal is to examine ASX's lack of an upstairs pricing rule, and its effect on information filtering (Hypothesis 5.4). The third aim is related to the first two, and seeks to model a trader's choice between the upstairs and downstairs market.

The remainder of this chapter is organised as follows. Section 5.2 contains information on the data source along with descriptive statistics for upstairs and downstairs trades, and their time trends. Section 5.3 analyses the liquidity of the limit order book around upstairs trades, and calculates expected costs if trades were instead routed downstairs. Section 5.4 examines the absence of 'fairness' rules in ASX upstairs markets, and its effect on broker behaviour. Section 5.5 models the propensity to trade upstairs using a probit specification. Section 5.6 summarises the results in addition to offering some concluding remarks.

5.2 Data and Descriptive Statistics

This study uses a sample of upstairs and downstairs trades from January, 1996 to December, 2005. An upstairs block trade is one that satisfies the requirements for BSC. A downstairs block trade is defined as a trade that satisfies the requirement for BSC, but is instead executed in the limit order book. In essence, this study captures order book block trades that exceed $1 million in value.

The main source of data used in this study is the Securities Industry Research Centre of Asia-Pacific (SIRCA). The SIRCA data provides complete details of all orders and trades on SEATS. Data on downstairs block trades includes fields for date, time, volume, price, and whether the trade was buyer- or seller-initiated, removing the need to use imprecise classification methods for downstairs block trades. Large market orders are often recorded as separate trades because they execute against multiple limit orders. However, because these 'trades' have a unique ID and timestamp (accurate to milliseconds), they are easily aggregated.

Upstairs data, on the other hand, is more complex, as it is often unclear which party had initiated the trade. With the exception of principal upstairs trades in which the brokers themselves are the counterparty, it is possible that two traders both had an equal demand for immediacy. This is apparent, as many upstairs trades occur at or near the midpoint of the best quotes, making classification difficult. Furthermore, while BSCs have to be reported immediately, in reality, there is always a small delay, as upstairs trades are manually entered into the trading platform. For upstairs trades, anything that is above the midpoint of the spread five minutes prior to the reporting of the trade is classified as a buyer-initiated trade, and anything below as a seller-initiated trade. Trades that occur at the midpoint are removed.[12] A subclass of BSCs, the FSSBSC trades are not reported immediately to the market, making their classification into buys and sells difficult. This study takes advantage of a unique proprietary dataset obtained from the ASX which lists every FSSBSC trade, allowing these trades to be removed.

To examine the limit order book liquidity conditions around upstairs trades, the entire limit order book is reconstructed using SIRCA order book data in a manner consistent with Bessembinder and Venkataraman (2004). Unlike their study, data on amendments and cancellation of orders are available through SIRCA, which allows precise reconstruction of the order book.

Table 5.1 presents several descriptive statistics for upstairs and downstairs block trades, which include the number of trades, the mean, median, and total value of block trades, and the proportion of total turnover that was executed upstairs or downstairs. This study ranks stocks by market capitalisation on a monthly basis, and places them into one of six market capitalisation groups, based on a monthly rank.

[12] This study acknowledges the problems associated with an imprecise classification method, and later tests the robustness of results using the spread at different times prior to the upstairs trade.

Table 5.1: Descriptive Statistics for Upstairs and Downstairs Trades

The block trade sample from January, 1996 to December, 2005 obtained from the Securities Industry Research Centre of Asia-Pacific (SIRCA) consists of a total of 249,771 block trades, of which 140,816 are downstairs, and 108,955 are upstairs trades. Downstairs trades are defined as those which satisfy the criteria for upstairs trading (that is, have a trade value in excess of $1 million), but are instead executed on the downstairs limit order book. For upstairs trades, only trades that occur during normal trading hours are included. Delayed reporting trades are also removed. For upstairs and downstairs, Table 5.1 reports the total number of trades, the mean, median, and total value of trades, categorised by market capitalisation groups. Turnover is expressed as a proportion of all block trade turnover.

Market Capitalisation Group	Location	No. of trades	Trade Value (in $ millions)			Prop. of total block turnover (%)
			Mean	Median	Total	
All	Downstairs	140,816	1.966	1.424	276,798	45.23
	Upstairs	108,955	3.076	1.778	335,185	54.77
1-20	Downstairs	83,332	1.896	1.424	158,028	25.82
	Upstairs	46,520	3.267	1.889	152,000	24.84
21-50	Downstairs	32,990	2.222	1.440	73,289	11.98
	Upstairs	31,212	2.846	1.720	88,841	14.52
51-100	Downstairs	14,899	1.838	1.400	27,389	4.475
	Upstairs	15,971	2.927	1.695	46,740	7.637
101-200	Downstairs	7,522	1.846	1.387	13,887	2.269
	Upstairs	10,389	3.045	1.700	31,631	5.169
201-500	Downstairs	1,862	2.071	1.498	3,856	0.6301
	Upstairs	4,338	3.410	1.698	14,794	2.417
501+	Downstairs	211	1.658	1.400	350	0.0572
	Upstairs	525	2.246	1.500	1,179	0.1927

Before the classification of trades into buys and sells, there are in total 249,771 block trades, of which 140,816 are downstairs, and 108,955 are upstairs. While downstairs block trades are greater in number, upstairs trades are on average much larger than downstairs trades ($3.0764 million versus $1.9657 million). The total value of upstairs trades represents close to 55% of total block trade turnover, at over $335 billion for the sample. Trade value is skewed towards larger trades, with the mean significantly larger than the median for both upstairs and downstairs block trades.

Block-trading in general is dominated by the top 20 stocks, accounting for more than half of the total block-trading turnover. Consistent with Bessembinder and Venkataraman (2004), the results presented here show that smaller stocks rely more on upstairs facilities, with upstairs turnover heavily dominating downstairs turnover in these stocks. This is not surprising, as order book liquidity for the smallest of stocks is typically very low, or close to non-existent. Traders wishing to trade large amounts in illiquid stocks therefore are reliant on upstairs markets.

Unique to this study, results from Table 5.1 suggest that upstairs trading in the smallest stocks, despite turning over more money than downstairs blocks, is virtually non-existent. There are only 525 upstairs trades for stocks outside of the top 500 in the entire sample, accounting for only 0.19% of total block trade turnover. Partially, this is caused by upstairs thresholds on the ASX remaining constant at $1 million for all stocks, including the least liquid ones. Unlike other exchanges such as the London Stock Exchange or Euronext (which now includes the Paris Bourse), which have adopted upstairs thresholds dependant on liquidity characteristics, the $1 million ASX threshold for the least liquid of stocks often prevents trades from executing upstairs.

This section also examines time trends in block-trading on the ASX. For each two-year period of the ten-year sample, the total number of trades, the total turnover for upstairs and downstairs blocks, and their relative contribution to block-trading is calculated. To help determine whether possible trends are biased by any particular subset of stocks, two Herfindahl-Hirschman indices are also calculated, one for the number of trades, and the other for turnover. The Herfindahl-Hirschman Index (HHI) is an index of market share, defined as:

$$H = \sum_{i=1}^{N} S_i^2 \qquad (5.1)$$

where S_i = the market share of stock i, in either of the two market segments, with upstairs and downstairs facilities treated as separate markets. Normally, N takes on a maximum value of 50, but for current purpose, N is unrestricted.[13] Table 5.2 presents the time trends of ASX block trades, by the number of trades and also by turnover. Block trades, both upstairs and downstairs, have grown over the ten-year sample, in terms of frequency and total value. This growth is most pronounced in downstairs block trades, which have grown from a total value (number of trades) of $4.676 billion (2,068) in 1996-97 to $87.426 billion (40,473) in 2004-05.

[13] The Herfindahl-Hirschman Index is typically used as a test of market dominance, where an N of 50 is a reasonable upper bound to the total number of firms. Any firm beyond the top 50 is unlikely to contribute significantly to the HHI. However, for the purpose of market dominance in securities trading, an N of 50 is inappropriate, as numerous stocks exist beyond the top 50, which attract significant trading interests.

Table 5.2: Trends in the Use of Upstairs Facilities

Table 5.2 reports trends in block-trading on the ASX. For each two-year period of the ten-year sample, the total number of trades, the total turnover for upstairs and downstairs blocks, and their relative contribution to block-trading are calculated. Two Herfendarl-Hirschman indices are calculated (with an unrestricted N); one for the number of trades, and the other for turnover. The Herfendarl-Hirschman Index (HHI) is an index of market share, defined as: $H = \sum_{i=1}^{N} S_i^2$, where S_i = the market share of stock i for upstairs/downstairs block trades.

Year	Location	No. of trades	Proportion of trades (%)	HHI on No. of trades	Total trade value ($ mil)	Proportion of total trade turnover (%)	HHI on total trade value
Full Sample	Downstairs	140,816	56.38	468	276,798	45.23	441
	Upstairs	108,955	43.62	165	335,185	54.77	180
1996-97	Downstairs	3,444	19.73	637	7,363	15.38	1048
	Upstairs	14,013	80.27	226	40,506	84.62	270
1998-99	Downstairs	5,612	23.93	502	10,126	17.50	534
	Upstairs	17,840	76.07	226	47,734	82.50	255
2000-01	Downstairs	19,560	45.06	617	34,919	32.56	589
	Upstairs	23,850	54.94	217	72,332	67.44	248
2002-03	Downstairs	41,426	62.60	562	77,150	50.52	555
	Upstairs	24,755	37.40	176	75,554	49.48	197
2004-05	Downstairs	70,774	71.29	452	147,240	59.78	440
	Upstairs	28,497	28.71	137	99,059	40.22	155

Upstairs trades, while experiencing moderate growth both in their frequency and their total value, is small in comparison to downstairs growth. It is apparent that upstairs trades dominate downstairs trades prior to the year 2000, both in their frequency and value. For example, in 1996-97, upstairs trades accounted for 79% (81%) of the total number of block trades (total block trade value). This trend is reversed for later years of the sample, with upstairs trades accounting for approximately 24% of all block trades (31% in total value) in 2004-05. Therefore, results suggest that block trades are less likely to go upstairs in the latter years of the sample, consistent with Hypothesis 5.3. This could be driven by an improvement in order book liquidity over time, making block trades easier to execute downstairs, reducing the need for upstairs facilities.[14]

It is also apparent that block trades, both upstairs and downstairs, have become less concentrated. The upstairs HHI for the number of trades and for total value experiences a consistent reduction over the sample period. This suggests that block-trading is now dominated to a lesser extent by trades in the larger stocks. While downstairs blocks also experience a decline in the HHI, most of this occurs in 1998-99, after which it remains relatively stable.

[14] This issue is examined further in Section 5.5, after controlling for confounding effects.

5.3 Cost of Sending an Upstairs Trade Downstairs

5.3.1 Statistical Analyses

To examine the limit order book liquidity conditions around upstairs trades, the entire limit order book is reconstructed using SIRCA order book data (taking account of amendments and deletions) in a manner consistent with Bessembinder and Venkataraman (2004). The execution cost of an upstairs trade is compared with a theoretical cost if it was instead routed to the downstairs limit order book. While this section of the study deals with 'costs', the aim of this is to examine characteristics of the limit order book around upstairs trades, and hypothesise possible reasons why trades go upstairs instead of remaining on the limit order book. The execution 'cost' of an upstairs trade, and the hypothetical cost of routing the same trade downstairs, is defined as follows:

$$E_j^{off} = P_{j,t}^{block} - Q_{i,t}^m \tag{5.2}$$

$$E_j^{on} = VWAP_j - Q_{i,t}^m \tag{5.3}$$

Where $P_{j,t}^{block}$ is the block trade price, $VWAP_j$ is the volume-weighted average price of the transaction by contemporaneously routing the upstairs order to the downstairs limit order book, and $Q_{i,t}^m$ is the contemporaneous bid-ask midpoint of the downstairs limit order book.

The difference between the two execution costs can be considered a ‘benefit’ of sorts, or more accurately, a cost-saving metric for upstairs trading.[15] Note that this ‘benefit’ metric overestimates the true costs of trading a large parcel of shares downstairs. It entirely ignores the ability of brokers to minimise execution costs by working a large order over a longer period of time. However, the purpose of the current analysis is to examine the state of the limit order book at the time of the upstairs trade, rather than an explicit comparison of execution costs per se.

Results in Table 5.3 are separated into four categories, based on the liquidity and execution cost characteristics of the trade. When an upstairs trade is sent downstairs, the contemporaneous limit order book could either provide insufficient liquidity to absorb the trade, cost less, cost more, or cost the same as the upstairs trade. As the limit order book during the auction phases is not meaningful for analysis, trades that occur prior to 10am or after 4pm are removed. Some upstairs trades occur at the downstairs midpoint, which makes classification into buyer- and seller-initiated trades difficult. Consequently, these trades are also removed. After excluding 36,535 of these observations (of which 3,631 are due to classification issues) from the original 108,955, there are in total 72,420 upstairs trades, of which 32,483 are buyer-initiated, and 39,937 are seller-initiated.

[15] In circumstances where the downstairs limit order book has insufficient liquidity to absorb the entire upstairs trade, they are excluded from the cost analysis. Their frequency is recorded.

Table 5.3: Cost of Sending an Upstairs Trade Downstairs – Contemporaneous Quotes

In this table, the execution cost of an upstairs trade is compared with a theoretical cost if it was instead routed to the downstairs limit order book. Cost of sending an upstairs trade to the limit order book is defined as VWAP of the trade minus the prevailing quote midpoint in the downstairs market. When an upstairs trade is sent downstairs, the contemporaneous limit order book could either have insufficient liquidity to absorb the trade, cost less, cost more, or cost the same as the upstairs trade. Results are further categorised into groups based on market capitalisation.

				Sufficient liq in the limit order book		
Market Capitalisation Group	**Initiator**	**No. of trades**	**Insufficient liq in the limit order book**	**cost up > cost down**	**cost up < cost down**	**cost up = cost down**
All	Buyer	32,483	12,946	18,114	709	714
	Seller	39,937	17,447	20,770	822	898
1-20	Buyer	13,869	2,215	10,731	583	340
	Seller	15,528	2,463	11,993	656	416
21-50	Buyer	9,355	3,974	5,110	77	194
	Seller	11,020	4,890	5,754	107	269
51-100	Buyer	4,930	3,229	1,557	23	121
	Seller	6,454	4,205	2,073	34	142
101-200	Buyer	3,202	2,465	659	20	58
	Seller	4,528	3,579	863	16	70
201-500	Buyer	1,021	959	57	4	1
	Seller	2,142	2,049	85	7	1
501+	Buyer	106	104	0	2	0
	Seller	265	261	2	2	0

The first observation is that 30,393 upstairs trades (12,946 buyer-initiated and 17,447 seller-initiated) cannot be filled immediately in the contemporaneous downstairs limit order book, which represents 42% of the entire sample. In an examination of the less liquid stocks, this proportion increases dramatically, and for stocks outside the top 200, few (if any) can be transacted immediately downstairs. Furthermore, when liquidity is sufficient, the number of transactions where the cost downstairs is lower than cost upstairs is few in number, especially with the smaller stocks. Therefore, upstairs trades appear to occur because i) there is insufficient liquidity to trade downstairs, and/or ii) the cost of moving the market is often large, especially when liquidity is low. These findings are thus consistent with Hypothesis 5.1 and Hypothesis 5.2. The choice of trading venue is examined in greater detail in Section 5.5, after controlling for confounding effects.

5.3.2 Sensitivity Tests

Results documented previously use the bid-ask quotes at the trade reporting time to determine the direction of upstairs trades. However, as upstairs trades are manually entered into the trading platform, there may be a small delay between the execution and reporting of these trades. To gauge the sensitivity of the previous results to the choice of methodology used, two additional measures of bid-ask quotes are used: the bid-ask spread five and ten minutes prior to the reported time of the upstairs trades. The analysis conducted in Section 5.3.1 is repeated here, using bid-ask quotes and depths prior to the reported trade times, but is otherwise identical.

Table 5.4 and Table 5.5 report respectively, the results obtained using bid-ask quotes and depths five and ten minutes prior to the upstairs trade reporting time. Results here are consistent with those presented in Table 5.3 and the notion that upstairs trades are typically used when liquidity in the downstairs limit order book is low, or associated trading costs are high. Results appear insensitive to the methodology used to determine the direction of upstairs trades.

Table 5.4: Cost of Sending an Upstairs Trade Downstairs – Five Min. Quote Lag

In this table, the execution cost of an upstairs trade is compared with a theoretical cost if it was instead routed to the downstairs limit order book. Cost of sending an upstairs trade to the limit order book is defined as VWAP of the trade, minus the bid-ask midpoint in the downstairs market five minutes before the trade reporting time. When an upstairs trade is sent downstairs, the limit order book five minutes before the reporting time could either have insufficient liquidity to absorb the trade, cost less, cost more, or cost the same as the upstairs trade. Results are further categorised into groups based on market capitalisation.

Market Capitalisation Group	Initiator	No. of trades	Insufficient liq in the limit order book	Sufficient liq in the limit order book		
				cost up > cost down	cost up < cost down	cost up = cost down
All	Buyer	33,710	13,479	18,374	1,017	840
	Seller	39,044	17,273	19,855	957	959
1-20	Buyer	14,427	2,350	10,852	831	394
	Seller	15,128	2,558	11,338	799	433
21-50	Buyer	9,745	4,125	5,247	120	253
	Seller	10,759	4,827	5,548	101	283
51-100	Buyer	5,113	3,380	1,568	40	125
	Seller	6,297	4,089	2,014	30	164
101-200	Buyer	3,229	2,498	645	20	66
	Seller	4,514	3,549	869	20	76
201-500	Buyer	1,081	1,013	62	4	2
	Seller	2,092	1,998	85	6	3
501+	Buyer	115	113	0	2	0
	Seller	254	252	1	1	0

Table 5.5: Cost of Sending an Upstairs Trade Downstairs – Ten Min. Quote Lag

In this table, the execution cost of an upstairs trade is compared with a theoretical cost if it was instead routed to the downstairs limit order book. Cost of sending an upstairs trade to the limit order book is defined as VWAP of the trade, minus the bid-ask midpoint in the downstairs market ten minutes before the trade reporting time. When an upstairs trade is sent downstairs, the limit order book ten minutes before the reporting time could either have insufficient liquidity to absorb the trade, cost less, cost more, or cost the same as the upstairs trade. Results are further categorised into groups based on market capitalisation.

