Trader Profits by Institutional and Retail Participants in Options Markets

Elvis Jarnecic and Kevin Liu*

*Finance Discipline, Faculty of Economics and Business, The University of Sydney.
Corresponding author: Elvis Jarnecic, Finance Discipline, Faculty of Economics and Business, The University of Sydney, Sydney, 2006. email: e.jarnecic@econ.usyd.edu.au

Abstract

This paper examines the source and determinants of trading profitability for institutional and retail traders on the ASX exchange traded option market. Both institutional and retail traders are found to derive a substantial proportion of their total profitability from providing liquidity but incur significant losses from price movements unfavourable to their inventory position (position-taking profits). Although both trader groups lose to market makers, institutional traders perform better than retail traders. Both trader groups are documented to initiate a small proportion of transactions they are involved in. They thus appear to be best characterised as net liquidity suppliers in the market. It is also found that institutional traders have stronger ability to process and utilise both order flow and exogenous market sensitive information than retail traders.

1. Introduction

Two developments that have been dominant in financial markets over the past two decades have been the increasing importance of derivatives markets and institutional investors. As a result of rapid advances in technology, financial engineering and increased market volatility and risk; world financial markets have witnessed the rapid growth, development, and widespread use of complex and sophisticated derivatives products. Alongside this has been the growing dominance of institutional investors, such as insurance company, superannuation and mutual funds in different types of securities markets. The emergence of institutional investors as an increasingly important market participant has imposed major changes in trader structure and dramatically remodelled the trading landscape in global financial markets. These two significant developments lead to interesting questions: what are the roles and impacts of institutional investors on derivative markets? What position and characteristics do non-professional individual investors (or retail investors) have in an era of institutional trading? While some empirical studies have attempted to address these issues, the focus of prior research has largely been on a particular group of traders in equity or futures markets. This study investigates the trading profitability of both institutional and retail investors in the Australian Securities Exchange (ASX) Options Market. Further profitability is segmented in components derived from market making and position taking activities. An understanding of the profitability of these two trader groups can provide important insights into their trading behaviour and economic roles in the market.

This study (1) empirically examines the magnitude and source of options trader profits for institutional and retail investors and (2) investigates the determinants of the trading profits for these two trader groups in the ASX Options Market. In order to examine the characteristics of these two trader groups, the trading profits are decomposed into liquidity and position-taking profits in a manner consistent with the prior trader profitability studies (e.g. *Hasbrouck and Sofianos, 1993; Frino et al., 2000; Chakravarty and Li, 2003*). The study extends this literature to institutional and retail traders in an options market. To our knowledge, this study represents the first empirical analysis that explicitly investigates the profitability of specific market participants in options markets.

This paper is motivated in a number of ways. First, while there exists a considerable body of research on the profitability of various types of investors in equity and futures markets, few studies have contributed to our understanding of the main sources and determinants of trader profitability in options markets. Further, the existing literature on trader profitability primarily focuses on market makers or quasi-market makers with little attention to other market participants. For example, *Hasbrouck and Sofianos (1993)* examine the profitability of transactions by specialists on the floor of the NYSE. *Kuserk and Locke (1993)* describe the high-frequency trading of futures floor traders trading for their own account and compare profits of this investor group on days in which futures prices hit price limits to other days in US futures market. *Frino et al. (2000)* examine the profitability of locals in the Australian futures market. These studies provide important evidence on the trading behaviour and economic roles of market makers (quasi-market makers) in the relevant equity and futures markets. However, given that market makers have significantly different obligations and

privileges to the other market participants and the distinctive market microstructures in equities, futures and options markets, the findings of these existing studies do not extend to institutional and retail investors in the options markets. Hence, the nature and economic roles of these two important trader groups are still unclear. This study aims to fill this gap by analysing the trading profits of these two trader groups separately in an options market.

Second, researchers rarely have access to information with respect to trader identity. Some exchanges do not collect quote information whereas others do not release such information presumably due to reasons of confidentiality. These issues impose enormous difficulties in distinguishing trader types and allocating their trading profits to the correct trader group. For this study, both transaction-level information and broker IDs are available for the ASX Options Market. This allows us to allocate brokers as retail or institutional, and therefore identify trades according to these two categories.

This paper therefore makes several contributions. First, it extends literature on trader profitability to institutional and retail traders in an options market. Due in part to difficulty of obtaining data, no prior studies have examined the trading profitability of market participants other than market makers (quasi-market makers). The data set obtained for this study provides a unique opportunity to extend prior literature to these two important trader groups in the options markets. Second, this study provides an understanding of institutional and retail participation, trading behaviour and economic roles in the options markets. The analysis of trader profitability and distribution of trading profits offers numerous valuable insights into the nature and characteristics of the two trader groups. The examination of liquidity and position-taking profits not only can provide evidence on the relative information advantage possessed by each trader group (*Manaster and Mann, 1999*) but also indicate the ability of each trader group to interpret information and adjust their position accordingly (*Hasbrouck and Sofianos, 1993*). Since the profits earned by traders represent their reward for providing liquidity and/or trading on order-flow related information (*Frino et al., 2000*), an analysis of trader profits also provides evidence on the economic roles of these two trader groups. Further, the distribution of profits can reveal useful information about the possible trading strategies employed by traders (*Fishman and Longstaff, 1992*). Therefore, an analysis of trader profits offers useful insights into the trading behaviour of each trader group and their economic roles, thereby constructing a more complete picture of trader dynamics in the options markets.

The remainder of this paper is organized as follows. Section 2 describes the institutional detail, including the organization of options trading on the ASX and the different types of options products traded. Section 3 provides a review of relevant literature regarding trader profitability and institutional/retail traders and theoretical considerations. Section 4 outlines the data used, while Section 5 describes the method of analysis. Section 6 reports the results of the empirical analysis. The final section provides a conclusion and direction for future research.

2. Institutional Details

This section presents a brief description of the features, trading procedures, market microstructure and the options contracts traded on the ASX Options Market.

The exchange traded option (ETO) market in Australia commenced trading on 3 February 1976 and is ranked amongst the top 10 options exchanges in the world according to trading volumes. The ASX Options Market attracts a broad range of market participants, including over 100,000 retail investors and most of the major financial institutions such as JP Morgan, Citigroup, Merrill Lynch and Deutsche Bank. As illustrated in figure 1, the ASX Options Market has exhibited a rapid growth in the past two decades. As at December 2004, the average trading volume exceeds 100,000 contracts a day, representing trade value of $250 billion per annum.

The ASX exchange traded option market operates using a fully automated screen based system, the Derivatives Trading Facility (DTF) that links brokers across the country. It is a modified version of the CLICK system developed by OM Technology (Sweden), a leading provider of exchange technology. Screen based trading commenced on 31 October 1997, prior to this options were traded by open-outcry on the trading floor. The introduction of screen based trading has brought about a significant change to the market. The market structure of the ASX Options Market now can be viewed as a hybrid order-driven system that combines order book trading and dealer trading (where the competitive market makers are referred to as 'Registered Traders'). Limit orders submitted by traders are kept in a central limit order book and executed automatically against market orders on a price time priority basis. As most options contracts are thinly traded, market makers are present to provide liquidity in the market, allowing traders to trade in and out of option positions. Market makers can be either individuals or firms. Each market maker is assigned one or more stocks in which they must meet certain obligations for certain percentages of time. Market makers are required to provide liquidity in the at- and near-the-money series at a maximum spread for a minimum number of contracts. Where a market does not exist, market makers are obliged to provide two-way quotes upon requests. Under this hybrid trading mechanism, liquidity is supplied by both market makers and limit order submitters; market makers not only compete against one another but also complete against the limit orders submitted by other traders while trading on their own account and at their own risk. In return of undertaking their obligations, all orders on the DTF are transparent to market makers and they are charged reduced trading fees.

All options contracts are cleared by the Australian Clearing House (ACH)[1]. The ACH acts as a central counterparty to each contract and guarantees its performance. The ACH collects margins from clearing members (for written positions) as part of its risk management procedures. ACH margin liabilities can be satisfied by cash or collateral such as shares, bank guarantees and money market securities. The ACH operates an electronic settlement and transfer system for settling derivative trades which is known as the Derivatives Clearing System (DCS). DCS is a computerised system providing electronic security transfer and electronic Delivery versus Payment (DvP) settlement, with monetary obligations between participants being met directly between participants and the funds transfer system of the banks.

[1] Formerly known as Options Clearing House (OCH).

It currently takes three business days after a trade (T+3) to settle.

This study focuses on exchange traded options. Although institutional traders are the dominant market participant in the ASX equity market and perceived to be a dominant force in the derivatives markets, the ASX exchange traded option market largely comprises retail investors.

Three types of ETO contracts are available on the market: 1) Index options; 2) Stock options; and 3) Low Exercise Price Options (LEPOs). Index options are European options that are exercisable only on expiry day. The underlying entity of Index options can be any ASX approved indices such as S&P/ASX 200 Index and S&P/ASX 50 Index. The Index options are cash settled using the opening price index calculation on expiry morning. Stock options are usually American style which can be exercised on or before the expiry date. Stock options are standardized by contract size (each contract representing 1,000 shares of the underlying stock), expiry date, and exercise price. As at July 2007, stock options written on 144 underlying stocks are available on the ASX Options Market, including 62 FLEX options[2] which carry no market maker obligations and have no quarterly expiry cycles. LEPOs are European style options that may be over either shares or indices. LEPOs have extremely low exercise price (1 cent for shares and 1 point for indices), so they trade for large premiums. LEPOs allow investors to profit from movements in the underlying entity on a one-for-one basis. Hence, buying (selling) LEPO is effectively similar to forward purchase (sale) of the underlying entity with highly leveraged exposure. Unlike other exchange traded options of which only the writer is margined, both the buyer and the writer of LEPOs are margined. There are currently 47 stocks with LEPOs listed.

Normal trading in the ASX exchange traded option market takes place on a continuous basis between 10:00 am and 4:20 pm for stock options. Unlike the opening procedures in the ASX equity market, no orders can be inputted prior to the opening and unexecuted orders are not allowed to carry forward to the next trading day in the options market. Though the options market opens at 10:00 am, each option class remains suspended until the underlying stock is opened in ITS[3]. The trading hours for stock options on the ASX is presented in Table 1.

As the table illustrates, market makers are not obliged to provide liquidity in two daily trading sessions; an afternoon session from 1:00 pm to 2:00 pm and an extended normal trading session from 4:00 pm to 4:20 pm. While market makers can still make transactions during these periods, they are not obliged to do so. After-hours trading is also possible following late trading procedures after 4:20 pm. The focus of this study is on the normal trading period from

2 Flexible (FLEX) options are option contracts traded on the ASX that have the exercise price, expiry month, expiry date and underlying security determined by the party seeking to have the series of options listed. FLEX options are available over either shares or indices approved by the ASX and can be American or European style exercise (can be European style only for Index options).

3 Integrated Trading System, formerly known as Stock Exchange Automated Trading System (SEATS) which is a national fully automated trading platform used in the ASX equity market.

10:00 am to 4:20 pm.