				Sufficient liq in the limit order book		
Market Capitalisation Group	**Initiator**	**No. of trades**	**Insufficient liq in the limit order book**	**cost up > cost down**	**cost up < cost down**	**cost up = cost down**
All	Buyer	34,043	13,787	17,939	1,536	781
	Seller	38,972	17,268	19,294	1,496	914
1-20	Buyer	14,470	2,403	10,467	1,266	334
	Seller	15,163	2,586	10,915	1,269	393
21-50	Buyer	9,920	4,281	5,202	184	253
	Seller	10,706	4,823	5,445	166	272
51-100	Buyer	5,180	3,442	1,558	53	127
	Seller	6,273	4,085	1,983	32	173
101-200	Buyer	3,243	2,502	652	24	65
	Seller	4,499	3,538	868	23	70
201-500	Buyer	1,115	1,046	60	7	2
	Seller	2,073	1,981	81	5	6
501+	Buyer	115	113	0	2	0
	Seller	258	255	2	1	0

5.4 Trade Filtration in Upstairs Markets Without 'Fairness' Rules

5.4.1 Statistical Analyses

This section documents the absence of a 'fairness' rule on the ASX, and its effects on upstairs pricing. Seppi (1990) predicts that informed traders receive poorer execution costs upstairs. Brokers will either accept trades, or reject them if the cost in information asymmetry exceeds the benefits. Therefore, these 'fairness' rules effectively censor cases in which the traders are deemed to be informed by the upstairs brokers. This makes the examination of trades which are more likely to be informed difficult. No 'fairness' rules exist on the ASX and upstairs trades can be executed at any agreed price. Trades perceived as being more informed are therefore not immediately discarded, as is the case of markets with more restrictive rules. This allows greater flexibility in studying upstairs broker behaviour in the presence of trades that are perceived as more informed. To test the hypothesis that information-motivated trades receive poorer execution costs upstairs, the 'price improvement' provided to upstairs traders relative to the downstairs spread is calculated. This is defined as:

$$improvement = \frac{(Ask - Trade)}{Ask}\text{, for buyer-initiated trades,} \tag{5.4}$$

$$improvement = \frac{(Trade - Bid)}{Bid}\text{, for seller-initiated trades,} \tag{5.5}$$

where *Trade* is the upstairs trade price, and *Bid* and *Ask* are respectively the contemporaneous downstairs bid and ask quotes at the reported time of the upstairs trade.

Table 5.6 categorises trades into four groups based on the size and sign of 'price improvement'. Upstairs trades either execute within the best downstairs quotes, at the best downstairs quotes, within 1% of the downstairs quotes, or otherwise. For each category, the number of observations, the median price improvement, and the median downstairs price movement from the prevailing mid-quotes to the closing price are reported. Results are further separated based on the direction of trade, with Panel A and Panel B displaying respectively, the results for buyer- and seller-initiated upstairs trades.

The results show that the proportion of upstairs trades executed outside of the spread is large on the ASX, being 28.11% for buys and 33.14% for sells. This is in contrast to Bessembinder and Venkataranman (2004), who find that for a subset of trades that are allowed to execute outside of the best spread, only 10.4% of buys and 9.3% of sells actually do. As expected, when 'fairness' rules do not exist, there is a greater variation in upstairs trade prices. The median post-trade price movements are monotonically increasing with groups that receive poorer execution costs. The size of median 'price improvement' for upstairs purchases (sales) ranges from 0.1490% (0.1587%) for trades that occur within the downstairs quotes, to -1.8032% (-2.0101%) for trades that executed more than 1% away from the downstairs quotes. The first three groups, which have the most favourable execution costs, have similar post-trade price movements. Post-trade returns for purchases (sales) in these three groups range from 0.0826% (-0.0485%) to 0.1022% (-0.0619%). However, the last group, which receive poorer execution costs in comparison to the first three, have significantly larger post-trade returns of 0.4427% for purchases and -0.1518% for sales. The results are therefore consistent with Hypothesis 5.4.

Table 5.6: The Distribution of Upstairs Trade Prices – Contemporaneous Quotes

In this table, the 'price improvement' provided to upstairs traders relative to the contemporaneous downstairs bid-ask spread is calculated. Trades are then categorised into four groups based on the size and sign of 'price improvement'. This table reports the number of observations in each category, the median price improvement, and the median stock returns from the bid-ask quote midpoint to the close.

Price improvement category	No. of Trades	Med. price improvement (%)	P-Value	Med. return until close (%)	P-Value
Panel A: Buyer Initiated					
Within best bid/ask	1,994	0.1490	0.0000	0.1022	0.0000
At best bid/ask	21,098	0.0000	N/A	0.0956	0.0000
Less than 1% away from best bid/ask	8,383	-0.1529	0.0000	0.0826	0.0000
More than 1% away from best bid/ask	647	-1.803	0.0000	0.4427	0.0000
Panel B: Seller Initiated					
Within best bid/ask	2,175	0.1587	0.0000	-0.0524	0.0227
At best bid/ask	24,226	0.0000	N/A	-0.0619	0.0000
Less than 1% away from best bid/ask	11,398	-0.1736	0.0000	-0.0485	0.0000
More than 1% away from best bid/ask	1,688	-2.010	0.0000	-0.1518	0.0000

There are two alternative explanations for the above results. The first is that these trades are not informed, but rather, are submitted with poor timing. While upstairs brokers may know the reputation of the trader based on their prior dealings, given that prices are moving quickly in the market, reputation alone may be insufficient to certify that these trades are information-free. The second alternative is that these traders are uncertified. Allowing uncertified traders to trade with their clients runs a greater risk of damaging their own reputation (and hence their future profits). A larger premium is therefore necessary to cover these additional risks. Both of these alternative explanations are at least partially consistent with the filtration of trades that are more likely to be informed, or at greater risk of adverse selection.

An implication of Seppi (1990) is that, in a multi-period game, informed traders are filtered out and denied trading opportunities. In effect, reputation becomes a perfect proxy to the information content of upstairs trades. In contrast to these predictions, the results in Table 5.4 indicate that trades more likely to be informed are still allowed to execute upstairs, although they incur greater execution costs. Therefore the results show that upstairs brokers use market conditions (in conjunction with reputation, which is by no means a perfect proxy to information content) to determine the information content of trades. If upstairs brokers have some knowledge about the future volatility of stock prices (at least in the short-run, even if this knowledge is noisy), then it would be entirely rational for them to incorporate this information in upstairs pricing.[16]

These results also add to the growing literature that presents execution costs as a function of market conditions [e.g. Chiyachantana, Jain, Jiang and Wood, 2004]. Results presented in this section differs to those Chiyachantana, Jain, Jiang and Wood (2004), who link the price impact of institution trades to bull versus bear markets, and

[16] Upstairs brokers are advantaged in two ways in comparison with other market participants with respects to information. First, they are affiliated with equity analysts from the same firm. In the absence of perfectly functioning Chinese walls, brokers may have access to more price-sensitive information that the rest of the market. Second, they have access to order flow information specific to the orders placed by their clients. While this may be a somewhat noisy proxy to the market order flow, it is nevertheless information that may be used to predict future price movements.

are determined on a monthly basis. In contrast, this section finds that brokers make use of shorter lived information to price upstairs trades.

Table 5.7: The Distribution of Upstairs Trade Prices – Five Min. Quote Lag

The 'price improvement' provided to upstairs traders relative to the downstairs bid-ask spread five minutes prior the reported trade time is calculated. Trades are then categorised into four groups based on the size and sign of 'price improvement'. This table reports the number of observations in each category, the median price improvement, and the median stock returns from the bid-ask quote midpoint to the close.

Price improvement category	No. of Trades	Med. price improvement (%)	P-Value	Med. return until close (%)	P-Value
Panel A: Buyer-Initiated					
Within best bid/ask	1,929	0.1402	0.0000	0.0937	0.0000
At best bid/ask	20,648	0.0000	N/A	0.1383	0.0000
Less than 1% away from best bid/ask	9,936	-0.1562	0.0000	0.1909	0.0000
More than 1% away from best bid/ask	812	-1.843	0.0000	0.6623	0.0000
Panel B: Seller-Initiated					
Within best bid/ask	2,076	0.1386	0.0000	-0.0423	0.1950
At best bid/ask	22,554	0.0000	N/A	-0.1030	0.0000
Less than 1% away from best bid/ask	12,211	-0.1745	0.0000	-0.1420	0.0000
More than 1% away from best bid/ask	1,766	-2.041	0.0000	-0.2515	0.0000

These results and inferences are also in contrast to those presented by Fong, Madhavan and Swan (2004), who find similar permanent price impact in upstairs and downstairs block trades on the ASX. They conclude that upstairs and downstairs trades have similar information content, which they source as evidence against information filtering by upstairs brokers. Results obtained in this chapter show that while reputation filtering by upstairs brokers may not be perfect (as evidenced by the use of market conditions), it nevertheless does occur, albeit in a more complex fashion than the processes proposed by Seppi (1990).

5.4.2 Sensitivity Tests

If upstairs trades are reported with a small delay, then results obtained previously using the contemporaneous limit order book may cause bias in the price improvement and post-trade return metrics. To control for this possibility, analysis conducted in Section 5.4.1 is repeated using the limit order book five and ten minutes prior to the upstairs reporting time. The limit order book five and ten minutes prior to the upstairs trade is used to determine the trade direction, the size of the price improvement, and post-trade returns. The methodology is otherwise identical. Table 5.7 and Table 5.8 report respectively the results obtained using bid-ask quotes five and ten minutes prior to the upstairs trade reporting time.

Overall, these two tables convey similar results to those seen in Table 5.6, and are consistent with the notion that upstairs markets detect informed trading. Upstairs trades that receive poorer prices from upstairs brokers typically have larger post-trade price movement.

Table 5.8: The Distribution of Upstairs Trade Prices – Ten Min. Quote Lag

The 'price improvement' provided to upstairs traders relative to the downstairs bid-ask spread ten minutes prior the reported trade time is calculated. Trades are then categorised into four groups based on the size and sign of 'price improvement'. This table reports the number of observations in each category, the median price improvement, and the median stock returns from the bid-ask quote midpoint to the close.

Price improvement category	No. of Trades	Med. price improvement (%)	P-Value	Med. return until close (%)	P-Value
Panel A: Buyer-Initiated					
Within best bid/ask	1,762	0.1481	0.0000	0.1264	0.0000
At best bid/ask	18,421	0.0000	N/A	0.1368	0.0000
Less than 1% away from best bid/ask	12,360	-0.1754	0.0000	0.1900	0.0000
More than 1% away from best bid/ask	1,103	-1.942	0.0000	0.5291	0.0000
Panel B: Seller-Initiated					
Within best bid/ask	2,033	0.1487	0.0000	0.0000	0.6710
At best bid/ask	20,189	0.0000	N/A	-0.0971	0.0000
Less than 1% away from best bid/ask	14,236	-0.1893	0.0000	-0.1458	0.0000
More than 1% away from best bid/ask	2,084	-2.057	0.0000	-0.4209	0.0000

5.5 Determinants on the Propensity to Trade Upstairs

5.5.1 Statistical Analyses

In this section, a trader's choice of trading venue is modelled. While Section 5.3 shows that block trades are usually sent upstairs when liquidity in the limit order book is low, or downstairs trading costs are high, there may be many confounding effects. The following Probit specification is proposed for modelling the propensity of upstairs block-trading:

$$U_i^* = \alpha_i + \beta_1 size_i + \beta_2 mcap_i + \beta_3 spread_i + \beta_4 vola_i + \beta_5 D_i^{post2001} + e_i \qquad (5.6)$$

where, U_i^* is the latent variable that determines the choice of venue for block-trading U_i, which has a binary outcome, and is equal to one for upstairs when U_i^* >0, and zero for downstairs for other values of U_i^*:

$$U_i \begin{cases} 1 & \text{If } U_i^* > 0 \\ 0 & \text{If } U_i^* \leq 0 \end{cases} \qquad (5.7)$$

The variable *size* is the natural logarithm of the trade value, *mcap* is the natural logarithm of the stock market capitalisation, *spread* is the percentage bid-ask spread of the stock immediately prior to the block trade, *vola* is the volatility of the stock measured as the natural logarithm of the ratio of the daily high and low prices, and $D^{post2001}$ is a dummy variable which is equal to one if the trade occurs during or after January, 2000, and zero otherwise.

One expects a larger trade size to increase the likelihood that a trade is sent upstairs. The execution of a large trade is naturally limited by the availability of liquidity in the limit order book, while no such restrictions are placed on upstairs trades (provided an upstairs broker can either find sufficient counter parties, or is willing to bear the risk themselves). Similarly, it is expected that traders prefer upstairs markets for block trades in smaller stocks. The sign for the market capitalisation coefficient is therefore expected to be negative.

The sign for percentage spread is expected to be positive for two reasons. First, since spreads proxy for the level of liquidity and trading costs in the limit order book at the time of the block trade, higher bid-ask spreads are expected to increase the likelihood that a trade is executed upstairs. Second, the bid-ask spread also measures the level of information asymmetry in the stock, both contemporaneously, and cross-sectionally. At times of increased information asymmetry, a liquidity-motivated block trade downstairs might easily be misinterpreted as informed. Therefore, in line with Seppi (1990), uninformed traders will prefer upstairs markets, where their ‘reputation’ provides them certification. The volatility metric used in this study is a measure of absolute price range within a trading day, and can be considered akin to the speed of stock price movements. When prices move quickly (higher volatility), one expects greater information asymmetry, and therefore less willingness from upstairs brokers to arrange such trades.

Table 5.9 reports the results from the probit analysis. After removing all trades executed outside of 10am to 4pm, or observations that had missing information on any of the variables, there are in total 205,959 block trades, of which 128,013 are downstairs, and 77,946 are upstairs. All coefficients are in the direction of a priori expectations and are statistically significant at the 1% level.

To examine the model’s goodness of fit, a ‘count pseudo R-squared’ is computed. This involves calculating the predicted probability, generated from the probit. If the predicted probability equal or exceeds 0.5, then it is deemed to be a predicted upstairs trade, otherwise it is predicted to be a downstairs trade. The predicted venue is compared to the actual venue, and the percentage of accurate predictions is reported as the ‘count pseudo R-squared’. As a benchmark, the pseudo R-square is compared to the percentage of all block trades that are executed downstairs. In the absence of any information to predict block trade venues, one’s best (and naïve) guess is simply the frequency of trades that were historically executed upstairs/downstairs, which is 62.15% for the current sample.

Table 5.9: Choice of Trading Venue – Contemporaneous Quotes

This table analyses the propensity for a block trade to be routed upstairs (as opposed to downstairs), modelled in the following manner with a probit specification:

$$U_i^* = \alpha_i + \beta_1 size_i + \beta_2 mcap_i + \beta_3 spread_i + \beta_4 vola_i + \beta_5 D_i^{post2001} + e_i$$

The model includes a variable for trade size, stock size, the contemporaneous downstairs bid-ask spread, the downstairs price volatility, and a date dummy variable.

Parameters	Estimate	Std. Error	Wald Chi-Sq	P-Value
intercept	4.246	0.0487	7,615	<.0001
size	0.6749	0.0053	16,343	<.0001
mcap	-0.1776	0.0021	7,045	<.0001
spread	0.3295	0.0047	4,984	<.0001
vola	-0.0040	0.0011	14	0.0002
post2001	-0.9520	0.0067	19,905	<.0001

Count pseudo R-square = 72.34%

An examination of the pseudo R-square suggests that the model has predictive power that exceeds a naïve benchmark by approximately 10%. The complexity of the decision process however, is apparent in the lack of near perfect predictive power. This suggests that various other factors (not considered in by this model) are important determinants on the choice of trading venue.

As expected, larger trades are more likely to be arranged upstairs, where liquidity is not limited in the traditional sense. Trades in larger stocks are less likely to be routed upstairs. Smaller stocks have lower liquidity in the downstairs limit order book, and will therefore place a greater reliance on upstairs markets for liquidity provision. The percentage spread, which is a measure for both liquidity and asymmetric information, has a positive coefficient. Increased volatility[17] reduces the likelihood of upstairs execution.

This is consistent with the notion that upstairs markets reduce information asymmetry by filtering out information-motivated trades. This also suggests that upstairs brokers may use market conditions, in conjunction with reputation, as a means of filtering out informed trades. Consistent with the results presented in Section 5.2, the date dummy variable indicates that the Australian market has reduced its reliance on upstairs liquidity. This is possibly caused by an improvement in the downstairs liquidity over time, making it easier to execute block trades on the limit order book. Overall, the probit results are consistent with Hypotheses 5.1, 5.2, and 5.3, and results portrayed in previous sections.

5.5.2 Sensitivity Tests

Tables 5.10 and 5.11 examine the robustness of results obtained in Table 5.9 by using the bid-ask spread five and ten minutes prior to the reporting timestamp of an upstairs trade. This procedure controls for a possible delay in trade reporting, which may increase the measurement error of limit order book conditions immediately preceding an upstairs trade. As downstairs trades do not suffer from delayed reporting, no

[17] This measure of volatility is based on the dispersion of trade prices within an entire trading day. The alternative is to use the prevailing dispersion of trade prices immediately prior to a block trade. A probit model based on this method yields qualitatively similar results, albeit with a lower level of statistical significance.

adjustments are made to these trades in comparison with Table 5.9. The model is otherwise identical to those used in Table 5.9.

Overall, signs of parameter coefficients from Table 5.10 and Table 5.11 are identical to those presented previously in Table 5.9. With the exception of the bid-ask spread variable, magnitudes of coefficient estimates are also similar. In comparison to Table 5.10 and Table 5.11, the coefficient for the bid-ask spread is much larger in Table 5.9. A larger economic significance (and higher pseudo R-square) from using the prevailing bid-ask spread is reassuring. Therefore, conclusions made previously are robust to possible delays in upstairs trade reporting times.

Table 5.10: Choice of Trading Venue – Five Min. Quote Lag

This table analyses the propensity for a block trade to be routed upstairs (as opposed to downstairs), modelled in the following manner with a probit specification:

$$U_i^* = \alpha_i + \beta_1 size_i + \beta_2 mcap_i + \beta_3 spread_i + \beta_4 vola_i + \beta_5 D_i^{post2001} + e_i$$

The model includes a variable for trade size, stock size, the downstairs bid-ask spread with a five min. lag, the downstairs price volatility, and a date dummy variable. With the exception of the spread variable, the model used in Table 5.10 is otherwise identical to Table 5.9.

Parameters	Estimate	Std. Error	Wald Chi-Sq	P-Value
intercept	4.994	0.0471	11,264	<.0001
size	0.6508	0.0051	16,120	<.0001
mcap	-0.2088	0.0021	10,368	<.0001
spread	0.0609	0.0015	1,620	<.0001
vola	-0.0035	0.001	11	0.0008
post2001	-0.9826	0.0067	21,426	<.0001

Count pseudo R-square = 71.91%

Table 5.11: Choice of Trading Venue – Ten Min. Quote Lag

This table analyses the propensity for a block trade to be routed upstairs (as opposed to downstairs), modelled in the following manner with a probit specification:

$$U_i^* = \alpha_i + \beta_1 size_i + \beta_2 mcap_i + \beta_3 spread_i + \beta_4 vola_i + \beta_5 D_i^{post\,2001} + e_i$$

The model includes a variable for trade size, stock size, the downstairs bid-ask spread with a ten min. lag, the downstairs price volatility, and a date dummy variable. With the exception of the spread variable, the model used in Table 5.11 is otherwise identical to Table 5.9.

Parameters	Estimate	Std. Error	Wald Chi-Sq	P-Value
intercept	4.892	0.0472	10,754	<.0001
size	0.6538	0.0051	16,148	<.0001
mcap	-0.2044	0.0021	9,891	<.0001
spread	0.0912	0.0018	2,579	<.0001
vola	-0.0032	0.001	10	0.0019
post2001	-0.9757	0.0067	21,119	<.0001

Count pseudo R-square = 71.56%

Table 5.12 examines the robustness of results obtained in Table 5.9 with the inclusion of two additional date dummy variables. In comparison to the model used in Table 5.9, these two dummy variables capture wider temporal differences in the propensity to trade upstairs. These two dummy variables are respectively, $D^{post1998}$, which is equal to one if the trade occurs during or after January, 1998, and zero otherwise, and $D^{post2004}$, which is equal to one if the trade occurs during or after January, 2004, and zero otherwise. The model is specified as follows, but is otherwise identical to the one used in Table 5.9:

$$\begin{aligned} U_i^* &= \alpha_i + \beta_1 size_i + \beta_2 mcap_i + \beta_3 spread_i + \beta_4 vola_i \\ &+ \beta_5 D_i^{post1998} + \beta_6 D_i^{post\,2001} + \beta_7 D_i^{post\,2004} + e_i \end{aligned} \quad (5.8)$$

Overall, signs of parameter coefficients from Table 5.12 are identical to those presented previously in Table 5.9. All date dummy variables have significantly negative coefficients and are consistent with Table 5.9 and the notion that improving downstairs liquidity reduces the need to trade upstairs. Results are therefore robust to the choice of date dummy variables.

Table 5.12: Choice of Trading Venue – Additional Date Dummy Variables

This table analyses the propensity for a block trade to be routed upstairs (as opposed to downstairs), modelled in the following manner with a probit specification:

$$U_i^* = \alpha_i + \beta_1 size_i + \beta_2 mcap_i + \beta_3 spread_i + \beta_4 vola_i + \beta_5 D_i^{post1998} + \beta_6 D_i^{post2001} + \beta_7 D_i^{post2004} + e_i$$

The model includes a variable for trade size, stock size, the contemporaneous downstairs bid-ask spread, the downstairs price volatility, and three date dummy variables. With the exception of two additional date dummy variables, the model used in Table 5.12 is otherwise identical to Table 5.9.

Parameters	Estimate	Std. Err.	Wald Chi-Sq	P-Value
intercept	4.357	0.0493	7,814	<.0001
size	0.6844	0.0053	16,649	<.0001
mcap	-0.1771	0.0021	6,895	<.0001
spread	0.3254	0.0047	4,806	<.0001
vola	-0.0055	0.0011	26	<.0001
post1998	-0.1722	0.0134	165	<.0001
post2001	-0.7593	0.0083	8,467	<.0001
post2004	-0.2974	0.0063	2,237	<.0001

Count pseudo R-square = 72.53%

5.6 Summary

The literature argues that upstairs facilities are valuable to traders because they offer taps into unexpressed liquidity (Grossman, 1992) and for their ability to filter out informed trades (Seppi, 1990). Using 10 years of data from the ASX, this study examines downstairs market conditions around upstairs trades. In addition, the current study models a block trader’s choice between upstairs and downstairs markets, and how these trades are priced by the upstairs brokers.

Consistent with prior literature, this chapter shows that upstairs markets are typically used when liquidity in the downstairs market is lacking, or when these costs are high. Upstairs markets are especially useful for trades of greater complexity, that is, larger trades and trades in smaller stocks, which are often difficult to arrange in the downstairs limit order book. These findings are generally consistent with the widely held belief that upstairs markets allow for the execution of trades that would otherwise not have occurred. However, in the analysis of block-trading trends, markets appear less reliant on upstairs facilities as a source of liquidity with the passage of time. This result is likely driven by the natural improvement in downstairs liquidity over time, which further lends support to the value of upstairs markets as a source of liquidity.

The results show that in the absence of ‘fairness’ rules, a large number of upstairs trades do occur outside of the best downstairs spread. However, consistent with the predictions of Seppi (1990), trades that are more likely to be informed receive poorer execution costs than those less likely to be informed. This provides evidence that upstairs brokers may use other information in addition to trader reputation (e.g. market conditions) to determine the information content of trades. The results presented in this study are therefore consistent with those of Chiyachantana, Jain, Jiang and Wood (2004), who report market conditions as a strong determinant of execution costs for institutional traders in the downstairs market.

Chapter 6: Unequal Access to Analyst Research

6.1 Introduction

Information asymmetry refers to one party having more or superior information to others. Merton (1987) separates information asymmetry into two dimensions: information asymmetry between investors and the management (depth), and information asymmetry between shareholders (breadth). While the extant literature overwhelmingly suggests that equity analysis reduces a company's cost of capital, insufficient distinction is made with the asymmetry between investor and the management, and asymmetry between investor groups. With regards to equity analysis, if the distribution of analyst reports is unequal, one cannot conclude that information asymmetry has decreased. When a subset of clients receive more information, or information in a more timely manner, asymmetry between management and the shareholders as a group may reduce, but asymmetry between different shareholders may actually increase.

This chapter seeks to clarify the relationship between equity analysts and information asymmetry by examining the level of investor access to analyst reports. Specifically, this chapter focuses exclusively on the asymmetry between shareholders, and seeks to show that:

i. Leakages exist in analyst recommendations, and certain customers of broker-analyst firms trade on these leakages, which nets them abnormal profits (Hypothesis 6.1);

ii. Investors of greater sophistication make greater use of analyst reports, even in the absence of leakages (Hypothesis 6.2).

The only other studies that examine the financial benefits in obtaining a research report early are Kim, Lin, and Slovin (1997), and Green (2006). These studies, however, focus on the timing difference between the official release of an analyst report and when that information is picked up by the rest of the market through word of mouth, or through the mass media. This study represents an investigation into leakages in analyst reports prior to the official release, and therefore differs significantly from these papers.

The remainder of this chapter is organised as follows. Section 6.2 discusses the data source, while Section 6.3 provides evidence of information leakages in analyst reports and their likely profitability. Section 6.4 analyses whether a subset of investors are more sophisticated, that is, whether they make use of information from a wider range of sources. Section 6.5 summarises this chapter's findings.

6.2 Data

The data used in this chapter comes from a proprietary dataset containing all trades on the ASX between 1996 and 2008 with fields for stock code, date, time, price, volume, and the buying and selling brokers. Data pertaining to equity analysis is obtained from I/B/E/S through Wharton Research Data Services (WRDS). This comes in three parts: earnings per share forecasts, consensus earnings forecasts, and stock recommendations. The earnings forecast dataset contains fields for analyst firm, stock ticker, date of forecast, forecasting period, and value of forecast. The consensus forecast database contains the stock ticker, forecasting period, mean/median consensus forecasts, number of forecasts, and the standard deviation of forecasts. The recommendations dataset contains the stock ticker, analyst firm, recommendation date, recommendation time, and the stock recommendation issued. While each analyst firm has its own rating system, I/B/E/S standardises these into five levels, which roughly correspond to strong buy, buy, hold, sell, and strong sell.

Through the use of a historical list provided by the ASX detailing the names and broker IDs of each brokerage house across time, brokers in the I/B/E/S dataset are matched to brokers in the trade level data. All this is further supplemented with index data from Yahoo Finance, and with the Signal G ASX announcements database provided by the Securities Industry Research Centre of Asia-Pacific (SIRCA).

6.3 Leakages in Analyst Recommendations

This section tests Hypothesis 6.1 by investigating the possible presence of leakages in analyst recommendations, and the likely financial benefits of trading on these leakages. Between 1996 and June 2008, there are in total 46,348 analyst recommendations in 1,273 stocks (identified by tickers). This section classifies recommendations into upgrades or downgrades by comparing each recommendation with the previous recommendation issued by the same analyst firm. While recommendations themselves might be biased, changes in recommendations might not be, especially when rational investors take note of any historical biases and systematically correct for them. Recommendations that did not change are therefore excluded from the analysis. This approach is consistent with Jegadeesh, Kim, Krische, and Lee (2004), where changes in recommendations are found to be stronger predictors of returns. Of the 46,348 recommendations, 33,302 represent clear upgrades or downgrades.

Recommendations are classified into those that occur during a trading session, and those that occur outside of one (i.e. before market open, or after market close). There is a danger in combining recommendations released during trading hours, given a large variation in the amount of time available for the market to process the information. For example, a recommendation released two minutes prior to the close may not cause a market reaction until the following day. Combining this together with recommendations released immediately after the open will introduce significant noise. To reduce the severity of this issue, and consistent with Green (2006), all recommendations released during market trading hours are excluded, with a total of 25,074 recommendations remaining. After matching recommendations to a list of ASX research brokers and trades database, there are 8,750 recommendations remaining.

Welch (2000) finds that equity analyst recommendations suffer from the effects of herding. Clement and Tse (2005) argue that bolder recommendations (i.e. those that do not suffer from herding) are more informative to the market. Herding, and generally recommendations being contemporaneously close to one another, cause confounding effects that are difficult to disentangle. Indeed, criticisms of the event study methodology usually stem from the lack of controls for confounding events, which makes drawing inferences both dangerous and difficult. Therefore, all recommendations released within a week of another recommendation (in the same stock) are excluded from the analysis. Recommendations around information events likewise cause results to be confounding. This section excludes all recommendations within two weeks of a company announcement deemed market-sensitive by the ASX. After excluding these observations, 1,082 upgrades and 1,161 downgrades remain. The sample selection criteria is summarised in Table 6.1.

An initial (and interesting) observation is the approximate equality in the number of upgrades and downgrades after controlling for herding effects and other information events. It therefore appears that analysts are not inherently biased, but rather become biased when incentives are present for them to be backward-looking. This is most severe when the analyst comes across a piece of information that s/he believes s/he has overlooked, as in the case of recommendations issued by another institution, or a company announcement. This may be driven, at least in part, by analysts' attempts to maintain their reputation (e.g. see Hong, Kubik and Solomon, 1998; and Graham, 1999). When no contemporaneous information events confound an analyst, s/he is more likely to recommend based purely on his/her private information. Consequently, there is no evidence that analyst recommendations are inherently biased.

To investigate the extent to which leakages occur in analysts' reports, daily order flow imbalances around the public release of stock recommendations are examined. Specifically, the variable of interest is the order flow imbalance for the broker recommending the stock, in the stock being recommended. Order flow imbalance is defined as the recommending broker's aggregate daily buy volume divided by the broker's total volume for the recommended stock during the trading session. For broker i on day t, the imbalance is:

$$Imbalance_{it} = Buy\_Vol_{it} / Total\_Vol_{it} \tag{6.1}$$

Table 6.1: Summary of the Sample Selection Criteria

This table summarises the sample selection criteria used in Section 6.3. It reports the action(s) taken, and the rationale for these actions. Also reported are the number of observations removed at each step, and the numbers remaining.

Action Taken	**Summary of Reason for Removal**	**No. Obs. Before**	**No. Removed**	**No. Obs. After**
Removal of all recommendations that are not clear upgrades or downgrades, or reiterated a previous recommendation from the same brokerage firm.	Unless a recommendation is an upgrade or a downgrade, it is unclear whether it is a positive or a negative information event.	46348	13046	33302
Recommendation that are released during a trading session are removed	It is difficult to gauge the market effects of different recommendations that are released at different times within a trading session.	33302	8227	25075
Only included recommendations by analysts that have a brokerage presence within Australia.	This section examines the activities of ASX broker-analysts around recommendation upgrades/downgrades. Unless the analysts have a brokerage business in Australia, this analysis is nonsensical.	25075	16325	8750
Removed confounding effects, that is, recommendations that are released within 1 week of another recommendation by another analyst, and recommendations released within two weeks of a market sensitive company announcement (as determined by the ASX).	Confounding effects reduce the validity of conclusions drawn from results.	8750	6507	2243

To measure deviations from market expectations, the broker's average daily order flow imbalance from four months to one month before the analyst recommendation is used as the benchmark imbalance. Abnormal order flow imbalance is examined for ten trading sessions before and after the recommendation. Note that ten trading sessions are not the same as ten trading days. For example, if a stock recommendation is made at 6pm, then the previous trading session is on the same calendar day, and the next trading session on the subsequent weekday. Consequently the 0th trading session (or day 0 commonly found in event studies) does not exist in this study, and due care is advised when interpreting the tables and figures. Table 6.2 and Figure 6.1 report the mean abnormal order imbalances for upgrades and downgrades in the event window, and associated student t-test p-values.

The results suggest that stock recommendations are perceived to be informative, and are traded on. Upon brokers issuing an upgrade (downgrade), there is abnormal and significant buy (sell) side order flow imbalance, which remains significant until day 9 (with the exception of day 3 for upgrades). Of greater interest to this study, however, is the order flow prior to the release of a stock recommendation, as they represent abnormal trading patterns possibly linked to leakages. For upgrades, buy-side order flow becomes significantly higher one trading session prior to the release of the recommendation. For downgrades, sell-side order flow is significantly larger up to four trading sessions before. This observably significant change in broker order flow is consistent with the presence of leakages prior to analysts' recommendations.

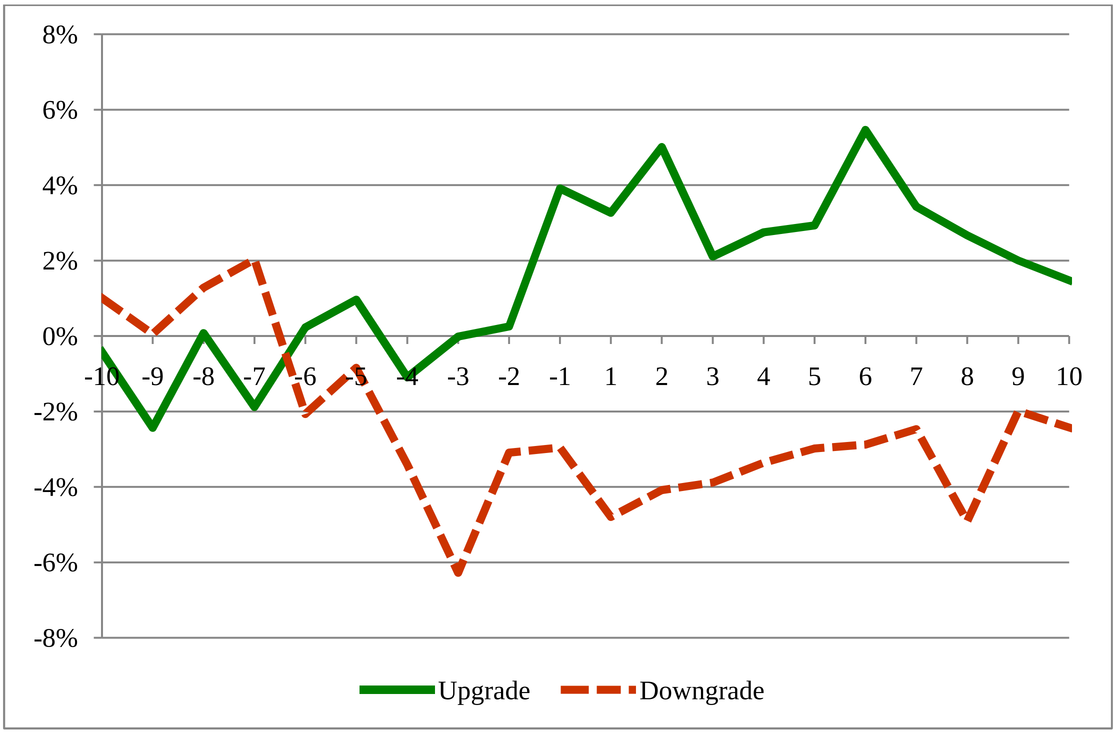
Table 6.2: Abnormal Order Flow Surrounding Equity Analysts' Recommendations

This table reports the mean abnormal order flow imbalance surrounding changes in equity analysts' recommendations. Order flow is defined as the issuing broker's total shares purchased (in the stock being recommended) on the day divided by the sum of purchases and sales. Abnormal order flow is the broker order flow minus a benchmark order flow, defined as a broker's average daily order flow imbalance from four months to one month before the recommendation. The mean abnormal order flow of upgrades and downgrades is examined for ten trading sessions before and after the recommendation, with significance determined by student t-tests with alphas at 5%.