3. Literature review and theoretical considerations

This section provides a review of literature relevant to trader profitability and institutional/retail traders and discusses theoretical considerations. To our knowledge, no research has explicitly analysed the profitability of specific market participants in options markets. A number of studies have examined trader profitability in equity and futures markets. Even though their findings are not necessarily generalisable to other market participants in options markets, the results nevertheless provide useful insights into the characteristics and determinants of trader profitability. With regard to institutional and retail traders, a considerable number of studies have provided evidence on the broad features of their informativeness, trading behaviour and economic roles in various types of markets. The rest of the literature review is divided into three subsections: section 3.1 reviews the literature on trader profitability, whereas section 3.2 covers the relevant institutional/retail trader literature. Section 3.3 discusses theoretical considerations.

3.1 Trader Profitability

This subsection reviews the relevant trader profitability studies in equity and futures markets. Perhaps due to the difficulty of obtaining detailed data, very limited empirical research has been accomplished in this area. The prior studies are primarily focused on market makers (or quasi-market makers) with little attention to the other market participants. Nevertheless, the existing studies provide many valuable insights into the analysis of trader profits and the determinants of trader profits.

In equity markets, *Hasbrouck and Sofianos (1993)* examine the profitability of transactions by the specialists (official market makers) on the floor of the New York Stock Exchange (NYSE). *Hasbrouck and Sofianos (1993)* use a sample of 137 firms for the period between November 1990 and January 1991 in their transaction analysis and a sample of 138 firms covering November 1988 through August 1990 in the daily analysis. They examine the nature of specialist trading profits and find that although the gross trading profits vary considerably across stocks and are often statistically indistinguishable from zero in long-term; the short- and medium-term components of trading profits are strongly positive and often statistically significant. The results suggest that specialist trades are profitable, but only in short and medium terms. These findings strongly confirm that specialist trading profits are mostly attributable to their short- and medium-term trading activity. *Hasbrouck and Sofianos (1993)* argue that their results reveal that as sole market makers, NYSE specialists are good short-term traders but undistinguished long-term speculators. They also demonstrate that these trading profits are almost entirely derived from bid-ask spread. When trades are assumed to take place at the midpoint of the spread, the implied profits are sharply reduced. However, they findings also show that although the implied trading profits are reduced significantly, small positive profit components do remain in the quote midpoint. *Hasbrouck and Sofianos (1993)* argue that the presence of these small positive profit components indicates specialists' ability to benefit from correctly anticipating price reversals. The paper provides important

evidence on that the bid-ask spread is a significant determinant of trader profitability in equity markets; and demonstrates that the specialists profit not only from the provision of liquidity but also through transacting on the basis of superior order flow information.

In relation to futures markets, a number of prior studies have examined profitability of various trader groups as market makers in the US futures markets. *Silber (1984)* examines the earnings of "scalpers" on the floor of the New York Futures Exchange (NYFE) during 1982-83 in order to identify the role of market makers in a freely competitive auction of futures exchanges. Scalpers are defined as specialized group of floor traders who fall into the category of short-term speculators and prefer to trade for themselves rather than execute orders through a floor broker. They are also referred to as "locals" and many studies suggest that they behave as if they are market makers (e.g. *Smidt 1985; Kuserk and Locke 1993*). As *Silber (1984)* argues, these traders are essentially market makers who quote bids and offers against which market orders can be executed. Unlike official market makers (e.g. NYSE specialists), locals do not have affirmative obligations to provide liquidity by quoting bids and offers but do so in the expectation of earning a return. Hence, they are more appropriate to be viewed as quasi-market makers without official duties. In order to examine the nature and function of locals as quasi-market makers, *Silber (1984)* uses transaction data of a representative local to identify the source of their income. He demonstrates that local profits stem from their skill in evaluating market conditions in the very short run and providing liquidity to other market participants. The findings reveal that the income of locals are positively related to the bid-asked spread and negatively related to the length of time a position is held, which are consistent with the results of *Hasbrouck and Sofianos (1993)*. *Silber (1984)* also shows that although competitive locals in futures markets do not have the same obligations and privileges as official market makers, they do behave and benefit in a manner consistent with the active market makers in equity markets. *Silber (1984)* supports the findings of *Hasbrouck and Sofianos (1993)* in futures markets by providing evidence on the importance of bid-ask spread as a determinant of futures local trader profitability. The paper also demonstrates the effectiveness of an analysis of trader profits in evaluating the economic roles of a particular trader group.

The characteristics of the quasi-market makers are further explored by *Manaster and Mann (1999)* in the US markets. In their paper, *Manaster and Mann* employ a highly detailed data set to analyse the trading profits of futures locals on the Chicago Mercantile Exchange (CME). While most of the previous profitability studies have to infer trade directions (buy or sell) due to the unavailability of comprehensive data, *Manaster and Mann (1999)* obtain an extensive data set which allows them to have direct observation of trade direction and obtain precise identification of trade contra parties for every transaction (trade aggression). This high level of detail in the data facilitates a decomposition of trading profits into two components: liquidity profit and timing profits (due to impact of price movements). *Manaster and Mann (1999)* demonstrate that the empirical results of the analysis of trader profits are highly sensitive to correct identification of trade direction. They argue that because their data can directly identify trade direction, they are able to discover some empirical regularities that have not been observable to previous studies which employ methods of inferring trade direction since these studies fail to properly distinguish between trade aggression and trade-direction. In

contrast to the traditional microstructure theory, they find that the CME market makers rather than the outside customers appear to have the information advantage. Their results indicate that market makers are predominant informed traders, not merely order fillers who provide liquidity services. They also discover that market makers receive less for trade execution when they make a well-timed trade. *Manaster and Mann (1999)* argue that these observations demonstrate that the market makers have both an execution advantage and a timing advantage relative to other market participants. When there is a trade-off between timing and execution, market makers with valuable information are willing to reduce or eliminate the execution advantage to exploit the information advantage. The findings of *Manaster and Mann (1999)* reveal a more complicated role for market makers than many previous theoretical and empirical studies have acknowledged; and provide important evidence on the close relationship between trader profitability and trade directions; and the negative relationship between trader's liquidity and position-taking profits.

The complicated role of future local traders as quasi-market makers is further confirmed by *Frino et al. (2000)* in Australian market. The study examines the profitability of local traders on the Sydney Futures Exchange (SFE); and provides evidence on the economic role of local traders in a non-US market. Unlike US futures markets, the Sydney Futures Exchange collected both quote information and transaction data which can be used to identify the parties involved in each trade. The study obtains trading floor data for the four most actively traded contracts and transaction level data, includes details such as trader identification, a unique transaction number and customer trade indicator (CPI), from the SFE for the period 24 July 1997 to 31 December 1997. The unique data set enables *Frino et al. (2000)* to decompose the total trading profits of locals into liquidity and position-taking components. The decomposition of trading profits is consistent with *Manaster and Mann (1999)* in which the trading income is decomposed into liquidity and "timing" profits (profits due to changes in true inventory prices). The profit measuring method *Frino et al. (2000)* adopted is in a manner similar to *Hasbrouck and Sofianos (1993)*. Their final results reveal that although local traders are expected to provide liquidity, they derive a substantial proportion of their total profits from position-taking. While locals appear to be net liquidity suppliers; they may actively trade when they process information relating to future price movements. Given these characteristics of locals, *Frino et al. (2000)* conclude that even though locals are often portrayed as unofficial market makers in futures exchanges, they are more appropriate to be characterized as active informed traders. These findings are consistent with the results of *Manaster and Mann (1999)* and further confirm that local traders play a more complex role than it is traditionally outlined in the futures market literature. In addition to the analysis of trader profits, *Frino et al. (2000)* also explicitly examine the determinants of local trader position-taking profitability using a regression analysis. The position-taking profits of local traders is found to be positively related to order-flow related information and negatively related to the exogenous information. Trade volume and price volatility are also proved to be significant determinants of local trader profits for certain types of futures contracts. As *Frino et al. (2000)* argue, the liquidity profits of traders represent their reward of supplying liquidity; the factors influencing trader's supply of liquidity are likely to have impact on trader's liquidity profits. *Berkman and Hayes' (2000)* demonstrates that the size of trades, volatility and the trading activity of underlying stocks are all variables that may contribute to a floor broker supply of liquidity. They provide indirect

evidence supporting that trade volume and price volatility can not only be determinants of position-taking profits but also influence liquidity profits of traders. These findings extend the results of *Manaster and Mann (1999)* and provide additional important insights into the determinants of trader profitability

A number of related studies have also analysed the trading behaviour, profits and interactions between trading profitability and other factors for market makers (quasi-market makers) in futures markets. For example, *Fishman and Longstaff (1992)* compare the trading profits of locals to other classes of traders, while *Kuserk and Locke (1993)* shows that locals can earn significant profit from trading strategies consistent with scalping. *Locke and Onayev (2007)* analyse the interaction between trading volume, trader profitability, and the informativeness of order flow; and find that the floor traders do not profit much from processing hedger orders, and earn more income during times of greater price discovery, when the long-run impact of order flow is significantly positive.

The prior studies demonstrate that the analysis of trader profitability can provide important evidence on the nature and economic roles of traders. They provide evidence on the determinants of trader profitability in the equity and futures markets. Although no studies have explicitly examined trader profitability of market participant other than market makers as a result of the unavailability of detailed data, the findings on market makers (or quasi-market makers) nevertheless offer useful insights into the possible common factors influencing trader profitability. As *Frino et al. (2000)* suggest, a dominant theme in the theoretical market maker and asymmetric information literature is that market makers trade with two main types of counterparties—informed and liquidity traders. The literature typically asserts that while market makers expect to gain in their transactions with uninformed traders, they are unlikely to profit from trading with informed traders. This traditional wisdom of the role of the market makers appears to be heavily challenged by many of the trader profitability studies, which suggest market makers play a more complicated role in various types of financial markets. This leads to interesting questions: what is the implication of the active and informed market makers on other market participants? Does there still exist a privileged group of traders which is informed and able to extract profit from trading with market makers or uninformed traders as described by the traditional literature? As it is reviewed in this subsection, although the existing studies have examined the profitability of market makers in various types of markets, little empirical research has been accomplished to advance our understanding of the trading features and economic roles of the counterparties that market makers trade with. This paper aims to fill this gap by examining the trading profits of institutional and retail traders.

3.2 Institutional and Retail Traders

This subsection reviews the relevant institutional and retail trader literature. Studies in this area typically focus on either particular group of traders in equity and futures markets. Although no studies have directly examined the profitability of both institutional and retail

traders in options markets, there are a considerable number of studies provide evidence on the nature, characteristics and trading behaviour of these two trader groups in other types of markets which can be used as basis for understanding the trading dynamics of these two trader groups in options markets.

Institutional and retail traders are widely recognized as two main types of market participants with distinct characteristics. Institutional traders are professional financial institutions such as insurance company, superannuation and mutual funds, which are financially sophisticated and trade large volumes of securities; while retail traders are typically non-professional individual investors that trade on their own behalf. *Garvey and Murphy (2005)* identify the main differences between institutional and retail traders. First, retail traders trade their own capital and bear all of the profits or losses. Institutions hire professional traders who trade the firm's capital which are collected from wide range of investors. Hence, the individuals making trade decisions in financial institutions do not fully bear the trading profits or losses themselves. Second, institutional traders pay considerably lower commissions on average than the commissions paid by retail traders. Third, retail traders need not be licensed while institutional traders are required to be certified. Fourth, retail traders are governed by strict margin requirements whereas institutional traders often receive preferential margin treatment. Finally, majority of retail traders receive no formal training, whereas institutional traders are supervised and generally receive continuous advice and training regarding trading strategies and techniques. *Garvey and Murphy (2005)* suggest these factors lead to the differences in trading behaviour which provide justifications for examining institutional and retail traders in two separate groups.

Davis and Steil (2001) define institutional investors as specified financial institutions that manage savings collectively on behalf of small investors toward a specific objective in terms of acceptable risk, return maximization and maturity of claims. Institutional investors are typically not regarded as homogeneous; they may differ in terms of the contractual relations between the owners of the assets and the asset managers as well as the definition of their liability. For example, insurance companies face high uncertainty about the amount and timing of their future cash outflow due to their contingent liability to clients. Hence, they have strong demand for liquidity and tend to invest high proportion of their funds in short-term assets in order to meet unforeseeable liabilities. In contrast, superannuation funds accumulate savings over working life of employees and have more clearly defined liability in terms of timing and amount. Therefore they have less demand for liquidity; and are capable and willing to invest higher proportion of their funds in long term assets than insurance companies. The different contractual relationships and liabilities assumed by institutional investors might result different demands and trading behaviour of institutional investors. However, *Davis and Steil (2001)* demonstrate that although institutional investors are typically not homogeneous, they can be assumed to have a high and similar degree of financial sophistication because of an increasing blurring of distinctions between types of institutional investor as a result of the recent trend of business diversification in the financial sector (e.g. insurance companies are tending to launch their own investment funds while mutual funds are being used as vehicle for retirement and pension saving). This provides rational justification for examining institutional investors as one trader group. Since retail traders are typically subject to similar expertise,

financial resources, trading skills and information, it is also reasonable to assume retail traders also have a similar degree of financial sophistication, thus can be analysed as one trader group. Therefore, institutional and retail traders are examined as two distinct trader groups in this paper.

In institutional/retail literature, institutional traders are often portrayed as informed traders (E.g. *Grullon and Wang, 2001; Anand, Chakravarty and Martell, 2005*), whereas retail investors are regarded as uninformed. *Dennis and Weston (2001)* argue that institutional and retail traders are characterized as reasonable proxies for informed and uninformed traders in order to overcome the practical difficulty in distinguishing the informativeness of market participants. However, although institutional investors are widely recognised as informed traders, the nature of information they have access to and the extent of their informativeness are still controversial.

The theoretical view generally suggests the nature of information institutional investors possess is public rather than private. *Davis and Steil (2001)* propose that institutional investors heavily rely on public information; they exploit the information advantage and make profit from their strong ability to absorb and process public information more quickly and accurately than other market participants. This view is supported by *Dennis and Weston (2001)* arguing that although institutional investors do not have the same access to private information the insiders have, they can create an informational advantage by exploiting economies of scale in information acquisition and processing since they have lower marginal costs of gathering and processing information than retail traders. Although the theoretical views are consistent, the empirical studies examining this view have not yet reached a consensus on the nature of institutional investors' information advantages. A growing literature suggests that institutional investors are able to profit from executing trades based on private information in equity markets. These studies show that changes in holdings by institutional investors are positively associated with their future earnings and returns (e.g. *Ali et al., 2004; Ke and Petroni, 2004; Ke, Ramalingegowda, and Yu, 2006*). These results are in contrast to other literature that suggests more limited evidence of informed trading by institutional investors. However, all these studies focus on the trading of a specific type of institutional investors being transient institutions which have a short investment horizon and trade actively for short-term profits. As *Carhart (1997)* suggests, the persistence of superior performance is not widespread and is not generalisable to other types of institutional investors. Furthermore, prior research shows that institutional investors are attracted to firms with richer public information environments, including greater analyst following (*O'Brien and Bhushan, 1990*) and higher disclosure quality (*Bushee and Noe, 2000*). *Bushee and Goodman (2007)* argue that these findings demonstrate that there is less opportunity for institutional investors to obtain a private information advantage. Hence, it is highly likely that informed trading by institutions is more limited in scope than suggested by some of the studies. This view is consistent with the theoretical perspective suggested by *Davis and Steil (2001)* and *Dennis and Weston (2001)*. In general, the existing literature suggests that the superior information of institutional investors as a group is primarily derived from their strong expertise in efficiently collecting, processing and interpreting public information, although specific types of institutional traders have the privilege of accessing to private information.

The evidence on the extent of institutional trader informativeness is relatively less controversial. Most prior research provides affirmative evidence on the view that institutional traders are better informed than other market participants. In equity markets, *Szewczyk, Tsetsekos and Varma (1992)* demonstrate that firms with relatively high levels of institutional ownership have a smaller price reaction to the announcement of equity offerings, while *Alangar, Bathala and Rao (1999)* find a consistent result for dividend change announcements. *Trzcinka (1998)* shows that initial public offerings that are largely purchased by institutional investors tend to do well, while those that are largely purchased by the general public tend to do badly. *Bartov, Radhakrishnan and Krinsky (2000)* discover that firms with high levels of institutional ownership have lower levels of post-earnings announcement drift in the stock price. While these studies are consistent with the view that institutions are better informed than other investors in equity markets, they provide less direct evidence based on reactions to corporate events. In contrast, *Dennis and Weston (2001)* directly test the relationship between ownership structure and the information content of equity trading. They find that information-based trading is positively and significantly related to the amount of both institutional and inside ownership; the trades of institutional investors have greater impact on prices. *Dennis and Weston (2001)* find that institutional investors are almost as informed as insiders and, they have superior information over retail investors.

The view that institutional traders are better informed than retail traders is also supported by evidence from emerging markets. *Lee, Lin and Liu (1999)* investigate the trading behaviour of institutional and individual investors in the Taiwan Stock Exchange (TSE) and examine the trading patterns and interdependencies among institutional investors, large individual investors, and small individual investors in the market. They show that the small individual investors are uninformed and slow learners. The large individual investors and institutional investors are almost equally informed. However, this result should be interpreted with caution; it is likely only confined to the emerging markets as a result of the unique microstructure of these markets. The retail investors in the TSE are the most dominant players. In terms of trading volume, institutional trades only account for less than 4% of total trades in the TSE, which sharply contrasts with previous results for US markets. However, regardless of the distinct trader structure, *Lee, Lin and Liu (1999)* demonstrate that the institutional investors are better informed than small individual investors. They also show that the trades made by institutional and small individual investors tend to be negatively correlated, implying that the small individual investors tend to provide liquidity to the institutional investors. From these studies, it is evident that institutional investors are better informed; and have stronger ability to interpret and react to new information than retail traders.

A significant number of research in institutional/retail investor literature focuses on trading behaviour, strategies and trading impact of institutional traders as a group in equity markets. *Keim and Madhavan (1995)* examine the behaviour of institutional traders, using data on the complete equity transactions of 21 institutions in various sub-periods from 1991-1993. They find that institutional traders appear to show a surprisingly strong demand for immediacy, even in those institutions whose trades are based on relatively long-lived information. *Bennett et al. (2003)* find that the preference of institutional investors is not constant overtime. They document shift in institutional preference and find that institutional investors' preference for

large, safe stocks has declined over time in favour of smaller, riskier stocks. The result shows that institutional investors are able to forecast returns and that post-herding returns of smaller securities are larger than post-herding returns for larger securities. *Bennett et al. (2003)* argue that institutional investors' informational advantages are greatest in small-capitalization securities.

In non-US markets, *Wang and Walker (2000)* examine both individual and institutional trading patterns and the impact of their trading activities on daily stock return in Japan, Hong Kong and Taiwan. They find evidence to support the information processing hypothesis in each of these markets. That is, investors earn lower average returns on Monday, particularly when bad news is disclosed on the previous Friday. They conclude that while this result is driven primarily by the trading activities of institutional investors in Japan and individual investors in Taiwan, both individual and institutional investors cause the effect in Hong Kong. Besides, they also find evidence of positive-feedback trading by individual and institutional investors in Japan and Hong Kong, but only by individual investors in Taiwan. These results are consistent with the relative importance of institutional and individual investors in each of these markets. Institutional investors account for the majority of trades in Japan and Hong Kong, whereas individual investors dominate trading in Taiwan. This study highlights that the relative importance and market power of institutional and retail investors can significantly influence their economic roles in various market settings. In a recent study, *Ng and Wu (2007)* examines that the trading behaviour of institutions and individuals in Chinese equity markets. Their results interestingly reveal that the trading behaviour of individual investors in China depends on the type of transactions and their wealth level. *Ng and Wu (2007)* find that a small group of wealthiest Chinese individuals tend to behave like institutions when they buy stocks, and behave like less wealthy individuals when they sell. Besides, the results also indicate that only the trading activities of institutions and of wealthiest individuals can affect future stock volatility, while those of Chinese individual investors at large have no predictive power for future stock returns. *Ng and Wu (2007)* have some interesting implications on the characteristics of institutional and retail investors. They demonstrate that the nature and economic roles of these two trader groups are not fixed; they can be influenced by internal factors such as the composition and economic power of traders in each group, and external factors such as market microstructure and transaction type.

Although the existing institutional/retail trader literature provides little direct evidence in options markets, the findings from equity markets nevertheless present useful insights into the nature and characteristics of the two trader groups. The findings of prior studies demonstrate that institutional investors are typically better informed; and have stronger ability to interpret and react to new information than retail traders. However, the information advantage and economic roles of the two trader groups are not fixed; they can be influenced by factors such as the type of securities traded, the relative economic power of trader groups and market microstructure.

3.3 Theoretical Considerations

Garvey and Murphy (2005) identify the main differences between institutional and retail traders. Since institutional traders possess more capital and greater expertise than retail traders, their transactions are expected to have higher trade value and greater exposure than the retail trades. The institutional/retail literature generally suggests that institutional traders are better informed than retail traders (e.g. *Lee, Lin and Liu 1999, Davis and Steil 2001, Dennis and Weston 2001*). One view regarding the nature of institutional traders' information advantage is that institutional traders typically have no access to private information; their information advantage is primarily derived from their strong ability to collect and process public information more quickly and accurately than retail traders (*Davis and Steil 2001, Dennis and Weston 2001, Bushee and Goodman 2007)*. Following this view, institutional investors are expected to outperform retail traders in making position-taking profits. They are expected to derive a higher proportion of their total profits (or less proportion of total losses) from position-taking than retail traders.