	Upgrades (n=1082)		**Downgrades (n=1161)**	
Trading Period	*Mean Abn. Orderflow (%)*	*P-Value*	*Mean Abn. Orderflow (%)*	*P-Value*
-10	-0.4144	0.7428	1.0095	0.4025
-9	-2.434	0.0553	0.0526	0.9657
-8	0.0756	0.9530	1.281	0.2894
-7	-1.883	0.1331	2.028	0.0989
-6	0.2312	0.8547	-2.068	0.0939
-5	0.9632	0.4543	-0.8441	0.4790
-4	-1.092	0.3942	-3.410	0.0048
-3	-0.0140	0.9912	-6.278	0.0000
-2	0.2507	0.8443	-3.092	0.0118
-1	3.911	0.0025	-2.955	0.0179
1	3.266	0.0097	-4.795	0.0001
2	5.011	0.0001	-4.083	0.0008
3	2.110	0.0982	-3.886	0.0016
4	2.750	0.0328	-3.358	0.0086
5	2.934	0.0200	-2.980	0.0180
6	5.463	0.0000	-2.878	0.0212
7	3.430	0.0072	-2.466	0.0486
8	2.671	0.0345	-4.913	0.0001
9	2.004	0.1142	-1.990	0.1026
10	1.475	0.2447	-2.423	0.0527

Figure 6.1: Abnormal Order Flow Surrounding Equity Analysts' Recommendations

Figure 6.1 displays the mean abnormal order flow imbalances for analyst-brokers surrounding changes in stock recommendations, in excess of a three-month historical benchmark. Order flow imbalance is measured by dividing the recommending analyst-broker's purchase volume by their total volume in a trading session.



To investigate the profitability of trading on leakages, the market-adjusted abnormal returns around recommendations are examined. Returns are defined as the close-to-close returns on a stock, net of returns on an index in the corresponding period. While optimally one should use the S&P/ASX 300 Index, an index that roughly equates to stocks with analyst coverage, this index did not exist until April 2000. This chapter therefore uses a broader market index, the All Ordinaries (roughly equivalent to the top 500 stocks) as a proxy of market returns. Table 6.3 and Figure 6.2 report the mean and median abnormal returns surrounding changes in recommendations.

Table 6.3: Abnormal Returns Surrounding Equity Analysts' Recommendations

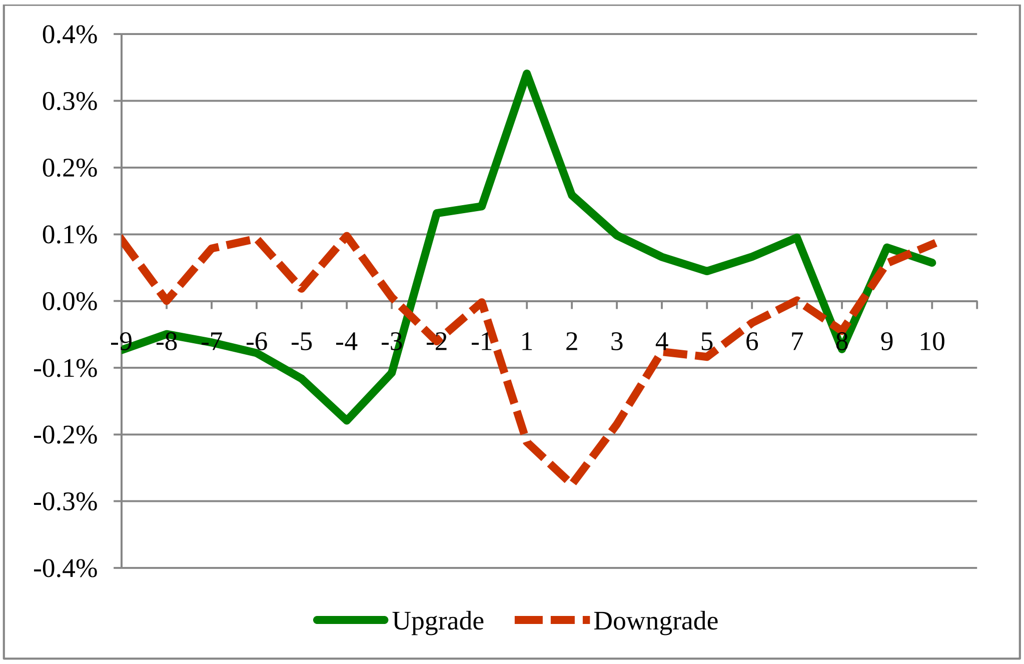
This table reports the mean and median abnormal returns surrounding changes in analyst recommendations. Trading session abnormal returns are defined as the close-to-close returns on the stock being recommended, net of the returns on the All Ordinaries Index. Mean and median abnormal returns for upgrades and downgrades are examined for ten trading sessions before and after the recommendation change, with significance determined respectively by student t-tests and sign rank tests, with alphas at 5%.

Trading	**Upgrades (n=1082)**				**Downgrades (n=1161)**			
Period	*Mean AR (%)*	*P-Value*	*Med. AR (%)*	*P-Value*	*Mean AR (%)*	*P-Value*	*Med. AR (%)*	*P-Value*
-10	-0.0663	0.3139	-0.1120	0.0478	0.0485	0.3875	-0.0311	0.8106
-9	-0.0733	0.2517	-0.0951	0.0278	0.0918	0.2106	0.1022	0.0029
-8	-0.0495	0.5332	-0.1330	0.0200	0.0002	0.9982	-0.0361	0.9621
-7	-0.0620	0.4269	-0.1253	0.0107	0.0788	0.2969	0.0598	0.0572
-6	-0.0779	0.2051	-0.0657	0.1043	0.0933	0.2432	0.1277	0.0164
-5	-0.1164	0.1183	-0.1503	0.0038	0.0185	0.7818	0.0547	0.2295
-4	-0.1792	0.0023	-0.1697	0.0000	0.0974	0.1460	0.1228	0.0576
-3	-0.1077	0.0893	-0.1477	0.0394	0.0055	0.9324	-0.0323	0.8104
-2	0.1316	0.0433	-0.0420	0.3096	-0.0604	0.5151	0.0273	0.7329
-1	0.1420	0.0337	0.0124	0.2508	-0.0018	0.9774	-0.1496	0.0788
1	0.3407	0.0000	0.1832	0.0000	-0.2114	0.0007	-0.1307	0.0004
2	0.1588	0.0149	0.0996	0.0088	-0.2746	0.0000	-0.1650	0.0000
3	0.0984	0.0977	0.0522	0.2248	-0.1846	0.0028	-0.1343	0.0000
4	0.0661	0.2116	0.0170	0.4915	-0.0760	0.1696	-0.1078	0.0319
5	0.0448	0.4149	0.0172	0.7136	-0.0837	0.1379	-0.0547	0.0925
6	0.0664	0.2516	-0.0123	0.5501	-0.0328	0.5672	-0.1208	0.1600
7	0.0952	0.1040	0.0756	0.0840	0.0011	0.9865	-0.0610	0.1555
8	-0.0722	0.2587	-0.0590	0.1525	-0.0448	0.5463	-0.1065	0.0861
9	0.0803	0.4153	0.0651	0.3007	0.0567	0.5730	0.0281	0.3983
10	0.0573	0.4451	0.0182	0.4028	0.0847	0.5430	-0.0612	0.3991

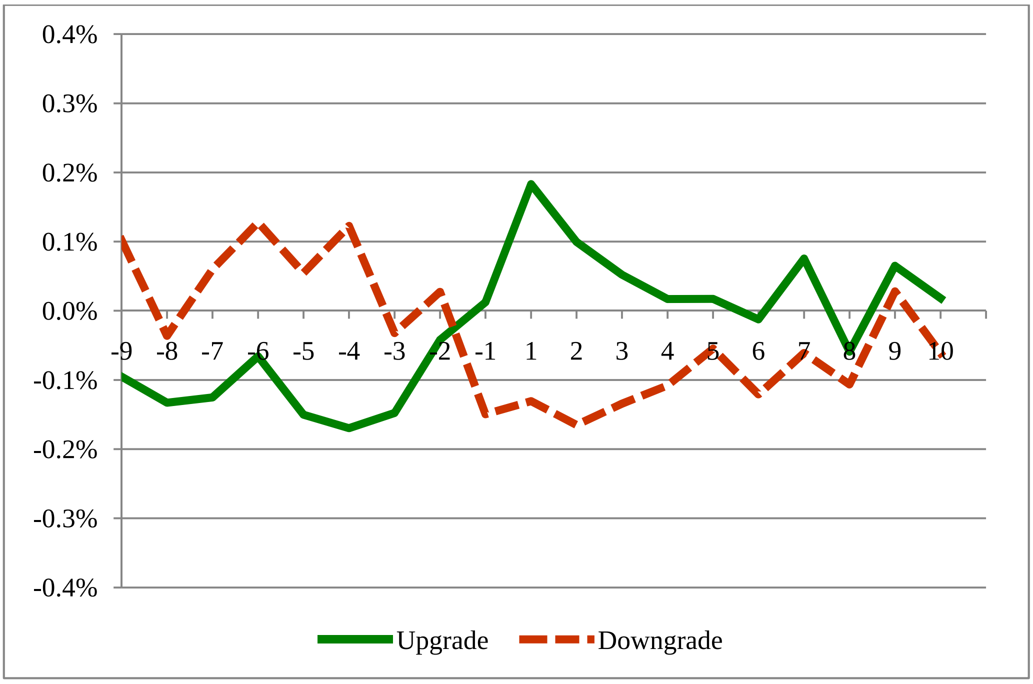
Figure 6.2: Abnormal Returns Surrounding Equity Analysts' Recommendations

Figure 6.2 displays stock returns surrounding changes in analyst recommendations, net of returns on the All Ordinaries Index in the corresponding period. Panel A displays mean abnormal returns, while Panel B displays median abnormal returns.

<u>Panel A: Means</u>



<u>Panel B: Medians</u>



Consistent with prior literature, results suggest that recommendations are valuable (e.g. Bjerring, Lakonishok, and Vermaelen, 1983), and mean abnormal returns on the trading session immediately after an upgrade (downgrade) are a statistically significant 0.3441% (-0.2236%). Abnormal returns remain significant for a further two trading sessions for downgrades, and one trading session for upgrades. In conjunction with Table 6.2 and Figure 6.1, these results are consistent with Hypothesis 6.1; that *leakages in analysts' reports exist, and these are valuable for those who trade on them.*

An interesting and peculiar observation is the lack of a long price run-up normally associated with information leakages. Results suggest that abnormal returns prior to the release of the recommendation are more likely to be positive for downgrades, and negative for upgrades. While these abnormal returns are statistically insignificant on their own, their accumulation is significant (shown later). This is inconsistent with results of prior information leakage studies. In fact, the literature considers positive abnormal returns prior to the release of positive information, and negative returns prior to negative information, as mandatory evidence for the presence of leakages.

A difference in the nature of the information leakage being studied may help to explain this peculiarity. To illustrate, let us juxtapose stock recommendations against a commonly examined information leakage involving corporate control. Prior to a merger announcement, information is often held by numerous parties associated with the deal, from the management, underwriters, lawyers, and accountants for example. This information is often known long before the official announcement. When they decide to trade on this private information, they compete with other informed traders and therefore trade aggressively, quickly moving prices.[18] In the case of a stock recommendation, the knowledge lies exclusively with the analyst and their brokerage house, and there is no urgency to trade as soon as the information becomes available to them. Therefore, leakages in stock recommendations will be unlikely to experience the same price run-up observed in corporate control events.

To further examine this issue, market-wide activity for these stocks around stock recommendations is analysed. Volume in the event window is benchmarked against the daily average volume for the recommended stock one to four months prior to the recommendation. For each day *t* and recommendation *i*, the student t-test is computed as follows:

$$t_{it} = \frac{mkt\_volume_{it}}{sd_i / \sqrt{n_i}} \tag{6.2}$$

where sd_i is the standard deviation of the benchmark estimate, and n_i the number of days used to calculate the benchmark. Table 6.4 reports the mean percentage abnormal volume and proportion of cases where the student t-stat exceeds a value of 0.7, representing a level of significance of approximately 20-25%. Figure 6.3 displays the percentage abnormal volume graphically.

[18] Foster and Viswanathan (1996) conclude that when multiple informed traders have information that is highly correlated, or in fact identical, it becomes a “rat race” to reach the market first.

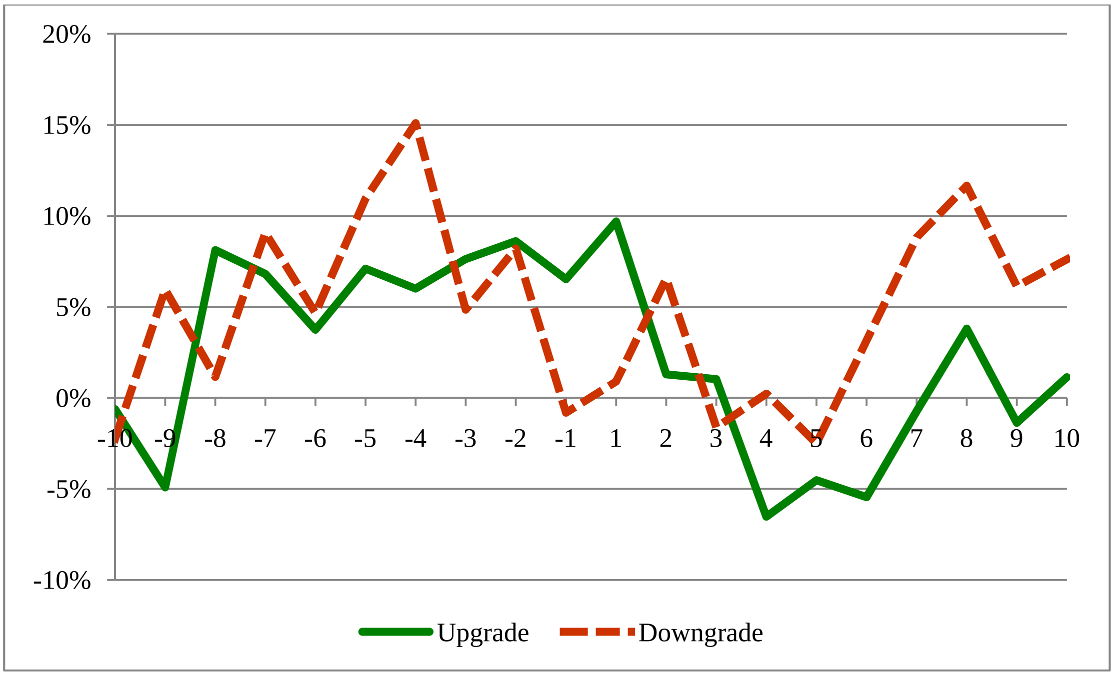
Table 6.4: Abnormal Volume Surrounding Equity Analysts' Recommendations

This table reports the mean abnormal volume surrounding changes in analyst recommendations. Abnormal volume is defined as the market volume for the stock being recommended, net of the historical daily average volume from four months to one month before the recommendation. This table also reports the percentage of cases where t-values for abnormal volume exceed 0.7, representing a level of significance of approximately 20-25%. Results for upgrades and downgrades are examined for 10 trading sessions before and after changes in analyst recommendations. All numbers reported are in percentages.

Trading Period	Mean Abn. Vol (%)		Prop. t>0.7 (%)	
	Upgrade	*Downgrade*	*Upgrade*	*Downgrade*
No. obs	*1082*	*1161*	*1082*	*1161*
-10	-0.6189	-2.236	37.99	38.85
-9	-4.919	5.947	40.94	42.03
-8	8.118	1.153	41.96	41.77
-7	6.808	9.072	40.67	40.66
-6	3.747	4.654	42.51	40.40
-5	7.101	10.94	39.28	42.21
-4	6.000	15.09	41.68	43.24
-3	7.628	4.845	43.90	40.48
-2	8.611	8.202	43.16	40.05
-1	6.521	-0.8170	42.05	38.59
1	9.694	0.8984	46.58	42.38
2	1.293	6.554	44.55	43.07
3	1.029	-1.613	42.05	39.62
4	-6.522	0.2327	38.35	40.83
5	-4.525	-2.502	38.08	36.61
6	-5.449	3.144	39.46	38.59
7	-0.7305	8.810	40.67	41.86
8	3.809	11.66	40.30	43.24
9	-1.372	6.129	37.80	40.66
10	1.132	7.606	38.91	41.00

Figure 6.3: Abnormal Volume Surrounding Equity Analysts' Recommendations

Figure 6.3 displays the mean abnormal volume (%) surrounding changes in stock recommendations, net of a historical three-month benchmark.