Hasbrouck and Sofianos (1993) demonstrate that bid-ask spread is a significant determinant of trader profitability. *Frino et al. (2000)* suggest that liquidity profits represent traders' reward for providing liquidity. Since liquidity profit is measured as the difference between trade price and the mid-point of bid-ask spread, it is expected to be positively related to the width of bid-ask spread. Following the view that institutional traders have strong ability to collect and process information (*Davis and Steil 2001, Dennis and Weston 2001, Bushee and Goodman 2007*), it is reasonable to expect their position-taking profits are likely to be higher during periods of information arrival. Thus, there is expected to be a positive relationship between institutional traders' position-taking profits and variables indicating new information release. Given institutional traders interpret information more accurately and react faster than retail traders (*Lee, Lin and Liu 1999, Davis and Steil 2001, Dennis and Weston 2001*), institutional traders are more likely to trade before retail traders during the period of information arrival. Hence, when retail trades occur, it is likely that prices have already incorporated the new information as a result of institutional traders' transactions, so it is expected a negative relationship exists between retail traders' position-taking profits and variables indicating new information release. Given informed traders are likely to trade aggressively in order to capture highest possible profits; there is expected to be a positive relationship between institutional traders' position-taking profits and their trade volume. *Manaster and Mann (1999)* find that when informed traders face a trade-off between liquidity and position-taking profits, the traders with valuable information are willing to reduce or eliminate the liquidity profits to exploit the information advantage. Thus, it is expected a negative relationship exists between the two trader groups' liquidity profits and position-taking profits. *Manaster and Mann (1999)* also show that the results of the analysis of trader's position-taking profits are highly sensitive to trade directions (buy or sell); hence the two trader groups' position-taking profits are expected to be related to trade directions.

4. Data

4.1 Data Sources

Our primary data is provided by the ASX. The data is provided for all transactions on exchange traded stock options for the period from 3 January 2006 to 7 July 2006. It includes total number of 754,794 trades that contains 16,735 option series written on 88 underlying stocks. The intraday transaction-level information obtained includes the following: trade date and time (to the nearest second), ASX code of option series, the ticker symbol of the underlying stock, the price at which the trade is executed, number of contracts bought or sold, buyer and seller broker ID indicating the brokers responsible for the trade, and the security type code identifying whether an option series is put or call. Information regarding broker details is also provided by the ASX. It specifies each broker's trading code, ID number and type, which enable us to identify retail and institutional brokers. As retail brokers only act for retail traders and institutional brokers primarily trade for institutional investors on the ASX Options Market, the broker type can be used as a good proxy for trader type with high level of accuracy. The unique set of data enables this study to examine the trading profits of retail and institutional investors as two separate trader groups.

Additional data relating to the underlying and options market is obtained from the Securities Industry Research Centre of Asia-Pacific (SIRCA). This data entails bid-ask prices of option series immediately prior to the trade, time-weighted average absolute spread of option series during the one hour period surrounding the trade, daily opening and closing price of option series, absolute value of returns of option series for one hour surrounding the trade, number of transactions in the underlying stock for one hour surrounding the trade, the information event during one hour prior trade. These variables were then matched to each trade record.

The data used in this study are similar in structure to those used by *Frino et al. (2000*), but covers a broader range of contracts for all market participants. Our data comprises transactions on all option series traded on the ASX Options Market for the sample period submitted by institutional traders, retail traders and market makers.

4.2 Data Procedures

Several filters are applied to the raw data provided by the ASX. First, Transactions between the same broker are assumed to be cross transactions and removed from the data set, because the profits measured from broker's perspective is zero in a cross trade. Second, the focus of this paper is on transactions take place in the normal trading period. Trades are eliminated if they are executed before 10:00 am or after 4:20 pm. Third, the calculation of position-taking profits requires measuring changes in "true price" of the inventory. This study follows the assumption used by *Frino et al. (2000)* that the mid-point of the bid-ask spread acts as a good proxy for the "true price". Transactions with absent bid or ask prices are eliminated because the mid-price cannot to be obtained in these trades. Fourth, *Manaster and Mann (1999)* show that the analysis of trader profits is sensitive to which side initiates the trade. The information regarding which party initiates the transaction can be obtained by examining the trade price in relation to the prevailing bid and ask prices and the trade direction (buy or sell). For example, a buy transaction occurred at ask price indicates the buyer uses a market order and initiates

the trade. In order to accurately determine which party initiates the trade, transactions that occurred at neither the bid nor ask price are removed from the data set. Fifth, thin trading in the options market presents a significant issue as most of option series are infrequently traded. These infrequently traded option series are likely to bias the regression analyses on spread, volatility and trading activity as they are normally not traded for weeks and have no posted bid-ask spreads. In order to account for this issue, the data is filtered to contain only those option series written on the 20 underlying stocks with highest total options trading volume. Furthermore, infrequently traded option series written on these 20 underlying stocks are further filtered out if the total number of transactions of them is smaller than ten during the sample period. While these two procedures eliminate 48.5% of the option series, the reduced sample still accounts for 73.1% of transactions (after undergoing filtering procedures step one to five) by volume and 76.6% by trade value. Sixth, all transactions in the original data are made by 64 different brokers. According to the broker details provided by the ASX, there are 30 retail brokers, ten institutional brokers, 14 market makers; eight brokers provide both wholesale and retail services and two brokers cannot be identified. In order to accurately determine trader type using broker type, transactions made by brokers who perform mixed services or by those cannot be identified are eliminated. Since retail brokers act only for retail investors on the ASX Options Market, the trader type can be determined with certainty if the broker is a retail one. However, although institutional brokers primarily act for institutional traders, some of their transactions could be on behalf of retail investors. In order to control this issue, the bottom 10% of transactions made by institutional brokers measured by either trade value or exposure is filtered out from the data set. The underlying assumption of this filtering method is that institutional trades are likely to have the highest trade value and exposure to the underlying asset. The smaller the trade value or exposure of a transaction is, the more difficult to determine whether institutional brokers act for retail or institutional traders. In order to more accurately determine trader type, the smallest transactions are eliminated since it is most unclear whether they are made on behalf of retail or institutional traders. This filtering procedure eliminates 60% of transactions made by institutional brokers, the remaining 40% transactions account for 82% of transactions by trade value and are assumed to be all made by institutional traders.

These data filters result a final sample of 133,908 transactions that contains 2,277 most actively traded option series on 20 underlying stocks with total trading value of $799.5 million for the period from 3 January 2006 to 7 July 2006.

5. Method

5.1 Profitability Analysis

This research develops an approach similar to *Frino et al. (2000)* to decompose institutional and retail trader profitability in an options market. A key feature of this technique is the use of the midpoint of the bid-ask quotes to distinguish between liquidity profits and profits due to the impact of price movement on trader’s inventory positions

Consider a trader's round-trip transaction, buying for price B_0 during period 0 and selling during period t for price S_t. As illustrated in Figure 2, the trader earns income from liquidity provision by buying at lower prices and selling at higher prices than its counterparties. Position-taking profits are earned from the movement of "true" price favourable to its inventory position. The total profit generated from this round-trip transaction is $S_t - B_0$, ignoring time value of money and commissions, and the profit can be decomposed into liquidity and position-taking profits. Following the prior literature (e.g. *Frino et al. 2000, Glosten 1987* and *Stoll 1989*), the mid-point of the bid-ask spread is used as a proxy for the "true" price of inventory. If the mid-price for all trades during time t is designated as X_t, then the liquidity revenue attributed to the buy trade can be identified as $X_0 - B_0$ and the liquidity revenue attributed to the sell is $S_t - X_t$. The total liquidity profit is the sum of liquidity revenue attributed to buy and sell trade $(X_0 - B_0) + (S_t - X_t)$, which represents the income associated with selling (or buying if liquidity profit is negative) immediacy. The position-taking profits are derived from movement in "true" prices of the inventory as proxied by mid-prices between period 0 and period t, which can be identified from Figure 2 as $X_t - X_0$. In this case, $X_t - X_0 > 0$ which indicates the trader buys prior to a price increase, then subsequently sells. It provides evidence on the "good" timing of the long trade as *Manaster and Mann (1999)* suggest. Alternatively, if the long trader sells subsequent to a price decrease, then $X_t - X_0 < 0$ and the trade was poorly timed. The position-taking profits provide evidence on the trader's information advantages and their ability to correctly interpret the information and trade on it effectively before the information is incorporated into prices.

Given the decomposition of profits for each trade, this study can allocate each trader group's trading profits due to liquidity provision and profits due to the impact of price movement on their positions. The remainder of this section outlines the formulas used in the analysis of trader profits.

5.1.1 Measurement of Liquidity Profits

Liquidity profits (losses) are given by the amount the buy price B_t (sell price S_t) is below (above) the prevailing midpoint quote X. Given that trader income is also a function of the quantity of options traded, liquidity profits of each trader group are calculated as follows:

$$1(a) \quad \sum_{t=1}^{n} Q_t^B * (X_B - B_t) \qquad \text{Buy} - \text{side liqudity profits}$$

$$1(b) \quad \sum_{t=1}^{n} Q_t^S * (S_t - X_S) \qquad \text{Sell} - \text{side liqudity profits}$$

Where Q_t^B and Q_t^S refer to the quantities bought and sold by a trader group at time *t*; X_B and X_S refer to the prevailing quote mid-point at the time the purchases and sales take place; and B_t and S_t refer to the buy and sell prices at time *t*.

5.1.2 Measurement of Position-Taking Profits

Position-taking profits (losses) refer to the component of total income that arises from subsequent favourable (unfavourable) price movements. The extent of position-taking profits is dependent on both the quote midpoint price movement, and the quantity of inventory subject to this price movement. Trader position-taking profits are given by:

$$2(a) \quad \sum_{t=1}^{n} Q_t^B * (X_C - X_B) \qquad \text{Position} - \text{taking profits for purchases}$$

$$2(b) \quad \sum_{t=1}^{n} Q_t^S * (X_S - X_C) \qquad \text{Position} - \text{taking profits for sales}$$

Where Q_t^B and Q_t^S refer to the quantities bought and sold by a trader group at time *t* that subject to the price movement; X_B and X_S refer to the prevailing quote mid-point at the time the purchases and sales take place; X_C is the prevailing benchmark closing price. Two benchmarks are used in this study: (1) daily closing price and (2) package closing price. It is important to note that while position-taking profits arise whenever there is a movement in the mid-point of the bid-ask spread, they are unrealised whenever a position remains open. One commonly adopted method to calculate trading profits and allocate them to each transaction is to mark the open positions to market at the end of the transaction day (e.g. *Frino et al. 2000*). This method assumes that any inventory positions remained open at the end of the transaction day will be closed at the daily closing price which is assumed to present the true price of the inventory. An important underlying assumption of the daily mark-to-market method is that

traders under the analysis do not tend to hold positions overnight, and if they do the positions are typically small. The validity of this assumption implies that the mark-to-market process is unlikely to have a major impact on the analysis. *Kuserk and Locke (1993, 1994)* suggest that both scalpers and day traders tend to trade in a manner consistent to this assumption. *Frino et al. (2000)* argue that local traders in futures markets (quasi-market makers) can also be viewed as having such trading behaviour. Although these studies support the validity of the underlying assumption of this mark-to-market method for these particular types of traders, there is no direct evidence on whether institutional and retail traders on the options markets behave in the same manner. In order to account for this potential issue, package closing price is used as a separate benchmark to provide comparable measures of the profits (can be reviewed as a robustness test). A trade package consists of all transactions made by one broker on a particular option series. This method assumes that any open inventory positions in a package are closed at the day on which the last transaction of the package takes place. The closing price at the last package trading day then represents the package closing price. A limitation of this method is that it considers together all the transactions made by a broker on behalf of their clients and analysis of an individual trader is not possible. However, package closing prices still provide a reasonably good benchmark that can be used to test the robustness of the results generated from daily closing prices. The position-taking profits of transactions are measured and reported separately using daily closing price and package closing price as benchmarks.

5.1.3 Measurement of Total Trading Profits

Total trader profitability (π_{total}) can thus be expressed as a function of both liquidity and position-taking profits.

$$3)\quad \pi_{total} = \sum_{t=1}^{n} Q_t^B * (X_S - E_t) + \sum_{t=1}^{n} Q_t^S * (S_t - X_S) + \sum_{t=1}^{n} Q_t^B * (X_C - X_B) + \sum_{t=1}^{n} Q_t^S * (X_S - X_C)$$

The measurement of total trader profitability follows the approach in *Frino et al. (2000)* and is consistent with the mark-to-market approach of calculating total trader profitability outlined in *Hasbrouck and Sofianos (1993)*. However, instead of marking open positions to market using one benchmark, this paper uses two separate benchmarks—the daily closing price and package closing price, with expectation that more accurate description of trader profitability can be obtained through the comparison of results measured by these two separate methods.

5.2 Regression Analysis

This study examines the determinants of liquidity profitability and position-taking profitability separately for institutional and retail investors. The dependent variables examined

are the total liquidity profit and total position taking profit as measured by equations 1 (a, b) and 2 (a, b). The total liquidity profits of institutional and retail traders are denoted as LI_t and LR_t, while the total position-taking profits of institutional and retail investors are denoted as PTI_t and PTR_t respectively. The literature review and theoretical discussion earlier suggested that trader profitability is related to the market bid–ask spread, trade volume, price volatility, the number of trading activities in the underlying market and information release. In order to test these determinants, the following models are estimated:

Determinants of Liquidity Profits:

-Institutional Investor

$$4(a)\quad LI_t = \beta_0 + \beta_1 SPREAD_1 + \beta_2 VOL_1 + \beta_3 VOLAT_1 + \beta_4 UACTIVITY_1 + \beta_5 INFO_1 + \beta_6 BSD_1 + \beta_7 NOMM_1 + \beta_8 MM_1 + \beta_9 RETAIL_1 + \beta_{10} OPEN_1 + \beta_{11} CLOSE_1 + \beta_{12} PTI_1 + \varepsilon_1$$

-Retail Investor

$$4(b)\quad LR_t = \beta_0 + \beta_1 SPREAD_1 + \beta_2 VOL_1 + \beta_3 VOLAT_1 + \beta_4 UACTIVITY_1 + \beta_5 INFO_1 + \beta_6 BSD_1 + \beta_7 NOMM_1 + \beta_8 MM_1 + \beta_9 II_1 + \beta_{10} OPEN_1 + \beta_{11} CLOSE_1 + \beta_{12} PTR_1 + \varepsilon_1$$

Determinants of Position-Taking Profits:

-Institutional Investor

$$5(a)\quad PTI_t = \beta_0 + \beta_1 SPREAD_1 + \beta_2 VOL_1 + \beta_3 VOLAT_1 + \beta_4 UACTIVITY_1 + \beta_5 INFO_1 + \beta_6 BSD_1 + \beta_7 NOMM_1 + \beta_8 MM_1 + \beta_9 RETAIL_1 + \beta_{10} OPEN_1 + \beta_{11} CLOSE_1 + \varepsilon_1$$

-Retail Investor

$$5(b)\quad PTR_t = \beta_0 + \beta_1 SPREAD_1 + \beta_2 VOL_1 + \beta_3 VOLAT_1 + \beta_4 UACTIVITY_1 + \beta_5 INFO_1 + \beta_6 BSD_1 + \beta_7 NOMM_1 + \beta_8 MM_1 + \beta_9 II_1 + \beta_{10} OPEN_1 + \beta_{11} CLOSE_1 + \varepsilon_1$$

Where,

$SPREAD_i$ = Time-weighted average absolute spread of option series during the one hour period surrounding the trade.

VOL_i = Number of contracts traded in each transaction.

$VOLAT_i$ = Absolute value of returns of option series for one hour surrounding the trade.

$UACTIVITY_i$ = Number of trades in option series for one hour surrounding the trade.

$INFO_i$ = Information dummy variable that equals 1 if an information event occurs during one hour prior trade; equals zero otherwise.

BSD_i = Trade direction (buy or sell) dummy variable that takes on a value of 1 for a buy trade; 0 for a sell trader.

$NOMM_i$ = No market maker obligation dummy variable that takes on a value 1 if trade occurs in one of the daily non-market maker obligation trading sessions (1:00pm – 2:00pm and 4:00pm – 4:20pm) and zero otherwise.

MM_i = Market maker dummy variable that takes on a value of 1 if the counter party is market maker and zero otherwise.

$RETAIL_i$ = Retail investor dummy variable that takes on a value of 1 if the counter party is retail trader and zero otherwise.

II_i = Institutional investor dummy variable that takes on a value of 1 if the counter party is institutional trader and zero otherwise.

$OPEN_i$ = Open dummy variable which takes on a value of one if trade occurs within one hour of the market opening, and zero otherwise.

$CLOSE_i$ = Close dummy variable which takes on the value of one if trade occurs within 30 minutes of the market closing, and zero otherwise.

Manaster and Mann (1999) suggest that the results of the analysis of trader profits are highly sensitive to trade directions (buy or sell), thus a trade direction dummy variable BSD_i is introduced to account for this effect. Since market makers are not obliged to provide liquidity in two daily trading sessions, a dummy variable $NOMM_i$ is introduced to examine whether trade occurs in these sessions influence a particular type of trading profits. Dummy variables specify counter party type (MM_i for market maker, $RETAIL_i$ for retail investor and II_i for

institutional investor) are introduced to capture whether a particular type of trading profits is related to trading against a particular trader group. As intraday trading patterns in the options markets are well documented (*e.g. Segara and Segara 2007*; *Sheikh and Ronn 1994*), opening and closing dummy variables are included to control the intraday effect. In order to examine the relationship between liquidity profits and position-taking profits, the position-taking profit of each transaction is introduced as an independent variable in liquidity profit regressions for each trader group. The regression analyses of 4(a, b) and 5(a, b) are run separately using profits measured by the daily mark-to-market method and the package mark-to-market method.

6. Results

6.1 Profitability Analysis

Table 2 provides descriptive statistics relating to general trade information of all market participants. Panel A of this table confirms that the ASX exchange traded option market is largely a retail market. Retail traders are involved in 45.5% of all the transactions, while institutional traders only account for 2.1% of the trades. Panel A also reveals that both retail and institutional traders participate more in call transactions than put ones. Institutional trading accounts for 2.4% of all the call trades, but only 1.9% of total put transactions; retail investors made 49.8% of all call trades and 41.3% of put transactions, given there is only an insignificant difference between the total number of call and put trades. However, while institutional traders only make 2.1% of the transactions, their trades account for 5.6% of total trade value. It indicates institutional investors make large trades relative to retail traders which is consistent with expectation. The information regarding the average trade size, value and exposure is illustrated in Panel B of Table 2. It shows that institutional trades are approximately three times larger than the retail ones by both trade value and exposure on average. Institutional investors' average trade volume is almost four times greater than the retail ones on call options; and over three times bigger than the retail ones on put options. This information is consistent with Panel A and highlights that while institutional trader is a small trader group in the ASX exchange traded option market; their transactions are considerably more significant than the retail trades on a per trade basis by trade value, volume and exposure. Although the focus of this study is on institutional and retail traders, an interesting point to note from Panel A in Table 2 is that market makers participate in more than half (52.3%) of all the transactions. It indicates that market makers do trade against one another and demand liquidity from other market makers and possibly from other market participants rather than purely supplying liquidity to institutional and retail traders. This is consistent with the findings of *Manaster and Mann (1999)* and *Frino et al. (2000)* that suggest a more active role of market makers in derivatives markets.

5.2.1 Institutional Traders

Table 3 provides descriptive statistics relating to the profitability of institutional trading. Panel

A and Panel B of this table reveal that the majority of institutional trades are unprofitable regardless whether the total profits are measured using daily closing price or package closing price. In fact, the ratio of profitable to negative transactions for all contracts is 0.97 and 0.91 as measured by the daily mark-to-market and the package mark-to-market methods respectively.

As the calculation of liquidity profits is irrelevant to which mark-to-market method is used, the liquidity profit analysis illustrated in both Panel A and Panel B in Table 3 provides exactly the same results. It reveals that most of the trades made by institutional traders provide positive liquidity profits to the trader group. Panel A and B illustrates that total liquidity profits of institutional traders are positive for both call and put options over the sample period. Institutional traders thus appear to derive income from supplying liquidity. The ratio of transactions with positive liquidity profits to negative ones is 4.51 for all contracts. Since the liquidity profits earned by traders represent their reward for providing liquidity, the strong positive ratio suggests that the institutional trades supplying liquidity are over four times greater than their trades demanding liquidity. Panel C in Table 3 also reveals that institutional traders only initiate (i.e. use market order) 17.2% of the trades they involved in, and supply liquidity (i.e. use limit order) for 82.8% of the transactions. It is consistent with the findings in Panel A and B and discloses that institutional traders are net supplier of liquidity in the ASX exchange traded option markets.

Panel A and Panel B also illustrate that institutional traders suffer significant position-taking losses regardless which measuring method is used in calculating the position-taking profits. The ratios of transactions with positive position-taking profits to the negative ones are 0.64 and 0.70 for all contracts as measured using daily closing price and package closing price respectively. The profits when measured using package closing prices result in higher dollar losses and greater standard derivations than using daily closing price. This is due to the fact that when an open position is closed daily, the price movement is subject to daily price changes; whereas when package closing price is used, the price movement typically covers longer time intervals as packages typically last a number of days. Thus the profits measured are subject to a higher probability of greater price volatility as they cover longer time period. The negative ratios indicate that institutional traders make position-taking losses in about 50% more transactions than they make positive profits. These findings might seem to contradict what is implied in prior literature that suggests institutional traders are expected to be informed and derive a significant portion of their profits from creating an open position prior to a price movement which is favourable to their inventory position. However, the fact that institutional traders make large position-taking losses does not necessarily imply that they are uninformed. There are three possible explanations. First, unlike the trading of underlying stocks, the purpose of trading options contracts can be more than just generating income. Traders can trade options to hedge or as a part of their overall trading strategy. Hence, using position-taking profits as a sole factor for evaluating options trader informativeness simply assumes all options traders trade for extra income and denies other important reasons for trading such as hedging. Second, *Lee and Yi (2001)* provide evidence that the options market is the primary venue for information trading only for small investors, whereas large investors do not necessarily trade options rather than stocks when they are informed. *Lee and Yi (2001)*

argue that the reason for this is that large trades in the options market need not be anonymous, and this feature enables option market makers to screen large informed investors more effectively. The lack of anonymity in the options market would cause large investors with private information to behave differently from small investors in choosing trading venues. Since market makers on the ASX Options Market can view all the orders and actively trade against other trader groups, institutional traders might prefer to make their information trading in other trading venues such as the underlying market, which might explain why the majority of their trading on the exchange traded option market appears to incur negative position-taking profits. Third, the fact that institutional traders, which are traditionally perceived as informed traders, incur great position-taking losses may suggest there exists a more informed trader group or groups which are more informed and response more quickly to new information than institutional traders. Panel C in Table 3 illustrates that the counter party to 91.2% of all institutional trading is market maker. Since institutional traders are net suppliers of liquidity in the market, it implies that market makers actively trade against institutional traders and derive significant position-taking profits from this trader group on the most actively traded option series. As market makers have access to privileged order flow information on the ASX exchange traded option market, the large position-taking losses of institutional traders can be due to the fact they are trading against a more informed and active trader group—the market makers. These provide three likely explanations, for the large position-taking losses of institutional traders documented in this paper.