Despite larger volumes in the days leading up to the recommendation, less than half of these cause an abnormally large increase, even at a very marginal level. This is attributable to the large variation normally associated with daily volume, and the level of control the analysts have in leaking recommendations. If a recommendation is leaked to only a handful of investors (as opposed to all clients), the rise in volume will be much lower in significance. Therefore, while leakages do create larger volumes, it is difficult for the market to detect these leakages, as only a limited number of traders act on the information. This is in stark contrast to the large volumes prior to merger announcements (e.g. Keown and Pinkerton, 1981), where informed traders compete with one another.

The analysis, however, does not explain why returns before and after the announcement move in opposite directions. Chiyachantana, Jain, Jiang and Wood (2004) find that market conditions are a major determinant of price impact for institutional investors. Purchases made during bear markets and sales made during bull markets experience significantly lower price impact. Leaking upgrades during falling markets and downgrades during rising markets is therefore consistent with the minimisation of transaction costs. When filling client orders, brokers face less competition for liquidity, and simultaneously reduce the risk of detection by the rest of the market.

To examine the likely benefit of transacting in favourable market conditions, two cumulative abnormal returns (CAR) are calculated, one from t(-10) to t(-2), and another from t(+1) to t(+10), excluding t(-1) altogether. The first window represents the CAR prior to the leakage of recommendations (transaction cost benefit), and the second represents the price run-up following trading (investment returns). Table 6.5 and Figure 6.4 present these findings. From t(+6) onwards, the second window yields a mean CAR of 0.7751% to 0.9357% for upgrades and -0.7654% to -0.9068% for downgrades. The CAR is at its maximum on t(+10) for buys and t(+8) for sales, with respective returns at 0.9357% and -0.9068%. This shows that clients of brokers who acquired (or offloaded) positions prior to a stock recommendation stand to gain approximately 0.75-0.9% for a holding period of two weeks or less.[19] The first window yields the largest mean CAR at t(-3), where returns are -0.7323% and 0.4340% respectively for upgrades and downgrades.

[19] Using a window of t(-1) to t(+10) yields similar results.

Table 6.5: Cumulative Abnormal Returns Surrounding Equity Analysts' Recommendations

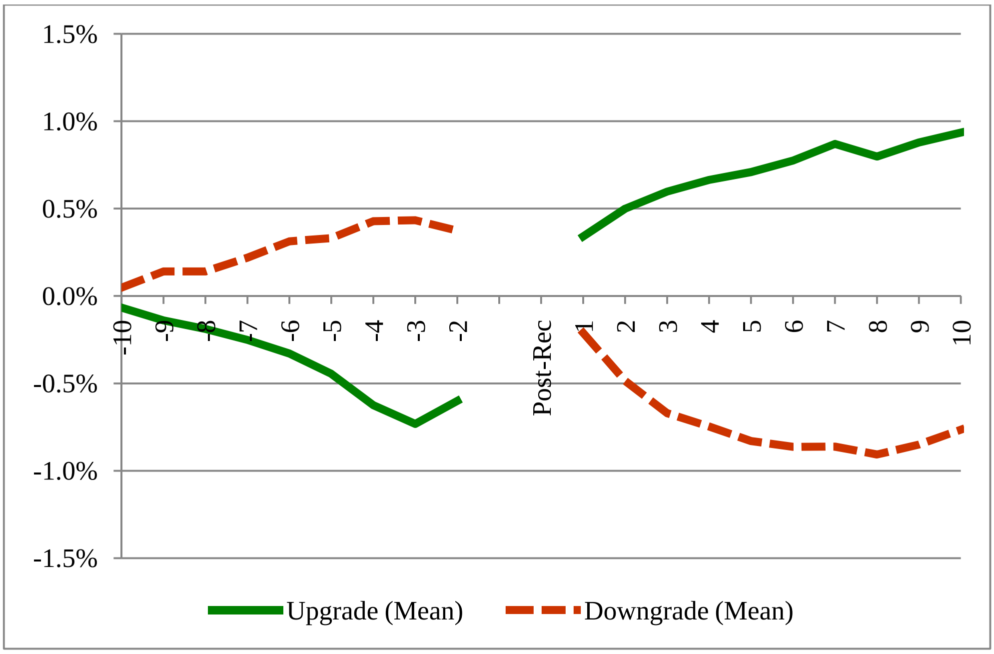
This table reports the mean and median cumulative abnormal returns (CARs) surrounding changes in analyst recommendations. Two CARs are calculated, a pre-event window from t(-10) to t(-2), displayed in Panel A, and a post-event window from t(+1) to t(+10), displayed in Panel B. Significance of mean and median CARs is determined respectively by student t-tests and sign rank tests, with alphas of 5%.

Trading	Upgrade (n=1082)				Downgrade (n=1161)			
Period	*Mean CAR (%)*	*P-Value*	*Med. Car (%)*	*P-Value*	*Mean CAR (%)*	*P-Value*	*Med. Car (%)*	*P-Value*
Panel A: Pre-event								
-10	-0.0663	0.3139	-0.1120	0.0478	0.0485	0.3875	-0.0311	0.8106
-9	-0.1397	0.1274	-0.1972	0.0187	0.1403	0.1257	0.1395	0.0205
-8	-0.1891	0.1063	-0.1968	0.0183	0.1405	0.2755	0.1294	0.0344
-7	-0.2512	0.0797	-0.3673	0.0009	0.2192	0.1471	0.3208	0.0006
-6	-0.3290	0.0331	-0.4375	0.0001	0.3126	0.0657	0.4911	0.0000
-5	-0.4454	0.0088	-0.6670	0.0000	0.3311	0.0721	0.5213	0.0001
-4	-0.6246	0.0005	-0.8902	0.0000	0.4285	0.0279	0.7158	0.0000
-3	-0.7323	0.0001	-0.8631	0.0000	0.4340	0.0370	0.6214	0.0000
-2	-0.6007	0.0028	-0.8369	0.0000	0.3736	0.1019	0.6952	0.0000
Panel B: Post-event								
1	0.3407	0.0000	0.1832	0.0000	-0.2114	0.0007	-0.1307	0.0004
2	0.4995	0.0000	0.2836	0.0000	-0.4860	0.0000	-0.3884	0.0000
3	0.5978	0.0000	0.3950	0.0000	-0.6706	0.0000	-0.5332	0.0000
4	0.6639	0.0000	0.4888	0.0000	-0.7466	0.0000	-0.5880	0.0000
5	0.7088	0.0000	0.4936	0.0000	-0.8303	0.0000	-0.7718	0.0000
6	0.7751	0.0000	0.5470	0.0000	-0.8631	0.0000	-0.7711	0.0000
7	0.8703	0.0000	0.6322	0.0000	-0.8620	0.0000	-0.7914	0.0000
8	0.7981	0.0000	0.6007	0.0000	-0.9068	0.0000	-0.8394	0.0000
9	0.8784	0.0000	0.8284	0.0000	-0.8501	0.0000	-0.7843	0.0000
10	0.9357	0.0000	0.8354	0.0000	-0.7654	0.0002	-0.7161	0.0000

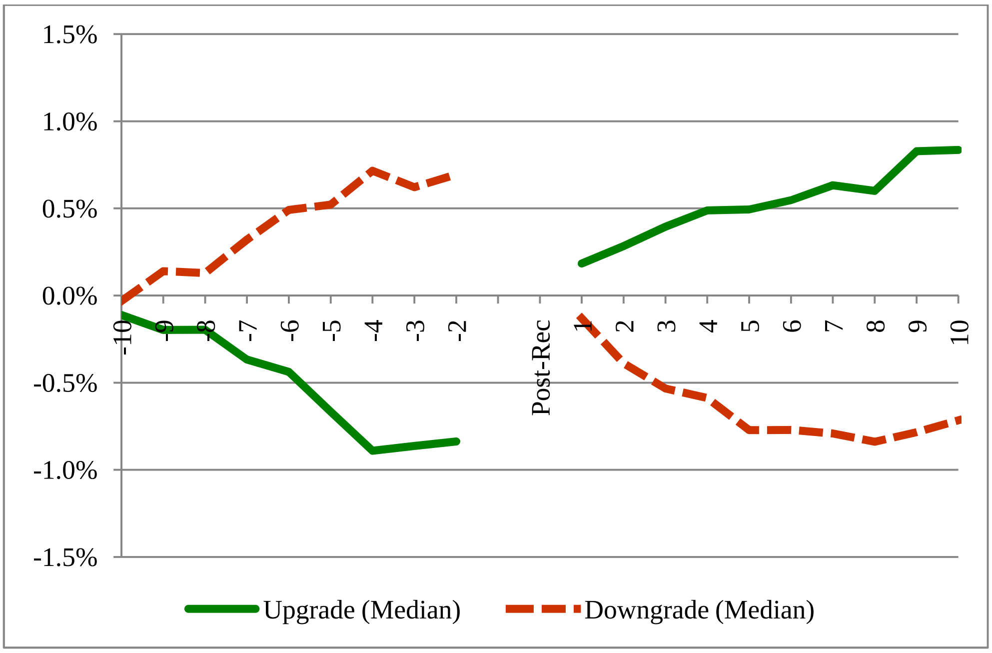
Figure 6.4: Cumulative Abnormal Returns Surrounding Equity Analysts' Recommendations

Figure 6.4 displays the daily cumulative abnormal returns surrounding changes in analyst recommendations. Two CAR windows are presented, one from t(-10) to t(-2), and another from t(+1) to t(+10). Panel A displays mean cumulative abnormal returns, while Panel B contains medians.

<u>Panel A: Mean</u>



<u>Panel B: Median</u>



By trading when prices are moving in the opposite direction of the intended trade, analysts (and their investment firm) minimise transaction costs for their clients, which can be interpreted as a ‘cost saving’ of sorts. The observations made here are not, however, free from limitations, and should be interpreted with some caution. First, it is impossible to estimate what transaction costs would have been, had analysts not timed their recommendations. It is therefore difficult to estimate the true benefit to market timing. However, given that transaction costs are generally positive, these results represent the floor to cost savings. To add complexity to the mixture, one can never prove with any degree of certainty that market timing was attempted. While the results presented are consistent with market timing, these results could be driven by a number of factors.

It is entirely plausible for the odd pre-event price ‘run-down’ (as opposed to run-up) to be an artefact of the sample selection procedure. While this procedure minimise the confounding effects of contemporaneous information events, it also reduces the likelihood that the sampled recommendations are based on a reinterpretation of publicly available information. The remaining recommendations are therefore likely to be driven by two factors: inside information or a reiteration of an analyst’s price target. The former is not inconsistent with the notion of market timing. However, the latter may occur when stock prices drop (rise) significantly below (above) an analyst’s target price. In the absence of any information (public or private) to suggest otherwise, the analyst may be inclined to believe the stock to be over/under priced, and therefore issue a change in recommendation despite not making any changes to their target price. This may be an alternative explanation as to why upgrades (downgrades) are preceded by a fall (rise) in stock prices.

6.4 Who Makes Greater Use of Analyst Information?

This section examines whether customers of more reputable analysts make their investment decisions based on a larger number of analyst forecasts. While the reputation of analysts (and their investment firm) can be proxied using analysts' rankings, this is not without potential issues. Analysts are usually ranked based on the industry they cover. While knowledge of an industry is a necessary precondition for a successful analyst, this does not necessarily imply that the best analyst in a field is the most informed in all stocks for that industry. It is plausible for an unranked analyst to be the most informed in a stock for the simple reason of being the only analyst covering it. As an alternate proxy, an investment firm's yearly volume market share for each stock, as an indicator of reputation, is used.

To test Hypothesis 6.2, analyst EPS forecasts that are made between 1996 and 2008 are examined. The method involves matching EPS forecasts by two different brokers on the same stock, where estimates are identical, are for the same forecast period, and are published within one weekday of each other, but not on the same day. This strict filter ensures that the two forecasts contain an equivalent amount of information, except for the possibility that one broker may have the advantage in reputation. For each matched pair, the broker having the larger market share (for the calendar year) in that stock is deemed to have higher reputation.

Four order flow imbalance measures are used, and are related to the way in which customers of the two investment firms react to each other's EPS forecasts. These ratios are:

A. Customers of the more reputable investment firm reacting to the EPS forecasts of the more reputable firm;

B. Customers of the less reputable investment firm reacting to the EPS forecasts of the more reputable firm;

C. Customers of the more reputable investment firm reacting to the EPS forecasts of the less reputable firm;

D. Customers of the less reputable investment firm reacting to the EPS forecasts of the less reputable firm.

Two tests are conducted to gauge the extent to which information is used by the customers of the more reputable and less reputable investment firms. Test 1 (A minus B) measures differences in the use of forecasts provided by the more reputable firm, while test 2 (C minus D) measures differences in the use of forecasts provided by the less reputable firm. If the hypothesis is correct, then one would expect one of the following to occur:

1) A-B > 0 and C-D > 0; that is, customers of the more reputable firm use more analyst information provided by both firms;
2) A-B > 0 and C-D = 0; that is, customers of the more reputable firm use more analyst information, but only in those provided by the more reputable firm. Both customer groups use an equal (or statistically indifferent) amount of analyst information from the less reputable firm;
3) A-B = 0 and C-D > 0; that is, customers of the more reputable firm use more analyst information, but only in those provided by the less reputable firm.

Both customer groups use an equal (or statistically indifferent) amount of analyst information from the more reputable firm.

Table 6.6 reports the median values of tests 1 and 2, and their associated sign rank p-values. There are in total 1498 matched pairs which satisfy the matching criteria, of which 680 exhibit a buy signal, and 818 exhibit a sell signal. For matches with a buy signal, customers of the more reputable investment firm react more to forecasts provided by both firms, when compared with the customers of the less reputable firm. On average, customers of the more reputable firm purchase 4.52% more for forecasts provided by the more reputable firm, and 4.72% more when they are issued by a less reputable firm. For matches with a sell signal, there are no significant differences in their reactions.

Therefore, it appears that the customers of more reputable investment firms show a greater degree of sophistication (at least for forecasts that exhibit a buy signal); that is, they make wider use of available information. This suggests that even in the absence of leakages in analyst reports, the customers of more reputable firms are likely to benefit more from equity analysis than other traders. It is possible that these traders are better endowed, and therefore can afford to subscribe to the research services of numerous investment firms.

Table 6.6: Abnormal Returns Surrounding Equity Analysts' Recommendations

This table reports the differences in the use of analyst earnings forecasts by customers of larger investment firms and those of smaller investment firms. The method involves matching EPS forecasts by two different brokers on the same stock, where estimates are identical, are for the same forecast period, and are published within one weekday of each other, but not on the same day. Test A represents the customers of the more reputable investment firm reacting to the EPS forecasts of the more reputable firm. Test B represents the customers of the less reputable investment firm reacting to the EPS forecasts of the more reputable firm. Test C represents the customers of the more reputable investment firm reacting to the EPS forecasts of the less reputable firm. And test D represents the customers of the less reputable investment firm reacting to the EPS forecasts of the less reputable firm. Test A-B measure differences in the use of forecasts provided by the more reputable firm, while test C-D measure differences in the use of forecasts provided by the less reputable firm. The statistical significance of mean and median differences in A and B, and C and D, are respectively tested with a t-test and sign rank test, at an alpha of 5%.

	Buy Signal (n=680)				**Sell Signal (n=818)**			
Tests	Mean (%)	P-value	Median (%)	P-value	Mean (%)	P-value	Median (%)	P-value
A	52.82	-		-	49.56	-		-
B	48.30	-		-	49.63	-		-
C	49.79	-		-	52.05	-		-
D	45.07	-		-	49.65	-		-
A-B	4.524	0.0320	2.290	0.0275	-0.0726	0.9695	0.0000	0.9347
C-D	4.716	0.0201	1.289	0.0244	2.399	0.1975	0.0000	0.1880

6.5 Summary

This chapter finds evidence consistent with the leakage of analyst recommendations, which provide financial benefits in a magnitude of approximately 0.75-0.9%. Previous studies document the presence of price run-ups prior to information leakages. Contrasting these studies, this chapter finds that positive analyst recommendations tend to be leaked when prices are trending downwards, while negative recommendations are leaked when prices trend upwards. Consistent with the minimisation of transaction costs (and Chiyachantana, Jain, Jiang and Wood, 2004), this study finds cost savings in excess of 0.4% for analysts who release recommendations during favourable market conditions. However, it is unknown to what extent the results are driven by the strict sample selection criteria.

This chapter also finds evidence that clients of larger brokers are more sophisticated, and have access to research from a greater number of analysts. This is consistent with the view that better endowed traders have greater access to information. Therefore, even if leakages do not exist, the distribution of equity information is unlikely to be equal.

Taken together, these results shed light on the complexity of the relationship between equity research and information asymmetry. While equity analysts are shown to reduce the level of information asymmetry between the management and shareholders, it appears that the distribution of information between shareholders is far from even.

Chapter 7: Anonymity and Heterogeneously Informed Brokers

"At the time, the ASX said the market players had been canvassed on the matter, the jury was out, and academic studies suggested a broker ID blackout would enhance liquidity. The idea was that people were more likely to trade, and therefore generate greater turnover, if nobody knew who was in the market doing what. Many brokers and fund managers were deadset against the idea, a handful were for it, but the overall vibe was 'more transparency is better than less transparency'."

- 'Blackout that caused an identity crisis', Michael West, *The Australian*, February 17, 2007.