Panel C in Table 3 illustrates the ratio of total long to short positions created by institutional traders is 1; the ratios are 0.92 and 1.11 for call and put options respectively. This indicates that while institutional traders take overall equal number of long positions as short positions, they are more comfortable to short call options than put ones. Combining the fact that institutional investors make more transactions on calls (56.5%) than puts (43.5%) and call transactions perform better on average than puts (Panel A in Table 3, mean of total profits on calls is $31.98, on puts is -$48.43), it might suggest that institutional traders are relatively less familiar with trading puts options, hence more reluctant to take the theoretically unlimited potential losses by entering into a short position on put options.

Panel C in Table 3 also documents that 15.7% of all institutional trading takes place in the first hour immediately after the market opens and 23.5% of their trades occur in the last trading hour before market closes. The total number of institutional transactions occurring in the opening and closing hours account for approximately 40% of all their trades. This indirectly demonstrates the intraday trading pattern for institutional trader group in the ASX Options Market which is consistent to what is documented by *Segara and Segara (2007)* in the overall ASX Options Markets.

5.2.2 Retail Traders

Table 4 provides descriptive statistics relating to the profitability of retail traders. Panel A and Panel B of this table reveal that similar to institutional trader, the majority of retail trades are

unprofitable regardless whether the total profits are measured using daily closing price or package closing price. The ratio of profitable to negative transactions for all contracts is 0.83 and 0.96 as measured by the daily mark-to-market and the package mark-to-market methods respectively. The decomposition of total profits shows that similar to institutional traders, retail traders also derive significant portion of their total trading profits from providing liquidity and suffer large position-taking losses. In fact, the ratio of transactions with positive liquidity profits to negative ones for all contracts is 5.91, while the ratio of transaction with positive position-taking profits to negative ones is 0.52 as measured by the daily mark-to-market method. This reveals that retail traders are also net suppliers of liquidity on the ASX Options Market.

Panel C of Table 4 shows that retail traders only initiate 13.6% of the transactions they involved and supply liquidity by submitting market orders for 86.4% of their trades. Compared to institutional traders, for which the ratio of transactions with positive liquidity profits to negative ones for all contracts is 4.51 and trade initiation percentage 17.2%, retail traders appear to be a more active liquidity supplier. However, although retail traders supply more liquidity than institutional traders, the liquidity profits they derive on average are much smaller than the ones earned by institutional traders. Panel A in Table 3 and 4 indicates the mean liquidity profits earned by institutional traders on all contracts is $148.69, which is more than twice as big as the average liquidity profits of retail traders ($68.93). This is consistent with the findings documented in Table 2 that institutional trades are bigger than retail ones.

Panel A of Table 4 reveals that retail traders incur considerable position-taking losses. The ratio of transactions with positive position-taking profits to negative ones for all contracts is 0.52 as measured by the daily mark-to-market method. Compared to the ratio for institutional traders of 0.64[4], it suggests that although institutional traders lose to market makers, they are better informed and have stronger ability to interpret and react on information than retail traders. This is consistent with the findings of *Lee, Lin and Liu (1999)* which demonstrates that institutional traders are better informed than retail traders in an emerging market, which exhibits some similar characteristics to the ASX Options Market in terms of the trader composition[5].

Panel C in Table 4 shows that market makers are the counter parties to retail traders in 86% of all retail trades. It is interesting to note that while institutional traders also trade largely against market makers, they tend to not trade with one another. Only 1.5% of all institutional trading are transactions between institutional traders. In contrast, 12.6% of all retail trades involve retail traders on both sides of the transaction. This suggests greater divergence of views among retail traders as compared to institutional traders. It also suggests that

[4] The position-taking profits measured by daily mark-to-market are use for comparison between institutional and retail traders. The profits measure by package closing prices are inappropriate to use for comparison purpose across different trader groups because the packages do not have a fixed length. Therefore daily mark-to-market is more appropriate as the profits of the two trader groups are subject to the same benchmark if their transactions take place at the same day.

[5] Both markets are largely retail markets in which institutional traders only account for small proportion of total trades.

institutional traders have similar information advantages and expertise which is consistent with the view of *Davis and Steil (2001)* which shows that although institutional investors are generally not homogeneous, they have a high and similar degree of financial sophistication. In contrast, as retail traders compose wide variety of traders with different knowledge, trading skills and information advantages, they tend to have different views about the market, and thus trade against each other more than institutional traders.

Panel C in Table 4 illustrates the ratio of total long to short positions created by retail traders is 0.95; the ratios are 0.94 and 0.97 for call and put options respectively. This shows that retail traders short more options than they long for all types of contracts; and they trade more short calls than short puts. Panel C in Table 4 also reveals that 15.8% of retail trades take place in the first hour immediately after the market opens and 24.8% of their trades occur in the last trading hour before market closes. The total number of retail transactions that occurred in the opening and closing hours accounts for over 40% of all their trades. This is consistent with the trading pattern of institutional traders and also provides indirect evidence on the well documented intraday trading pattern in the options market.

The analysis of trader profits reveals that the ASX exchange traded option market is largely a retail market. Institutional traders account for only smaller proportion of the total trades but their transactions are more significant than retail ones on per trade basis by trade value, volume and exposure. It documents that both institutional and retail traders incur a total loss in the market; however, institutional traders perform better than retail traders on average in generating both liquidity and position-taking profits. The decomposition of total profits demonstrates that both institutional and retail traders derive significant portion of their profits from providing liquidity and incur position-taking losses. The total loss of these two trader groups suggests that they do not earn enough liquidity profits to offset their position-taking losses. Since these two trader groups primarily use limit orders and earn significant positive liquidity profits, both trader groups appear to be net liquidity suppliers in the market. However, the fact that both institutional and retail traders are net liquidity suppliers implies that market makers are net demanders of liquidity which contradicts their designated role in the options market. While beyond the scope of this study, we have examined trading profitability of market makers in order to test the robustness of the findings for institutional and retail traders. The results are reported in Appendix 1 and are consistent with the findings illustrated in Table 3 and 4.

5.3 Regression Analysis

5.3.1 Determinants of Liquidity Profits

Table 5 reports results analysing the determinants of liquidity profits made by institutional and retail traders. It documents the market conditions under which a particular trader group is more likely to make liquidity profits.

The coefficient on spread (*SPREAD*), volume (*VOL*) and underlying stock volatility (*UACTIVITY*) is positive and statistically significant for both institutional and retail investors. Consistent with expectations, this implies that traders are more likely to make positive liquidity profits when bid-ask spreads are wide, trades are large in quantity and underlying stock activity is high. Since the mid-point of bid-ask prices are assumed to be the true value of options contracts following *Frino et al. (2000),* the wider the bid-ask spread, the higher liquidity profits will be obtained by each trader group. The positive coefficient on trade volume suggests that institutional traders and retail traders that trade larger quantities are more likely to obtain positive liquidity profits. As the liquidity profits represent traders' reward of supplying liquidity, this reflects that both trader groups are willing to use limit order when trading large quantities of options contracts. The positive coefficient on underlying stock activity reveals that a trade is more likely to generate greater positive liquidity profits when there are higher trading activities take place in the underlying market around the trade.

The coefficient on information release dummy variable (*INFO*) is negative for institutional traders but statistically insignificant, while it is negative and statistically significant for retail traders. This implies that when retail traders trade around market sensitive information release, they are more likely to make negative liquidity profits. It suggests that retail traders demand liquidity around information events because they believe they are informed. The coefficient on the non-market maker obligation dummy variable (*NOMM*) is significantly positive for both institutional and retail traders; it reveals that as net suppliers of liquidity, institutional and retail traders make larger liquidity profits when market markers are not forced to provide liquidity. The coefficient on market maker counterparty dummy variable is positive and statistically significant for both trader groups. This is consistent with the analysis of trader profits suggesting that market makers are the primary counterparty of these two trader groups and demand liquidity from them. The coefficient on close dummy variable (*CLOSE*) is significantly positive for institutional traders. It implies that when institutional traders trade at the close, they make larger liquidity profits which indicate that they are more likely to supply liquidity at market close. Finally, Table 5 documents a significant negative relationship between liquidity and position-taking profits for both trader groups. This is consistent with *Madhavan and Smidt (1993)* and *Frino et al. (2000)* demonstrating that market makers are willing to sacrifice liquidity profits in order to profit from favourable price movements; and reveals that sacrificing one type of profits in order to obtain another type of profits is not confined to market makers only. That is, when institutional and retail traders generate liquidity profits they tend to give up position taking profits.

5.3.2 Determinants of Position-Taking Profits

Table 6 (a) and (b) report results analysing the determinants of position-taking profits made by institutional and retail traders specifically. They document the market and trading conditions under which the trader groups are more likely to make position-taking profits. Since the position-taking profits are measured using two benchmarks, daily closing price and

package closing price with the regression analyses are conducted and reported separated for each measurement method.

Table 6 (a) documents that the coefficient on spread (*SPREAD*) is negative but statistically insignificant for institutional traders, while Table 6 (b) reveals that spread is significantly negative for retail traders. This implies that in periods of lower liquidity, retail traders initiate trades that incur position taking losses.

Table 6 (a) and (b) also document that the coefficients on trade volume (*VOL*), volatility (*VOLAT*) and underlying stock activity (*UACTIVITY*) are all significantly positive for institutional traders, but they are all significantly negative for retail traders. The positive coefficient on volatility implies that during the periods of high volatility, institutional traders are more likely to make larger position-taking profits while the retail traders will incur larger losses. It is consistent with the view that institutional traders are better informed than retail traders *(Lee, Lin and Liu 1999, Davis and Steil 2001, Dennis and Weston 2001)* as informed traders are typically perform better in the period of high volatility to maximise their profits. The positive coefficient on underlying stock activity implies that the institutional traders are more likely to generate position taking profits when the underlying stock activity is high. This reveals that institutional traders have strong ability to process order flow information; and is consistent with the view of *Davis and Steil (2001)* which suggest that institutional traders rely on public information and they information advantages are primarily derived from their strong ability to absorb and process more quickly and accurately than retail traders. The positive coefficient on volume reflects that when institutional traders trade large quantities, they are more likely to make larger position-taking profits. It reflects institutional trader's high effectiveness in using their information for trading. In contrasts, the negative coefficients for retail traders reveal the opposite; it shows the retail traders' inability to process information correctly in a timely manner and to trade their information effectively. As *Dennis and Weston (2001)* argued, the fact that institutional traders have superior ability to process and utilise public information is due to their lower marginal costs of gathering and processing information than retail traders which arises from their economies of scale in information acquisition and processing.
Table 6 (a) also illustrates that the coefficient on information release dummy variable (*INFO*) is positive and statistically significant for institutional traders; while the same coefficient for retail traders are unclear as the signs are different as measured by the different mark-to-market methods. This demonstrates that institutional traders do not only have superior ability to process order flow information but also have strong ability to interpret and use exogenous market sensitive information.

The coefficient on trader direction dummy (*BSD*) is statistically significant for both trader groups which is consistent with the finding of *Manaster and Mann (1999)* suggesting that the results of the analysis of trader profits are highly sensitive to trade directions (buy or sell).

Table 6 (b) reveals that the coefficient on market maker counterparty dummy variable (*MM*) is negative and statistically significant for retail traders. This indicates that when retail traders trade against market makers they are more likely to make position-taking losses than when

they trade with either an institutional or another retail trader. This is consistent with the findings of Table 4 and 5 which document that retail traders are net suppliers of liquidity and lose substantial position-taking profits when supply liquidity to market makers.

6. Summary And Futures Research

This paper examines the source and determinants of trading profitability for institutional and retail traders on the ASX exchange traded option market. The findings in this paper indicate that both institutional and retail traders derive a substantial proportion of their total profitability from providing liquidity and incur significant losses from price movement unfavourable to their inventory position (position-taking profits). Although both trader groups lose to market makers, institutional traders perform better than retail traders. Both trader groups are documented to initiate a small proportion of transactions they are involved in. They thus appear to be best characterised as net liquidity suppliers in the market.

This paper also models the market and trading conditions under which institutional and retail traders are more likely to derive positive liquidity and position-taking profits. Several findings in this paper, in particular a comparison of institutional traders' income and retail traders' income, indicate that institutional traders have stronger ability to process and utilise both order flow and exogenous market sensitive information than retail traders. The extent of institutional and retail trader liquidity profitability appears to increase with bid-ask spread, trade volume, the extent of underlying activity. These findings show that as liquidity suppliers, both institutional and retail traders' liquidity profits are influenced by the same set of factors. The institutional position-taking profits are positively related to trade volume, price volatility, and underlying activity; while retail traders' position-taking profits are negatively related to these factors which demonstrate that institutional trader's stronger ability to process information and react quickly and effectively on the information than retail traders.

Several possible areas of future research stem from this paper. First, since the ASX Options Market largely comprises retail traders, this trader group can be decomposed into different types (e.g. large and small according to their trade value following *Lee, Lin and Liu 1999*). An examination of the different types of retail traders could be undertaken, to ascertain whether these different types of retail traders with certain trading characteristics, have different information advantage and trading behaviour. Second, with the use of more detailed data, institutional traders can be examined in groups according to their trading style and contractual obligation. Finally, it is interesting to notice that market makers actively demand liquidity in the options market for the most actively traded option series and it appears that their supply of liquidity is related to whether the options are actively traded or not. This provides a very fruitful avenue for future research.

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Table 1

Trading Hours: Exchange Traded Stock Options

The table below sets out the trading hours for Stock options. All times are Sydney local times.

9am to 9.45am	Report trade function available for overseas trade reporting
10am to 1pm	Normal trading
1pm to 2pm	Trading without market maker obligations
2pm to 4pm	Normal trading
4pm to 4.20pm	Extended normal trading (without market maker obligations applying)
4.20pm to 5pm	Manual late trading (based on existing late trading procedures)
5.01pm to 7am	Overseas trading (based on existing late trading procedures)

Source: http://www.asx.com.au/investor/options/trading_information/trading_hours.htm

Table 2

All Market Participants - Descriptive Statistics

This table reports descriptive statistics relating to general trade information of institutional traders, retail traders and market makers for the period from 3 January 2006 to 7 July 2006.

Panel A

Number of Transactions	All Contracts		Call		Put	
Institutional Trader	5,713	2.1%	3,225	2.4%	2,488	1.9%
Retail Trader	121,945	45.5%	66,585	49.8%	55,360	41.2%
Market Maker	140,158	52.4%	63,857	47.8%	76,301	56.9%
Total	267,816		133,667		134,149	
Total Trade Value						
Institutional Trader	$90,059,980	5.6%	$50,816,975	5.9%	$39,243,005	5.3%
Retail Trader	$628,810,006	39.3%	$335,311,490	39.2%	$293,498,516	39.5%
Market Maker	$880,063,455	55.1%	$470,316,803	54.9%	$409,746,652	55.2%
Total	$1,598,933,441		$856,445,268		$742,488,173	

Panel B

Average Trade Value	All Contracts	Call	Put
Institutional Trader	$31,523	$31,505	$31,533
Retail Trader	$10,313	$10,072	$10,603
Ratio: Institution:Retail	3.06	3.13	2.97
Average Trade Volume			
Institutional Trader	38.8	42.9	33.4
Retail Trader	10.7	10.9	10.5
Ratio: Institution:Retail	3.62	3.95	3.17
Average Exposure			
Institutional Trader	$1,346,803	$1,305,893	$1,399,285
Retail Trader	$460,826	$444,062	$480,980
Ratio: Institution:Retail	2.92	2.94	2.91

Table 3
Institutional Trader Profitability: Descriptive Statistics

This table reports descriptive statistics relating to the profitability of institutional traders for the period from 3 January 2006 to 7 July 2006. Panel A reports the number and distribution of transactions with positive, negative and zero profits; the profits are in dollar terms using daily closing price as a benchmark for profit calculation. Panel B reports the same statistics using package closing price as a benchmark. The ratio of positive to negative in Panel A and Panel B is computed by dividing the number of transactions with positive profits, by the number of transactions with negative profits. The total profits are decomposed into liquidity and position-taking profits. The transactions of call and put options are separately reported. Panel C outlines the relevant statistics relating to the trading patterns of institutional traders. It reports the distribution of transactions in the opening and closing hour; at the bid and ask prices and initiated by institutional traders.

Panel A: Daily Closing Price

	Total Profits			Liquidity Profits			Position-taking Profits		
Number of Transactions with	All contracts	Call	Put	All contracts	Call	Put	All contracts	Call	Put
Positive Profits	2,204	1,230	974	4,659	2,625	2,034	2,184	1,251	933
Negative Profits	2,272	1,307	965	1,032	580	452	3,398	1,907	1,491
Zero Profits	1,237	688	549	22	20	2	131	67	64
Ratio: Positive:Negative	0.97	0.94	1.01	4.51	4.53	4.50	0.64	0.66	0.63
Total No. of Transactions	5,713	3,225	2,488						
(%)		56.5%	43.5%						
Profits	-$17,365	$103,125	-$120,490	$849,465	$443,584	$405,881	-$866,830	-$340,459	-$526,371
(%)		46.12%	53.88%		52.2%	47.8%		39.3%	60.7%
Median	0	0	0	152.00	160.00	150.00	-165.00	-175.00	-150.00
Mean	-3.04	31.98	-48.43	148.69	137.55	163.14	-151.73	-105.57	-211.56
25th Percentile	-520.00	-525.00	-500.00	62.00	60.00	65.00	-750.00	-750.00	-764.00
75th Percentile	490.00	495.00	480.00	313.00	310.00	313.00	450.00	450.00	450.00
Std Dev.	2,835.99	2,301.27	3,406.38	594.39	614.90	566.50	2,884.79	2,349.85	3,456.74

Panel B: Package Closing Price

	Total Profits			Liquidity Profits			Position-taking Profits		
Number of Transactions with	All contracts	Call	Put	All contracts	Call	Put	All contracts	Call	Put
Positive Profits	2,334	1,333	1,001	4,659	2,625	2,034	2,322	1,345	977
Negative Profits	2,566	1,471	1,095	1,032	580	452	3,302	1,834	1,468
Zero Profits	813	421	392	22	20	2	89	46	43
Ratio: Positive:Negative	0.91	0.91	0.91	4.51	4.53	4.50	0.70	0.73	0.67
Total No. of Transactions	5,713	3,225	2,488						
(%)		56.5%	43.5%						
Profits	-$1,036,222	-$220,762	-$815,460	$849,446	$443,571	$405,875	-$1,885,668	-$664,333	-$1,221,335
(%)		21.3%	78.7%		52.2%	47.8%		35.2%	64.8%
Median	0	0	0	152.00	160.00	150.00	-200.00	-193.00	-209.00
Mean	-181.38	-68.45	-327.76	148.69	137.54	163.13	-330.07	-205.99	-490.89
25th Percentile	-1,200.00	-1,100.00	-1,400.00	62.00	60.00	65.00	-1,438.00	-1,350.00	-1,511.50
75th Percentile	1,000.00	1,100.00	967.50	312.00	310.00	313.00	1,025.00	1,125.00	944.00
Std Dev.	11,878.56	12,451.70	11,092.42	594.39	614.90	566.49	11,881.33	12,439.40	11,116.75

Panel C

Number of Transactions (%) at

	Total	Call	Put
Opening Hour	15.7%	15.1%	16.5%
Closing Hour	23.5%	23.5%	23.4%
Open and Closing	39.1%	38.6%	39.8%

	Total	Call	Put
Bid price	49.4%	49.0%	49.8%
Ask price	50.6%	51.0%	50.2%
Ratio	0.97	0.96	0.99

Number of Transactions (%)

	Total	Call	Put
Initiated by Institutions	17.2%	17.8%	16.4%
Initiated by Counter Party	82.8%	82.2%	83.6%
Ratio	0.21	0.22	0.20

Counter Party (%)

	Total	Call	Put
Market Make	91.2%	90.4%	92.3%
Institutions	1.5%	1.8%	1.0%
Retail Trader	7.4%	7.8%	6.8%

Total Trade Value and Exposure

	Total	Call	Put
Trade Value	$90,059,980	$50,816,975	$39,243,005
(%)		56.4%	43.6%
Exposure	$3,847,815,820	$2,106,405,625	$1,741,410,195
(%)		54.7%	45.3%

Number of Long and Short transactions (%)

	Total	Call	Put
Long	50.0%	47.9%	52.7%
Short	50.0%	52.1%	47.3%
Ratio	1.00	0.92	1.11

Table 4
Retail Trader Profitability: Descriptive Statistics

This table reports descriptive statistics relating to the profitability of retail traders for the period from 3 January 2006 to 7 July 2006. Panel A reports the number and distribution of transactions with positive, negative and zero profits; the profits are in dollar terms using daily closing price as a benchmark for profit calculation. Panel B reports the same statistics using package closing price as a benchmark. The ratio of positive to negative in Panel A and Panel B is computed by dividing the number of transactions with positive profits, by the number of transactions with negative profits. The total profits are decomposed into liquidity and position-taking profits. The transactions of call and put options are separately reported. Panel C outlines the relevant statistics relating to the trading patterns of retail traders. It reports the distribution of transactions in the opening and closing hour; at the bid and ask prices and initiated by retail traders.