7.1 Introduction

Chapter 7 re-examines the effect of anonymous trading. While broker IDs naturally affect the execution ability of brokers, the extant empirical literature focuses predominantly on market-wide effects (e.g. Foucault, Moinas and Theissen, 2007; Comerton-Forde, Frino and Mollica, 2005; Comerton-Forde and Tang, 2008; and Frino, Gerace and Lepone, 2008), and find that markets improve on average. This does not necessarily imply, however, that anonymity is Pareto-efficient, especially when a particular group of brokers benefits at the expense of others.

While exchanges have been quick to unite in anonymity on the grounds of greater market quality, concerns of fairness have been raised in an ASX consultation paper and by the media. These concerns have some validity, as the removal of broker IDs is likely to affect different market participants in different ways, possibly benefiting some at the expense of others. The recent empirical literature, however, focuses predominantly on market-wide effects of anonymity, citing improved market quality indicators such as lower bid-ask spreads.

This chapter disentangles from a pool of averages the effect of anonymity on heterogeneously informed brokers. Brokers are the natural unit of analysis for broker IDs because they are the only ones that have legal access to them. This chapter makes use of a unique dataset made available from the ASX, which includes the identities of brokers in every trade. This allows a separation from a pool of averages, the winners and losers in the anonymity game, and the mechanisms at work. As a consequence of the approach used, this is the first study to examine the execution ability of brokers around changes in anonymity, and possibly the first to examine broker execution ability in general. Three hypotheses are tested in this chapter. The first hypothesis (Hypothesis 7.1) tests the average market-wide implications of anonymity for transaction costs. The latter two hypotheses (Hypothesis 7.2 and Hypothesis 7.3) examine the likely beneficiaries of anonymity, by separating heterogeneously informed brokers.

The remainder of this chapter is set out as follows. Section 7.2 describes the data used in this study, while Section 7.3 examines market-wide effects caused by the ASX broker ID removal. Section 7.4 investigates the effects of broker ID removal on the trading costs of different brokers, while Section 7.5 controls for trade size differences. Section 7.6 analyses the price discovery implication, while Section 7.7 examines the effect of anonymity on broker market share. Section 7.8 concludes and summarises the findings.

7.2 Data

This chapter examines one calendar year before and after the removal of broker IDs from the ASX on 28 November, 2005. Data used in this chapter are from a proprietary dataset provided by the ASX. It contains stock code, date, time, trade price, trade volume, the buyer broker ID, and the seller broker ID. As the data contain no information on the initiating party, it is difficult to classify trades into buys and sells. To overcome this issue, the dataset is supplemented with a list of all trades from TAQTIC, offered by the Securities Industry Research Centre of Asia-Pacific (SIRCA). This dataset comes from a Reuters feed, and contains stock code, date, time, trade price, trade volume, the prevailing best bid, and the prevailing best ask. The direction of the trade is then determined using the prevailing bid-ask quotes.

7.3 Market-Wide Execution Costs - Pool of Averages

To introduce a level of consistency with prior studies, this section tests Hypothesis 7.1 by examining the market-wide effects of a switch to an anonymous trading regime. In particular this section is interested in the average execution costs for market orders of different-sized stocks, before and after the ASX broker ID removal. Two classical price impact measures are used in the analysis: the "total price effect", and the "temporary price effect", also commonly known as the price reversal. As proxies to these measures, the returns from the open to trade and from the trade to the close are used. These are adjusted by the returns of the prevailing All Ordinaries Index in the corresponding time period. The two metrics are defined as follows:

$$Open\ to\ Trade_i = \frac{VWAP_{i,t}}{Open} - \frac{Index_t}{Index\ Open} \tag{7.1}$$

$$Trade\ to\ Close_i = \frac{Close}{VWAP_{i,t}} - \frac{Index\ Close}{Index_t} \tag{7.2}$$

Stocks are separated into four groups based on their daily closing market capitalisation; the top 100 stocks, 101-200, 201-500, and 501+. These correspond roughly to stocks in the ASX 100 Index, the ASX 200 Index, the All Ordinaries Index, and those uncovered by indices. Market orders that execute against multiple limit orders are 'packaged' together, with their volume-weighted average price, $VWAP_{i,t}$ used as the trade price. There are in total 12,026,685 market orders sampled in Table 7.1, 6,096,641 of which are purchases, and 5,930,044 are sales. Sample size for purchases (sales) in the top 100, 101-200, 201-500, and 501+ stock groups are respectively 3,692,401 (3,546,344), 1,076,979 (1,070,471), 854,208 (849,005), and 473,053 (464,224). To examine the significance of changes in transaction costs, a t-test is conducted on the difference of two means, assuming unequal variance[20] in the pre- and post-anonymity regimes.

[20] F-tests are conducted to test the variances of the two anonymity regimes for each stock group. As the null hypothesis (of unequal variance) cannot be rejected for any of the stock groups, variances are therefore assumed to be unequal. However, t-test results using equal variances are similar, and do not qualitatively change any of the conclusions.

Table 7.1: Anonymity and Market-Wide Execution Costs

This table reports the mean effect of anonymity on market-wide execution costs. Two execution cost measures are employed; open to trade and trade to close. Open to trade is defined as the return from the opening to the trade, and trade to close as the return from the trade to the closing. Both measures are adjusted for the returns of the All Ordinaries Index in the corresponding period. Results are reported separately for pre- and post-anonymity regimes, and the resulting change is grouped by market capitalisation, and the direction of the trade. Two sample t-tests are conducted to examine the significance of the mean changes (assuming unequal variance, with p-values reported).

Market Capitalisation Group	**No. Trades**		**Open to Trade**				**Trade to Close**			
	Pre	Post	Pre (%)	Post (%)	Change (%)	P-Value	Pre (%)	Post (%)	Change (%)	P-Value
All										
Buys	6,096,641	8,948,628	0.2476	0.2114	-0.0362	0.0000	-0.0689	-0.0598	0.0091	0.0000
Sells	5,930,044	9,251,660	-0.1887	-0.1667	0.0220	0.0000	0.0507	0.0605	0.0098	0.0000
Top 100										
Buys	3,692,401	5,348,716	0.0192	-0.0283	-0.0475	0.0000	-0.0344	-0.0410	-0.0066	0.0000
Sells	3,546,344	5,417,018	-0.0745	-0.0885	-0.0139	0.0000	0.0291	0.0319	0.0028	0.0000
101-200										
Buys	1,076,979	1,591,805	0.0919	0.0584	-0.0336	0.0000	-0.0535	-0.0431	0.0104	0.0000
Sells	1,070,471	1,795,198	-0.1852	-0.1531	0.0321	0.0000	0.0601	0.0966	0.0365	0.0000
201-500										
Buys	854,208	1,282,208	0.4182	0.3466	-0.0715	0.0000	-0.0802	-0.0460	0.0342	0.0000
Sells	849,005	1,347,760	-0.4505	-0.3220	0.1285	0.0000	0.1147	0.1167	0.0020	0.3955
501+										
Buys	473,053	725,899	2.077	2.074	-0.0026	0.8291	-0.3524	-0.2590	0.0934	0.0000
Sells	464,224	691,684	-0.5900	-0.5115	0.0785	0.0000	0.0772	0.0821	0.0049	0.4971

Table 7.1 shows that across all stocks on average (results ungrouped by market capitalisation), open to trade returns are significantly reduced for both buys and sells. For purchases (sales), average change in open to trade returns pre- and post-anonymity is -0.0362% (0.0220%). Changes in trade to close returns for purchases (sales) are 0.0091% (0.0098%).

For results grouped by market capitalisation, open to trade returns also appear to decrease significantly, with the exception of sales in the top 100 stocks (which increased), and purchases in the 501+ stock group (with a statistically insignificant change). Changes in open to trade returns for purchases (sales) in the top 100, 101-200, 201-500, and 501+ stock groups are respectively -0.0475% (-0.0139%), -0.0336% (0.0321%), -0.0715% (0.1285%), and -0.0026% (0.0785%).

Trade to close return changes based on market capitalisation are erratic and do not appear to have strong systematic patterns. However, trade to close returns do appear to decrease in the top 100 stocks for both purchases and sales. Changes in trade to close returns for purchases (sales) in the respective stock groups are -0.0066% (0.0028%), 0.0104% (0.0365%), 0.0342% (0.0020%), and 0.0934% (0.0049%), with statistical significance at the 1% level in all cases except sales in the 201-500 and 501+ stock groups.

The recent literature either predicts or finds lower bid-ask spreads following anonymity. To the extent that bid-ask spreads are related to transaction costs, the results are consistent with Hypothesis 7.1 and previous literature, and the notion that anonymity improves market quality on average. The results on trade to close returns are less convincing, with a lack of consistency between stock groups, and between purchases and sales.

7.4 Anonymity and the Trading Costs of Different Brokers

Broker IDs are informative when they reveal to the market the identity of market participants who in the past have been perceived as being more informed. The market is more inclined to react (e.g. follow) the trades of these participants if they believe that this strategy will earn them higher returns. It is therefore plausible that the removal of broker IDs affects different brokers differently, depending on their level of informativeness. Previous literature, together with the findings in the previous section, document lower execution costs after the removal of broker IDs. Taken at face value, these results imply that the removal of broker IDs results in a market-wide cost saving, which may be misinterpreted as being Pareto-efficient. This section hypothesises that the distribution of these cost savings is unequal, and is skewed towards brokers with a reputation for being more informed (Hypothesis 7.2).

Brokers are separated into two groups based on the market's perception of their quality. For this purpose, a list of the top ten brokers from the 2005 Business Review Weekly East Coles Best Brokers Survey is obtained. Brokers are ranked in three categories based on their research, trade execution, and market making abilities. While brokers have different rankings within these categories, the same ten brokers appear in all three. The literature (and Chapter 6 of this dissertation) shows that research reports provided by equity analysts are informative and valuable (e.g.

Womack, 1996; Barber, Lehavy, McNichols and Trueman, 2001; Gleason and Lee, 2003, and Jegadeesh, Kim, Krische, and Lee, 2004).

Furthermore, these ten brokers are also the largest full-service brokers operating at the ASX, and receive a disproportionate amount of the total market order flow. Given the larger number of equity analysts (and other resources) at their disposal, and the amount of order flow they receive, these brokers are more likely to be informed than other brokers operating in the market. These ten brokers are therefore classified as the 'top brokers' group, with the remaining brokers classified as the 'other brokers' group.

The analysis conducted in Section 7.3 is repeated here. The methodology is identical, with a further classification of market order trades into those conducted by 'top brokers' and 'other brokers'. Table 7.2 reports that in total there are 5,322,602 market orders from 'top brokers' and 6,704,083 from 'other brokers'. The trades of 'top brokers' appear to be concentrated in the top 200 stocks, with the bottom two stock groups only accounting for 12.64% of all their trades. Table 7.2 also reports the mean open to trade, and trade to close returns for the two broker groups (Panel A for 'top brokers' and Panel B for 'other brokers') in the pre- and post-anonymity regimes. Similar to Table 7.1, results are further partitioned by market capitalisation groupings.

When examining the results ungrouped by market capitalisation, there is a significant (at 5%) reduction in the mean open to trade returns for both broker groups in both buys and sells. For the purchases (sales) of 'top brokers', open to trade returns change on average by -0.0379% (0.0271%), while for 'other brokers', this change is -

0.0047% (0.0107%). Therefore, while execution costs appear to reduce for both broker groups, the magnitude of the cost reduction is much larger for the ‘top brokers’.

Open to trade results by market capitalisation groups convey similar information, albeit with more variation. For ‘top brokers’, changes in open to trade returns of purchases (sales) in the top 100, 101-200, 201-500, and 501+ stock groups are respectively -0.0458% (0.0073%), -0.0501% (0.0532%), -0.0210% (0.1157%), and 0.0286% (0.0587%). Changes for ‘top brokers’ are significant at the 1% level, with the exception of the 501+ stock group, where purchases experience no significant change, while sales are significant only at the 5% level. For ‘other brokers’, changes in open to trade returns of purchases (sales) in the respective stock groups are -0.0516% (-0.0360%), -0.0156% (0.0037%), -0.0696% (0.1295%), and -0.0011% (0.0818%). The changes in open to trade returns for ‘other brokers’ are also significant at the 1% level, with the exception of sales in the 101-200 group, and purchases in the 501+ group.

For trade to close returns (ungrouped by market cap), the average size of price reversals for ‘top brokers’ (in both buys and sells) has significantly increased (at the 1% level) in the post-anonymity period. The same results, however, are not seen in the trade to close returns of ‘other brokers’, where the average size of price reversals for purchases has decreased, and no significant change is seen in the price reversal of sales. Trade to close returns for the purchases (sales) of ‘top brokers’ change by -0.0101% (0.0230%), while for ‘other brokers’, this change is 0.0197% (0.0000%).

Table 7.2: Execution Cost of Top Research Brokers Versus Other Brokers

The analysis conducted in Table 7.1 is repeated here, with trades further classified into those conducted by 'top brokers' and those conducted by 'other brokers'. A 'top broker' is defined as one that ranks within the top 10 brokers as determined by the Business Review Weekly East Coles Best Brokers of November 2005. The 'other brokers' group contains the remaining unranked brokers. Results are reported separately for pre- and post-anonymity regimes, with the resulting change grouped by market capitalisation, and the direction of the trade. Panel A contains the results for 'top brokers', while those for 'other brokers' are in Panel B. Two sample t-tests are conducted to examine the significance of the mean changes (assuming unequal variance, with p-values reported).

Market Capitalisation Group	**No. Trades**		**Open to Trade**				**Trade to Close**			
	Pre	Post	Pre (%)	Post (%)	Change (%)	P-Value	Pre (%)	Post (%)	Change (%)	P-Value
Panel A: Top Brokers										
All										
Buys	2,671,722	4,425,549	0.0970	0.0591	-0.0379	0.0000	-0.0275	-0.0376	-0.0101	0.0000
Sells	2,650,880	4,840,587	-0.1690	-0.1418	0.0271	0.0000	0.0349	0.0578	0.0230	0.0000
Top 100										
Buys	1,826,119	2,879,794	0.0308	-0.0150	-0.0458	0.0000	-0.0234	-0.0354	-0.0119	0.0000
Sells	1,786,965	3,068,813	-0.0942	-0.0869	0.0073	0.0000	0.0179	0.0310	0.0131	0.0000
101-200										
Buys	515,162	927,098	0.1026	0.0525	-0.0501	0.0000	-0.0442	-0.0469	-0.0027	0.1051
Sells	521,423	1,073,181	-0.1906	-0.1374	0.0532	0.0000	0.0460	0.0977	0.0518	0.0000
201-500										
Buys	273,569	526,234	0.2530	0.2320	-0.0210	0.0000	-0.0156	-0.0353	-0.0196	0.0000
Sells	280,239	605,653	-0.4212	-0.3055	0.1157	0.0000	0.1060	0.1177	0.0117	0.0004
501+										
Buys	56,872	92,423	1.421	1.449	0.0286	0.2929	-0.0622	-0.0273	0.0349	0.0711
Sells	62,253	92,940	-0.9970	-0.9383	0.0587	0.0206	0.1074	0.0935	-0.0139	0.4347

Table 7.2 (Continued)

Panel B: Other Brokers

All										
Buys	3,424,919	4,523,079	0.3650	0.3604	-0.0047	0.0239	-0.1012	-0.0815	0.0197	0.0000
Sells	3,279,164	4,411,073	-0.2047	-0.1939	0.0107	0.0000	0.0635	0.0635	0.0000	0.9886
Top 100										
Buys	1,866,282	2,468,922	0.0078	-0.0438	-0.0516	0.0000	-0.0452	-0.0475	-0.0023	0.0001
Sells	1,759,379	2,348,205	-0.0545	-0.0905	-0.0360	0.0000	0.0404	0.0330	-0.0074	0.0000
101-200										
Buys	561,817	664,707	0.0822	0.0665	-0.0156	0.0000	-0.0620	-0.0379	0.0241	0.0000
Sells	549,048	722,017	-0.1801	-0.1765	0.0037	0.1384	0.0735	0.0950	0.0214	0.0000
201-500										
Buys	580,639	755,974	0.4960	0.4264	-0.0696	0.0000	-0.1106	-0.0535	0.0571	0.0000
Sells	568,766	742,107	-0.4650	-0.3355	0.1295	0.0000	0.1190	0.1159	-0.0032	0.3122
501+										
Buys	416,181	633,476	2.1662	2.1651	-0.0011	0.9330	-0.3920	-0.2928	0.0992	0.0000
Sells	401,971	598,744	-0.5270	-0.4452	0.0818	0.0000	0.0725	0.0803	0.0078	0.3192

When examining results partitioned by stock groups, trade to close returns draw similar conclusions, albeit with some variation. For 'top brokers' the magnitude of price reversals generally increases. Changes in trade to close returns for the purchases (sales) of 'top brokers' in the respective stock groups are -0.0119% (0.0131%), -0.0027% (0.0518%), -0.0196% (0.0117%), and 0.0349% (-0.0139%); and all are significant at the 1% level with the exception of purchases in the 101-200 stock group, and both purchases and sales in the 501+ stock group. The trades of 'other brokers' show a much lower level of consistency, and in many cases experience a fall in the average size of price reversals. For these 'other brokers', changes in trade to close returns for purchases (sales) in the respective stock groups are -0.0023% (-0.0074%), 0.0241% (0.0214%), 0.0571% (-0.0032%), and 0.0992% (0.0078%). These returns are significant at the 1% level, with the exception of sales in the 201-500 and 501+ stock groups.

In summary of the results so far, open to trade returns generally decrease in the post-anonymity regime for both broker groups. Previous literature shows that bid-ask spreads decrease following a switch to an anonymous regime. Consistent with these findings, and the results presented in Section 7.3, both broker groups benefit from the reduction in total execution costs. The trades of 'top brokers' experience either an increase in the size of price reversals, or in other cases no significant change. This suggests that the removal of broker IDs has reduced the market's capacity to identify those that are most likely to be informed.

However, the change in the magnitude of price reversals appears less consistent for 'other brokers' in comparison to 'top brokers', and actually increases in numerous cases. There are two possible causes for this result: that the ‘other brokers’ are now more informed, or it is simply a case of mistaken identity, where a number of trades conducted by the ‘other brokers’ are erroneously judged as informed. The former is unlikely as little probable cause exists for ‘other brokers’ to have suddenly become more informed. It is therefore plausible that ‘other brokers’ have lost their ability to signal their identity (in being less informed), causing their trades to move prices more often.

Taken as a whole, these results suggest that large and reputable full-service brokers are the major beneficiaries of the broker ID blackout, which is consistent with Hypothesis 7.2. Given the larger number of equity analysts these firms typically employ, and the amount of order flow they receive, they are more likely to be informed than other brokers. Prior to the removal of broker IDs, these large brokers can be easily identified by the market, which will seek to replicate their strategies, quickly moving prices. In the anonymous regime, information can no longer be inferred from broker IDs (as they no longer exist), and the market instead relies solely on patterns in order flow. This increases the probability of ‘mistaken identity’ where informed trades are misclassified by the market as uninformed, and vice versa.

7.5 Trade Size and Execution Costs

Execution costs are positively related to the size of the transaction (e.g. Chan and Lakonishok 1993, 1995). This is affected by the available liquidity at the time of the trade, and the potential price movements caused by temporary liquidity imbalances (e.g. Stoll, 1979; Ho and Stoll, 1981). In addition to liquidity costs, Easley and

O'Hara (1987) argue that large trades move prices more often as they are used by the market to proxy for the level of information contained in the trade. The literature provides mixed empirical results on anonymity and trade size. Foucault, Moinas and Theissen (2007) find a strong increase in the average trade size post-anonymity, while Comerton-Forde and Tang (2009) report an increase in the average limit order size at the best bid and ask prices. However, as these studies do not distinguish between heterogeneously informed brokers, little can be concluded on the relationship between anonymity and the trade size of informed market participants.

Kyle (1985) argues that informed traders attempt to conceal their activity by hiding among noise traders. To that end, one would expect informed traders to optimise their trading strategies to look less conspicuous, and possibly to appear similar to the trades of uninformed traders. In the transparent regime where the identities of brokers are displayed, trade size alone is a poor way for informed brokers to hide their intentions, as information can be derived from the brokers' order flow and trade patterns.

For example, imagine a stylistic thought experiment where an informed broker wishes to purchase 100,000 shares of a stock which they believe will have favourable performance in the future. They may choose to trade quickly and immediately, at which point they incur large liquidity costs. The alternative is to split the required number of shares into parcels, of for example 1,000 shares, and trade as liquidity becomes available in the market. While the latter strategy may reduce liquidity costs, it increases the risk of other market participants inferring information from their order flow, at which point the uninformed may choose to mimic their trades. These mimic trades move prices, which creates significant execution risk to the unexecuted portion of their desired position. In anonymous markets, however, other traders have a greater difficulty in inferring information from order flow. This provides informed brokers with a larger incentive to hide their intention by making their trade size appear less informed. To the extent that smaller trades are perceived as less informed, one would therefore expect informed brokers to have a smaller average trade size in the anonymous regime.

Table 7.3 reports the mean (Panel A) and median (Panel B) trade sizes (in dollar terms) in the pre- and post-anonymity periods. Across all stocks, mean trade size decreased by 17.30% for ‘top brokers’, and increased by 2.75% for ‘other brokers’, while median size decreased by 26.30% for the ‘top brokers’ and 0.36% for the ‘other brokers’.

Overall, the average trade size of ‘top brokers’ has decreased by a greater amount (or has increased by a lower amount) in comparison to the trades of ‘other brokers’. Therefore, these results lend support to the notion that anonymity affects the optimal trading strategies of informed traders. Specifically, anonymity allows informed traders to better conceal their intentions by mimicking the trade size of less informed traders. Such a strategy would be less successful in the transparent regime, since a series of small trades in the same direction from the same broker would quickly cause suspicion. However, given the difficulty of controlling for all confounding events, it is difficult to say with certainty that other factors have not driven (at least in part) some of the results obtained on average trade size. For example, a progression to algorithmic trading over time could potentially decrease the average trade size of the large full-service brokers, despite little change in their non-algorithmic trading behaviour.

Table 7.3: Anonymity and Changes in Average Trade Size

This table reports the mean (Panel A) and median (Panel B) trade size of 'top brokers' and 'other brokers' in the two transparency regimes, grouped by market capitalisation. This table also reports changes in the mean and median trade sizes. To examine the significance of mean changes, two sample t-tests are conducted, assuming unequal variance. The significance of changes in medians are conducted using rank-sum tests.

Broker Group	**Market Capitalisation Group**	**Trade Size ($)** Pre	Post	**Change ($)**	**Change (%)**	**P-Value**
Panel A: Mean Trade Size						
Top Brokers	All	34,956	28,908	-6,048	-17.30	0.0000
	Top 100	45,848	39,768	-6,080	-13.26	0.0000
	101-200	14,068	10,614	-3,454	-24.55	0.0000
	201-500	8,593	7,250	-1,343	-15.63	0.0000
	501+	6,923	7,606	683	9.869	0.0000
Other Brokers	All	24,874	25,559	685	2.753	0.0000
	Top 100	37,054	38,338	1,284	3.465	0.0000
	101-200	15,228	14,865	-363	-2.384	0.0000
	201-500	9,705	10,201	497	5.117	0.0000
	501+	6,021	6,861	840	13.95	0.0000
Panel B: Median Trade Size						
Top Brokers	All	10,593	7,808	-2,786	-26.30	0.0000
	Top 100	15,934	12,760	-3,174	-19.92	0.0000
	101-200	4,754	2,378	-2,376	-49.98	0.0000
	201-500	3,104	1,452	-1,652	-53.22	0.0000
	501+	3,903	4,170	267	6.829	0.0000
Other Brokers	All	8,820	8,788	-32	-0.3640	0.0000
	Top 100	14,461	14,558	97	0.6700	0.0000
	101-200	7,615	6,695	-920	-12.08	0.0000
	201-500	5,226	5,087	-139	-2.656	0.0000
	501+	3,500	3,960	460	13.14	0.0000

Irrespective of the underlying mechanisms that cause this, a change in average trade sizes is a reason for concern over the reliability of execution cost estimates provided in Sections 7.3 and 7.4. Smaller trades will on average reduce execution costs, as they are more likely to occur at the best bid or ask prices. It is therefore possible that lower execution costs are the product of smaller trades alone (especially for the 'top brokers'), rather than an effect induced by anonymity. To control for trade size, a series of simple Ordinary Least Square (OLS) regressions are estimated.

There are two dependent variables in the OLS regressions: the 'total cost' and the 'price reversal'. Negative returns in open to trade for sales, and trade to close for purchases, are converted into positive metrics by multiplying them by minus one. This provides easier interpretation and allows purchases and sales to be grouped together, avoiding an unnecessarily cumbersome number of regressions. The metrics are defined as follows:

$$Total\ Cost_i = \begin{cases} +1 \times Open\_to\_Trade_i, & for\ purchases \\ -1 \times Open\_to\_Trade_i, & for\ sales \end{cases} \tag{7.3}$$

$$Price\ Reversal_i = \begin{cases} -1 \times Trade\_to\_Close_i, & for\ purchases \\ +1 \times Trade\_to\_Close_i, & for\ sales \end{cases} \tag{7.4}$$

Open to trade and trade to close are market-adjusted, and are as previously defined. Analysis is conducted separately for 'top brokers' and 'other brokers', and for stocks in the different market capitalisation groupings. The model used is simple, and includes the size of the trade measured in dollar terms (in units of $1 million), and a dummy variable for the post-anonymity regime. They are defined as follows:

$$Total\ Cost_i = \alpha + \beta_1 \times Trade\_Size_i + \beta_2 \times Post_i + \varepsilon_i \quad (7.5)$$

$$Price\ Reversal_i = \alpha + \beta_1 \times Trade\_Size_i + \beta_2 \times Post_i + \varepsilon_i \quad (7.6)$$

Table 7.4 reports the regression results for ‘top brokers’ in Panel A, and ‘other brokers’ in Panel B. After controlling for trade size, the ‘total costs’ of trades are significantly lower in the anonymous regime for both broker groups, across all stock groups, with the exception of trades in the 501+ stock group by ‘top brokers’, which exhibit no significant change. Parameter estimates of the post-anonymity dummy variable for ‘top brokers’ (‘other brokers’) in the top 100, 101-200, 201-500, and 501+ stock groups are respectively -0.0245% (-0.0088%), -0.0479% (-0.0067%), -0.0660% (-0.0995%), and -0.0050% (-0.0336%). Interestingly, the coefficient for the trade value of ‘top brokers’ in 501+ stocks is negative, despite all other ‘total cost’ regressions carrying a positive coefficient. This suggests that a large trade by ‘top brokers’ reduces transaction costs, which is counterintuitive. It is possible that ‘top brokers’ refrain from trading in these small stocks when liquidity is unavailable, and only choose to trade when spreads are tighter and depth is greater. The results may therefore be a partial reflection of this selection bias.

Table 7.4: Execution Costs, Controlling for Changes in Trade Size

This table reports the effect of anonymity on transaction costs, controlling for the value of the trades. A simple ordinary least squares regression, including the dollar value of trades and a dummy variable for the anonymous regime as independent variables, is estimated. To prevent an unnecessarily large number of statistics, purchases and sales are combined. The open to trade returns of sales and the trade to close returns of purchases are multiplied by minus one. With the exception of these adjustments, 'total costs' correspond directly to open to trade returns, while 'price reversals' correspond with trade to close returns. Panel A reports the regression results for 'top brokers', while those for 'other brokers' are reported in Panel B.

Market Capitalisation Group	**Variables**	**Total Cost**		**Price Reversal**	
		Estimate (%)	P-Value	Estimate (%)	P-Value
Panel A: Top Brokers					
Top 100	Intercept	0.0616	0.0000	0.0228	0.0000
	Size	0.0112	0.0000	-0.0449	0.0000
	Post	-0.0245	0.0000	0.0121	0.0000
101-200	Intercept	0.1430	0.0000	0.0485	0.0000
	Size	0.2565	0.0000	-0.2415	0.0000
	Post	-0.0479	0.0000	0.0282	0.0000
201-500	Intercept	0.3330	0.0000	0.0661	0.0000
	Size	0.6100	0.0000	-0.5601	0.0000
	Post	-0.0660	0.0000	0.0173	0.0000
501+	Intercept	1.211	0.0000	0.1070	0.0000
	Size	-1.728	0.0054	-3.094	0.0000
	Post	-0.0050	0.7850	-0.0232	0.0733
Panel B: Other Brokers					
Top 100	Intercept	0.0297	0.0000	0.0475	0.0000
	Size	0.0211	0.0000	-0.1246	0.0000
	Post	-0.0088	0.0000	-0.0023	0.0000
101-200	Intercept	0.1270	0.0000	0.0765	0.0000
	Size	0.2183	0.0000	-0.5796	0.0000
	Post	-0.0067	0.0002	-0.0004	0.7268
201-500	Intercept	0.4770	0.0000	0.1300	0.0000
	Size	0.3651	0.0000	-1.611	0.0000
	Post	-0.0995	0.0000	-0.0295	0.0000
501+	Intercept	1.346	0.0000	0.2730	0.0000
	Size	2.463	0.0000	-6.287	0.0000
	Post	-0.0336	0.0002	-0.0400	0.0000

Overall, the above results suggests that the ‘total costs’ of trading reduce when markets move to an anonymous regime. This is consistent with previous literature, and results reported in the previous sections. However, the extent to which cost reductions are economically significant for the smallest of stocks is debatable. For example, ‘total costs’ for ‘other brokers’ in the 501+ stock group is reduced by 0.0336%, while base costs (the intercept) are 1.346%, representing a fall of 2.4947% (using the intercept as the base). For the top 100 stocks on the other hand, ‘total costs’ are reduced by 29.69% for ‘other brokers’. A similar story exists for the ‘top brokers’, where ‘total costs’ are reduced by 39.76% in the largest stocks, but increase by 0.4143% in the smallest stocks (albeit a statistically insignificant change).

Foucault, Moinas and Theissen (2007) argue that anonymity reduces transaction costs, but only when the participation rates of informed traders are low. When applied to a stock with a high participation rate, they predict higher transaction costs in the form of bid-ask spreads. Smaller and less liquid stocks have more information held by corporate insiders, and are therefore more likely to experience informed trading, However, as the empirical section of their study only include stocks in the CAC40, representing the most liquid stocks on the Paris Bourse, little can be concluded regarding the effects of anonymity on small and illiquid stocks. While the results presented here do not show a rise in the ‘total costs’ of trading small stocks, they do suggest that the benefits of anonymity are much lower in these securities. To that extent, these results are consistent with the predictions of Foucault, Moinas and Theissen (2007).

The results also show larger price reversals in the anonymous regime for ‘top brokers’, while ‘other brokers’ have smaller reversals. The post dummy coefficients for the ‘top brokers’ in the top 100, 101-200, 201-500, and 501+ stocks are respectively 0.0121%, 0.0282%, 0.0173%, and -0.0232%, all of which are significant at the 1% level, with the exception of the 501+ stock group. For ‘other brokers’, the coefficients are -0.0023%, -0.0004%, -0.0295%, and -0.0400%, respectively, and are all significant with the exception of the 101-200 stock group.

Results presented above display a large disparity between the effects of the broker ID black-out on broker groups who are heterogeneously informed. These results show (after controlling for trade size) that the magnitude of price reversals generally increases for ‘top brokers’ and decreases for ‘other brokers’. This is consistent with the results from Section 7.4 (and Hypothesis 7.2), and the notion that anonymity benefits informed traders at the expense of uninformed traders. Markets in an anonymous regime have a greater difficulty in differentiating between the trades of the two broker groups. ‘Top brokers’ are more likely to be classified (or perhaps misclassified) as uninformed, while the trades of ‘other brokers’ are more likely to be treated as informed.

7.6 Contribution to Price Discovery

O’Hara (2003) argues that markets provide two things: liquidity and price discovery. Price discovery, or the process in which prices are formed in markets, is the centre of much attention in economics and related fields. In numerous market microstructure models, price discovery occurs through a process where the uninformed traders gradually learn about the true price of an asset by trading with the informed (e.g. Glosten and Milgrom, 1985; Kyle, 1985; Easley and O'Hara, 1987, 1992). This learning process is examined by Biais, Hillion and Spatt (1999) for the pre-opening period on the Paris Bourse. They find that as time approaches the opening, the information content and efficiency of prices increase.

A large number of studies examine the relative contribution to price discovery from different markets that trade identical or linked assets (e.g. Hasbrouck, 1995; and Harris, McInish, Shoesmith and Wood, 1995, for NYSE versus US regional exchanges; Fleming, Ostdiek and Whaley, 1996; and Tse, 1999, for derivatives versus equity markets; Eun and Sabherwal, 2003, for Canadian stocks cross-listed in the US; and Barkham and Geltner, 1995, for securitised versus unsecuritised real estate markets). The literature examines the level of contribution to price discovery made by medium versus other-sized trades (Barclay and Warner, 1993), and the level of contribution made by institutional versus retail traders (Chakravarty, 2001).

If financial intermediaries have heterogeneity in the level of information they hold, then informed intermediaries are expected to contribute a larger proportion to price discovery. This price discovery dynamic may be affected by changes to the market microstructure, especially when these changes allow informed brokers to mask their identity. In transparent markets, one would expect broker identifiers to act as a signal to information. Abnormal order flow patterns from an informed broker will likely attract the attention of other traders, at which point they may decide to mimic the strategies of the informed broker. This moves prices, reducing the ability of the informed broker to acquire their desired position.

Therefore in the presence of broker IDs, one way in which less informed brokers contribute to price discovery is by mimicking the trades of more informed brokers. In the absence of broker IDs, prices will not adjust as quickly and consistently to the trades of the informed broker, as markets rely solely on information available in the order flow, reducing the less informed brokers' contribution to price discovery. One would therefore expect more informed brokers to make a larger contribution to price discovery in the anonymous regime.

This section extends the literature by examining the relative contribution to price discovery made by more informed and less informed brokers, and the clients whom they represent. This section also examines how this price discovery dynamic is affected by the ASX broker ID removal. A measure similar to the Weighted Price Contribution (WPC) metric used in Barclay and Warner (1993) is adopted. The WPC measure is defined as follows:

$$PC_s^b = \frac{\sum |\Delta P_{si}^b|}{\sum |\Delta P_{si}|} \qquad (7.7)$$

Where the price contribution of broker group b in stock s is the ratio of (i) the sum of price changes caused by broker group b and (ii) the sum of price changes caused by all brokers. For each stock, the proportion of price innovations caused by the 'top brokers' is calculated. This is then averaged across stocks to obtain the average contribution to price discovery across stocks. Stocks are grouped based on their market capitalisation on 28 November, 2005. Stocks which were not listed for the entirety of the two year sample period are removed from the analysis. In cases where one broker group made zero contribution to price discovery in either the pre- or post-anonymity periods, that stock is also removed. This section also calculates per stock changes in the WPC. To measure the extent in which changes to the WPC are significant, a t-test is computed on the series of mean WPC changes, and a sign rank test for the medians.

Table 7.5 reports the average contribution to price innovation by ‘top brokers’ and ‘other brokers’, in the pre/post-anonymity regimes, grouped by market capitalisation. The results show that ‘top brokers’ contribute significantly to price discovery, especially in the larger stocks. In the top 100 and 101-200 stock groups, the ‘top brokers’ contribution to price discovery exceeds 50% and 40%, respectively. This contribution is lower for the 201-500 and 501+ stock groups, exceeding 25% and 15% respectively. Therefore the top ten full-service brokers appear to have an information advantage in the larger and more liquid stocks. In the small to micro caps (201-500) and unindexed stocks, this advantage, if any, is much lower. To the extent that large institutional traders are more likely to use reputable full-service brokers, these results are consistent with Chakravarty (2001), who find that institutions move prices more often than retail investors.

Consistent with Hypothesis 7.3, results also show that the top brokers contribute more towards price discovery in the anonymous regime (with higher mean and median WPC in the post period), but only for the top 500 stocks (roughly corresponding to stocks in the All Ordinaries Index). Mean (median) WPC increases are 1.6944% (2.0258%), 3.4351% (3.3021%), and 2.4726% (2.6194%) for the top 100, 101-200, and 201-500 stocks, respectively. For stocks outside of the top 500, large research brokers actually contribute less to price discovery, with mean (median) WPC decreasing by 1.2437% (0.5950%).

Table 7.5: Contribution of Top Brokers to Price Discovery

This table reports the contribution of 'top brokers' to price discovery in the two transparency regimes, using the Weighted Price Contribution (WPC) metric first seen in Barclay and Warner (1993). The WPC metric (for each stock) is defined as the total absolute price movements caused by the trades of 'top brokers', divided by the total absolute price movements for the entire stock. This table reports the mean contribution of 'top brokers' to price discovery (per stock) in the pre/post periods, with the associated mean/median changes, and are grouped by market capitalisation. To examine the significance of mean changes on a stock by stock basis, paired student t-tests are conducted. Medians are tested using signed rank tests.

Market Capitalisation Group	Mean Pre (%)	Mean Post (%)	Mean Change (%)	P-Value	Med. Change (%)	P-Value
Top 100	53.14	54.84	1.694	0.0004	2.026	0.0003
101-200	43.14	46.57	3.435	0.0000	3.302	0.0000
201-500	26.69	29.16	2.473	0.0000	2.619	0.0000
501+	17.21	15.97	-1.244	0.0105	-0.5950	0.0209

In general, these results are consistent with the notion that the informed gain with anonymity. Some caution is advised when interpreting these results based on the broker groupings. While the likelihood for 'top brokers' to be informed is higher than for 'other brokers', this does not necessarily mean that 'top brokers' are always more informed. The level of a broker's informativeness is partially related to their research activities. Therefore, if a broker has no coverage in a particular stock, the likelihood of their being informed in that stock will be much lower.[21] With that in mind, the results do not show that the informed contribute less to price discovery in the 501+ stock group, and they should not be interpreted as a deviation from economic

[21] Indeed, some of the 'top brokers' do not even have a small/micro caps equity analysis team during the sample period, and focus solely on the top 100 stocks.

common sense. What these results do show is that an information advantage exists for ‘top brokers’ in the larger stocks, and the removal of broker IDs appears to magnify these advantages. Likewise, the broker ID blackout has increased the competitive disadvantage for ‘top brokers’ in the smallest of unindexed stocks, where coverage is extremely sparse, if not non-existent.

7.7 The Effect of Anonymity on Brokerage Market Share

Market share is likely to be of high importance to brokers as it represents the pool from which they draw revenue. The literature shows that information provided by equity analysts has a significant impact on volume generated through the affiliated brokerage firm. In stocks for which brokerage firms provide analyst coverage, Irvine (2001) shows that order flow is higher than for uncovered stocks. Irvine (2004) finds that earnings forecasts and recommendations cause significantly higher volume for the brokerage firms that release them. In transparent markets, traders that do not have access to analyst research reports can mimic (to a certain extent) the strategies of full-service brokers by observing their order flow. In anonymous markets, however, this ability is impaired, as traders can no longer identify the brokerage houses historically associated with valuable research reports. The value placed on equity research reports is therefore likely to be higher in anonymous markets. This may lead to an increase in the order flow of the reputable full-service brokers.

This section hypothesises that brokers who are more likely to be informed will be the beneficiary of these market share increases (Hypothesis 7.3). This hypothesis is consistent with the study conducted on corporate bond markets by Bessembinder, Maxwell and Venkataraman (2006), who find a reduction in the market share of large dealers when switching to a more transparent reporting regime. To measure market share, the total dollar turnover and number of trades executed through ‘top brokers’ versus ‘other brokers’ are calculated.

Table 7.6 shows that the ‘top brokers’ market share in turnover increases across all stock groups, with the exception of the 501+ group. Changes in the turnover market share for the top 100, 101-200, 201-500, and 501+ groups are 0.4265%, 4.0284%, 4.5838%, and -0.0395%, respectively. For the number of trades, market share for the ‘top brokers’ increases across all stock groups, with changes of 3.7736%, 6.7702%, 7.4574%, and 0.1735%, respectively. While these results represent the actual changes to market share in turnover and number of trades, their level of significance is difficult to determine, as they lack the necessary degrees of freedom to conduct reasonable statistical tests. For the purpose of statistical testing, changes in market share are calculated for each stock separately. From these calculations, the mean and median per stock change in ‘top broker’ market share is then determined. For the purpose of statistical testing, a t-test is conducted for the mean, and a sign rank test for the medians.

Table 7.6: Market Share in Turnover and Number of Trades

This table reports the market share of 'top brokers' in trade turnover and number of trades, grouped by the market capitalisation of stocks. Statistics are calculated separately for the two transparency regimes, with the difference in the pre/post market share representing the change. As the 'change' is a simple difference between two numbers, no statistical tests are provided. All numbers reported are in percentages.

Market Capitalisation Group	Top Brokers Turnover Market Share (%)			Top Brokers No. Trades Market Share (%)		
	Pre	Post	Change	Pre	Post	Change
All	54.45	55.21	0.7570	46.13	50.72	4.590
Top 100	57.35	57.78	0.4265	53.59	57.36	3.774
101-200	47.09	51.12	4.028	47.71	54.48	6.770
201-500	29.46	34.04	4.584	30.41	37.86	7.457
501+	14.04	14.00	-0.0395	12.17	12.35	0.1735

Table 7.7, Panel A displays the results for market share in turnover, and results based on the number of trades are in Panel B. The direction of market share changes in Table 7.7 is generally consistent with those presented in Table 7.6. For turnover (Panel A), mean (median) changes in market share for the 'top brokers' in the top 100, 101-200, 201-500, and 501+ groups are 2.0468% (2.0839%), 3.8287% (2.9406%), 2.6499% (2.7417%), and -0.7312% (-0.7313%). For the number of trades (Panel B), mean (median) changes in market share for the same groups are 4.5228% (4.0201%), 6.0871% (5.6220%), 2.9553% (3.1272%), and -0.4283% (-0.5888%). The above results are significant at the 1% level of significance for t-tests and signed rank tests, with the exception of t-test for mean change in turnover market share in the 501+ stock group (significant at the 2% level), and both tests for changes in the number of trades in the same group (significant at the 10% level).

Table 7.7: Market Share, Per Stock Average

This table reports the market share of 'top brokers' in trade turnover (Panel A) and number of trades (Panel B), grouped by the market capitalisation of stocks. Statistics are calculated on a per stock basis, separately for the two transparency regimes, with the difference in the pre/post market share representing the change. To measure the significance of changes in means, t-tests are conducted, while signed rank tests are conducted to test the medians.

Market Capitalisation Group	Pre Market Share (%)	Post Market Share (%)	Mean Change (%)	P-Value	Med. Change (%)	P-Value
Panel A: Average market share per stock in turnover						
All	23.79	24.20	0.4126	0.0855	0.4118	0.0619
Top 100	55.47	57.51	2.047	0.0000	2.084	0.0000
101-200	45.36	49.19	3.829	0.0000	2.941	0.0000
201-500	28.46	31.11	2.650	0.0000	2.742	0.0000
501+	17.26	16.53	-0.7312	0.0178	-0.7313	0.0009
Panel B: Average market share per stock in no. of trades						
All	22.50	23.49	0.9856	0.0000	0.9490	0.0000
Top 100	53.05	57.58	4.523	0.0000	4.020	0.0000
101-200	46.07	52.16	6.087	0.0000	5.622	0.0000
201-500	28.05	31.00	2.955	0.0000	3.127	0.0000
501+	15.63	15.21	-0.4283	0.0693	-0.5888	0.0572

These results are therefore consistent with the notion that anonymity affects the value of equity research, and consequently the market share of the large and reputable full-service brokers. Consistent with Hypothesis 7.3, market share for the 'top brokers' increases significantly across all stock groups in both turnover and the number of trades made, with the exception of the 501+ group. Their market share in the smallest of stocks actually decreases, albeit at a lower level of statistical significance. This is possibly related to the lack of equity research conducted on unindexed stocks.

The literature presents two possible sources of remuneration for equity analysts covering a stock: from additional brokerage generated through increased trading, and from potential investment banking income arising from any relationships created with management. These potential sources of income are likely to be small for the stocks outside of the All Ordinaries, making analyst coverage in them unlikely. Furthermore, market share for the ‘top brokers’ in these stocks is small to begin with (i.e. around 15%). The ‘top brokers’ are therefore less likely to be informed in these small stocks, which explains why anonymity has not improved their market share. This is consistent with the results obtained from the price discovery analysis (from Table 7.5), where the ‘top brokers’ are found to contribute less to price discovery in the 501+ stock group.

7.8 Summary

Using a unique dataset from the ASX with broker identifiers, this chapter aims at disentangling from a pool of averages the effect of anonymity on heterogeneously informed brokers. While recent empirical literature in anonymity focuses predominantly on market-wide effects, this study takes one step further and examines the winners and losers after anonymity is introduced. Consistent with the empirical literature, the results show that market-wide average execution costs decrease. However, these benefits appear to be skewed towards the large and reputable full-service brokers, who are more likely to be informed. The purchases of these full-service brokers have greater price reversals post-anonymity, a result not seen consistently for other brokers.

This lends support to the notion that anonymity reduces the market's ability to infer information from the identity of brokers, reducing the impact of information-motivated trades to subsequent prices. However, the trades of the less informed brokers face a case of 'mistaken identity', and lose their ability to reduce price impact by signalling to the market. This is consistent with the theoretical work by Admati and Pfleiderer (1991), who propose lower transaction costs for uninformed traders, but only when these traders are able to signal.

Consistent with the above findings, this study shows, using Barclay and Warner's (1993) Weighted Price Contribution (WPC) metric, that large and reputable full-service brokers contribute more to price discovery in the anonymous regime. This is not surprising, as anonymity reduces the ability of less informed brokers to mimic the trading strategies of the informed. This chapter also finds evidence that brokerage market share for the 'top brokers' increases in the anonymous regime. This is consistent with the findings of Bessembinder, Maxwell and Venkataraman (2006), who find reduced market share for the largest dealers when corporate bond markets move to a more transparent regime.

Chapter 8: Conclusions

In a market free from imperfections, such as those described by Leon Walrus, it is unclear what role market intermediaries play, if any. However, equity markets suffer from two imperfections: imperfect liquidity and imperfectly symmetric information. Given these imperfections, market intermediaries serve two roles: to reduce execution and liquidity costs when markets are not perfectly liquid, and to reduce information asymmetry costs through information production and dissemination, and through the identification of trades that are more likely to be informed. Therefore, demand for the services of market intermediaries exists in equilibrium, enhancing overall welfare.

While both roles are important in reducing market imperfections (and are therefore discussed), this dissertation focuses predominantly on the relationship between market intermediaries and information asymmetry. By differentiating the identities of different market intermediaries using unique datasets, this dissertation re-examines the issues surrounding market intermediaries and information asymmetry, but with greater detail than what was previously possible. Specifically, this dissertation examines three areas of the literature that require additional clarification:

1) The role of brokers in upstairs markets,
2) The relationship between equity analysts and information asymmetry, and
3) The effect of market structures on heterogeneously informed market intermediaries.

Chapter 5 investigates the role of brokers in the upstairs market. The literature argues that upstairs facilities are valuable to traders because they offer taps into unexpressed liquidity (Grossman, 1992), and for their ability to filter out informed traders (Seppi, 1990). The ASX provides a unique setting to test the predictions of Seppi (1990), where upstairs brokers differentiate between informed and uninformed traders, as no 'fairness' rules exist on the pricing of ASX upstairs trades. When brokers have the freedom to trade at any negotiated price, they will be more willing to trade with the informed provided they are sufficiently compensated for the risk they take on. This is in direct contrast to other studies, which only sample upstairs trades that occur close to the best spread.

Results suggest that upstairs markets are more widely used when liquidity in the downstairs market is low, or when trading costs are high. Results also suggest that upstairs markets are especially useful for complex trades, i.e., trades of larger size and trades in smaller stocks, which are often difficult to arrange cheaply in the downstairs limit order book. Findings in Chapter 5 are therefore generally consistent with Grossman (1992) and the widely held belief that upstairs markets allow for the execution of trades that would not otherwise have occurred.

Results on the absence of 'fairness' rules indicate that a large number of upstairs trades occur outside of the best downstairs spread, in contrast to the findings of Bessembinder and Venkataraman (2004). When prices are moving quickly, upstairs trades receive poorer execution costs (in comparison to flat markets), as they are more likely to carry information. To the extent that upstairs brokers differentiate between informed and uninformed traders, these results are consistent with Seppi (1990).

Findings from Chapter 5 contrast with those of Fong, Madhavan and Swan (2004), who find no evidence of broker filtering. In addition, these results provide evidence that upstairs brokers may use other information in addition to trader reputation (e.g. market conditions) to determine the information content of trades. This is consistent with Chiyachantana, Jain, Jiang and Wood (2004), who report market conditions as a strong determinant of execution costs for institutional traders in the downstairs market.

Chapter 6 investigates the complex relationship between equity analysts and information asymmetry by examining the level of investor access to analyst reports. The literature suggests that analysts help to reduce information asymmetry by bringing privately held information in the hands of management to the market, and through their superior ability in disseminating and analysing publicly available information. Merton (1987) separates information asymmetry into two dimensions: information asymmetry between investors and the management (depth), and information asymmetry between shareholders (breadth). While both are presumably important dimensions of information asymmetry, the literature focuses predominantly on the relationship between analysts and the depth dimension of information asymmetry (e.g. Rogers and Grant, 1997; Frankel and Li; 2004).

Results from Chapter 6 are consistent with the presence of leakages in analyst recommendations. Furthermore, clients of larger and more reputable broker-analysts appear to use more analyst reports. While analysts may excel at bringing privately held information to the market, its distribution is unlikely to be equal. Thus, there is a likely trade-off in the information asymmetry between investors and the management (depth), and information asymmetry between shareholders (breadth).

However, Chapter 6 refrains from making the dangerous conclusion that these leakages are necessarily bad for the market. As Irvine, Lipson and Puckett (2007) and Gomes, Gorton and Madureira (2007) suggest, removing leakages altogether would seriously affect the analysts' incentives to acquire information. Therefore, in the case of equity analysis, there exists a trade-off between the level of information asymmetry between shareholders and the management, and the asymmetry between shareholders.

Chapter 7 re-examines the effect of anonymity using a unique dataset from the ASX with broker identifiers. The recent literature suggests that anonymity increases liquidity (e.g. Foucault, Moinas and Theissen, 2007; Comerton-Forde, Frino and Mollica, 2005; Comerton-Forde and Tang, 2008; and Frino, Gerace and Lepone, 2008). However, these studies are conducted on a market-wide basis, despite brokers being the natural unit of analysis. Using a unique dataset, Chapter 7 aims at disentangling from a pool of averages the effect of anonymity on heterogeneously informed brokers.

While the results suggest that market execution costs decrease on average (which is consistent with prior literature), the benefit of anonymity is skewed towards the large and reputable full-service brokers, who are more likely to be informed. Findings in Chapter 7 indicate that anonymity reduces the market's ability to infer information from trades. This results in larger price reversals for the trades of large full-service brokers. However, the trades of the less informed brokers face a case of 'mistaken identity', and lose their ability to reduce price impact by signalling their identity to the market (e.g. through mechanisms similar to those described by Seppi, 1990; or Admati and Pfleiderer, 1991). Furthermore, results suggest that the market share of large full-service brokers increases, with their trades having a greater contribution to price discovery. Chapter 7 illustrates the complexity of the relationship between anonymity and market quality, a complexity that is difficult to appreciate when examining a pool of averages.

Overall, the results presented in this dissertation raise three complexities in the relationship between market intermediaries and information asymmetry. Chapter 5 shows that upstairs brokers filter out informed trades (through market conditions in addition to reputation). If some of these informed trades are forced downstairs, this may have implications for the quality of downstairs markets. Chapter 6 demonstrates that the distribution of equity analyst reports is unlikely to be equal, with certain investors having greater access. While equity analysts may reduce information asymmetry between the management and shareholders, unequal information dissemination may potentially result in a higher level of information asymmetry among shareholders. Chapter 7 finds that anonymity improves market quality on average, although these benefits are skewed towards brokers who are more likely to be informed.

Doubtlessly, these complexities warrant greater investigation. To further explore these areas in the future, this dissertation proposes two additional avenues of research. First, to examine the effects of upstairs markets 'cream-skimming' downstairs markets, an investigation could be conducted on an exogenous increase in the level of upstairs activity. The simplest foreseeable method for this investigation is the identification of changes in upstairs thresholds. For example, a higher (lower) threshold will exogenously increase (decrease) the number of upstairs trades. Second, theory is currently lacking on the trade-off between the depth and breadth dimensions of information asymmetry. It would be valuable to investigate the costs and benefits of equity analysts in the context of this potential trade-off in information asymmetry.

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