Panel A: Daily Closing Price

	Total Profits			Liquidity Profits			Position-taking Profits		
Number of Transactions with	All contracts	Call	Put	All contracts	Call	Put	All contracts	Call	Put
Positive Profits	42,319	22,880	19,439	104,122	56,814	47,308	40,993	22,215	18,778
Negative Profits	50,716	27,558	23,158	17,621	9,662	7,959	78,383	42,946	35,437
Zero Profits	28,910	16,147	12,763	202	109	93	2,569	1,424	1,145
Ratio: Positive:Negative	0.83	0.83	0.84	5.91	5.88	5.94	0.52	0.52	0.53
Total No. of Transactions	121,945	66,585	55,360						
(%)		54.6%	45.4%						
Profits	-$5,114,476	-$2,954,407	-$2,160,069	$8,408,372	$4,572,284	$3,836,088	-$13,522,848	-$7,526,691	-$5,996,157
(%)		57.8%	42.2%		54.4%	45.6%		55.7%	44.3%
Median	0	0	0	45.00	45.00	50.00	-50.00	-50.00	-50.00
Mean	-41.94	-44.37	-39.02	68.95	68.67	69.29	-110.89	-113.04	-108.31
25th Percentile	-150.00	-150.00	-150.00	15.00	15.00	15.00	-225.00	-225.00	-228.00
75th Percentile	90.00	80.00	95.00	100.00	100.00	100.00	60.00	60.00	65.00
Std Dev.	1,425.93	1,432.05	1,418.54	334.37	324.56	345.79	1,462.28	1,457.62	1,467.87

Panel B: Package Closing Price

	Total Profits			Liquidity Profits			Position-taking Profits		
Number of Transactions with	All contracts	Call	Put	All contracts	Call	Put	All contracts	Call	Put
Positive Profits	55,215	29,966	25,249	104,122	56,814	47,308	54,911	29,817	25,094
Negative Profits	57,737	31,774	25,963	17,621	9,662	7,959	66,140	36,289	29,851
Zero Profits	8,993	4,845	4,148	202	109	93	894	479	415
Ratio: Positive:Negative	0.96	0.94	0.97	5.91	5.88	5.94	0.83	0.82	0.84
Total No. of Transactions	121,945	66,585	55,360						
(%)		54.6%	45.4%						
Profits	-$5,116,911	-$856,824	-$4,260,087	$8,405,809	$4,570,913	$3,834,896	-$13,522,720	-$5,427,737	-$8,094,983
(%)		16.7%	83.3%		54.4%	45.6%		40.1%	59.9%
Median	0	0	0	45.00	45.00	50.00	-48.00	-50.00	-45.00
Mean	-41.96	-12.87	-76.95	68.93	68.65	69.27	-110.89	-81.52	-146.22
25th Percentile	-1,060.00	-1,060.00	-1,065.00	15.00	15.00	15.00	-1,125.00	-1,125.00	-1,130.00
75th Percentile	930.00	900.00	990.00	100.00	100.00	100.00	895.00	850.00	945.00
Std Dev.	8,413.24	7,589.74	9,307.64	334.36	324.56	345.79	8,411.83	7,589.29	9,305.27

Panel C

Number of Transactions (%) at

	Total	Call	Put
Opening Hour	15.8%	16.0%	15.5%
Closing Hour	24.8%	24.9%	24.6%
Open and Closing	40.6%	41.0%	40.1%

	Total	Call	Put
Bid price	47.7%	47.6%	47.7%
Ask price	52.3%	52.4%	52.3%
Ratio	0.91	0.91	0.91

Number of Transactions (%)

	Total	Call	Put
Initiated by Retail Traders	13.6%	13.7%	13.4%
Initiated by Counter Party	86.4%	86.3%	86.6%
Ratio	0.16	0.16	0.15

Counter Party (%)

	Total	Call	Put
Market Make	86.0%	85.8%	86.1%
Institutions	1.4%	1.6%	1.2%
Retail Trader	12.6%	12.5%	12.7%

Total Trade Value and Exposure

	Total	Call	Put
Trade Value	$628,810,006	$335,311,490	$293,498,516
(%)		53.3%	46.7%
Exposure	$28,097,919,414	$14,784,143,545	$13,313,775,869
(%)		52.6%	47.4%

Number of Long and Short transactions (%)

	Total	Call	Put
Long	48.8%	48.5%	49.1%
Short	51.2%	51.5%	50.9%
Ratio	0.95	0.94	0.97

Table 5
Determinants of Liquidity Profits

This table reports the regression coefficient for the regression models detailed below:

$$LI_t = \beta_0 + \beta_1 SPREAD_1 + \beta_2 VOL_1 + \beta_3 VOLAT_1 + \beta_4 UACTIVITY_1 + \beta_5 INFO_1 + \beta_6 BSD_1 + \beta_7 NOMM_1 + \beta_8 MM_1 + \beta_9 RETAIL_1 + \beta_{10} OPEN_1 + \beta_{11} CLOSE_1 + \beta_{12} PTI_{11} + \varepsilon_1$$

$$LR_t = \beta_0 + \beta_1 SPREAD_1 + \beta_2 VOL_1 + \beta_3 VOLAT_1 + \beta_4 UACTIVITY_1 + \beta_5 INFO_1 + \beta_6 BSD_1 + \beta_7 NOMM_1 + \beta_8 MM_1 + \beta_9 II_1 + \beta_{10} OPEN_1 + \beta_{11} CLOSE_1 + \beta_{12} PTR_{11} + \varepsilon_1$$

The dependent variables LI_t and LR_t represents the liquidity profits of institutional traders and retail traders respectively. The model was estimated for institutional trader transactions for the period from 3 January 2006 to 7 July 2006.

	LI1: *Institutional Trader*				LR1: *Retail Trader*			
Variable	Coefficient	t-stat	Pr > |t|		Coefficient	t-stat	Pr > |t|	
Intercept	-99.0074	-1.460	0.1438		-68.2812	-21.960	<.0001	
SPREAD	268.3655	2.320	0.0203	^^	622.7271	37.820	<.0001	*
VOL	0.2853	1.970	0.0494	^^	2.6663	53.630	<.0001	*
VOLAT	-0.1866	-0.670	0.5011		0.0001	0.000	0.9985	
UACTIVITY	0.0587	3.310	0.0009	**	0.0241	10.840	<.0001	*
INFO	11.2488	0.200	0.8447		-20.5109	-3.060	0.0022	^
BSD	15.8039	1.020	0.3059		2.7444	1.500	0.1347	
NOMM	173.6577	2.610	0.0090	^	25.1686	3.880	0.0001	*
MM	180.7778	2.760	0.0057	^	62.6007	22.440	<.0001	*
RETAIL	27.8177	0.390	0.6938		---	---	---	
II	---	---	---		-22.3728	-2.760	0.0058	^
OPEN	-14.0764	-0.640	0.5206		2.8440	1.100	0.2732	
CLOSE	92.7459	2.930	0.0034	^	-5.1900	-1.460	0.1437	
PTI	-0.0379	-14.120	<.0001	*	-0.0485	-77.200	<.0001	*
Number of Observation		5,713				121,945		
Adjusted R-squared		4.51%				8.59%		
F-Value		23.5				955.73		
DW statistic		1.594				1.714		

* Significant at 0.01%
** Significant at 0.1%
^ Significant at 1%
^^ Significant at 5%

Table 6 (a)

Determinants of Position-Taking Profits: Institutional Trader

This table reports the regression coefficient for the regression models detailed below:

$$PTI_{1i} = \beta_0 + \beta_1 SPREAD_i + \beta_2 VOL_i + \beta_3 VOLAT_i + \beta_4 UACTIVITY_i + \beta_5 INFO_i + \beta_6 BSD_i + \beta_7 NOMM_i + \beta_8 MM_i + \beta_9 RETAIL_i + \beta_{10} OPEN_i + \beta_{11} CLOSE_i + \varepsilon_i$$

$$PTI_{2i} = \beta_0 + \beta_1 SPREAD_i + \beta_2 VOL_i + \beta_3 VOLAT_i + \beta_4 UACTIVITY_i + \beta_5 INFO_i + \beta_6 BSD_i + \beta_7 NOMM_i + \beta_8 MM_i + \beta_9 RETAIL_i + \beta_{10} OPEN_i + \beta_{11} CLOSE_i + \varepsilon_i$$

The dependent variables PTI_1 and PTI_2 represents the position-taking profits earned by institutional traders, calculated using daily closing price and package closing price respectively. The model was estimated for institutional trader transactions for the period from 3 January 2006 to 7 July 2006.

	PTI1: *Daily Closing Prices*				PTI2: *Package Closing Prices*			
Variable	Coefficient	t-stat	Pr > |t|		Coefficient	t-stat	Pr > |t|	
Intercept	-428.4533	-1.280	0.2001		-740.5301	-0.540	0.5923	
SPREAD	-397.3639	-0.700	0.4864		-439.5673	-0.190	0.8523	
VOL	1.4806	2.070	0.0388	^^	3.9093	1.320	0.1871	
VOLAT	5.5680	4.070	<.0001	*	2.7109	0.480	0.6317	
UACTIVITY	0.2458	2.810	0.0050	^	0.3645	1.010	0.3136	
INFO	1046.5430	3.700	0.0002	**	2234.8764	1.910	0.0564	^^^
BSD	333.0817	4.380	<.0001	*	1122.3616	3.570	0.0004	**
NOMM	-793.9993	-2.420	0.0155	^^	1670.4588	1.230	0.2180	
MM	-51.9040	-0.160	0.8724		-707.4453	-0.530	0.5965	
RETAIL	-94.6093	-0.270	0.7862		-499.8386	-0.350	0.7290	
OPEN	-44.6302	-0.410	0.6799		203.3388	0.450	0.6495	
CLOSE	-97.9610	-0.630	0.5305		1269.9112	1.970	0.0493	^^
Number of Observation		5,713				5,713		
Adjusted R-squared		1.18%				0.35%		
F-Value		7.18				2.80		
DW statistic		1.254				1.187		

* Significant at 0.01%
** Significant at 0.1%
^ Significant at 1%
^^ Significant at 5%
^^^ Significant at 10%

Table 6 (b)
Determinants of Position-Taking Profits: Retail Trader

This table reports the regression coefficient for the regression models detailed below:

$$PTR_{1i} = \beta_0 + \beta_1 SPREAD_i + \beta_2 VOL_i + \beta_3 VOLAT_i + \beta_4 UACTIVITY_i + \beta_5 INFO_i + \beta_6 BSD_i + \beta_7 NOMM_i + \beta_8 MM_i + \beta_9 II_i + \beta_{10} OPEN_i + \beta_{11} CLOSE_i + \varepsilon_i$$

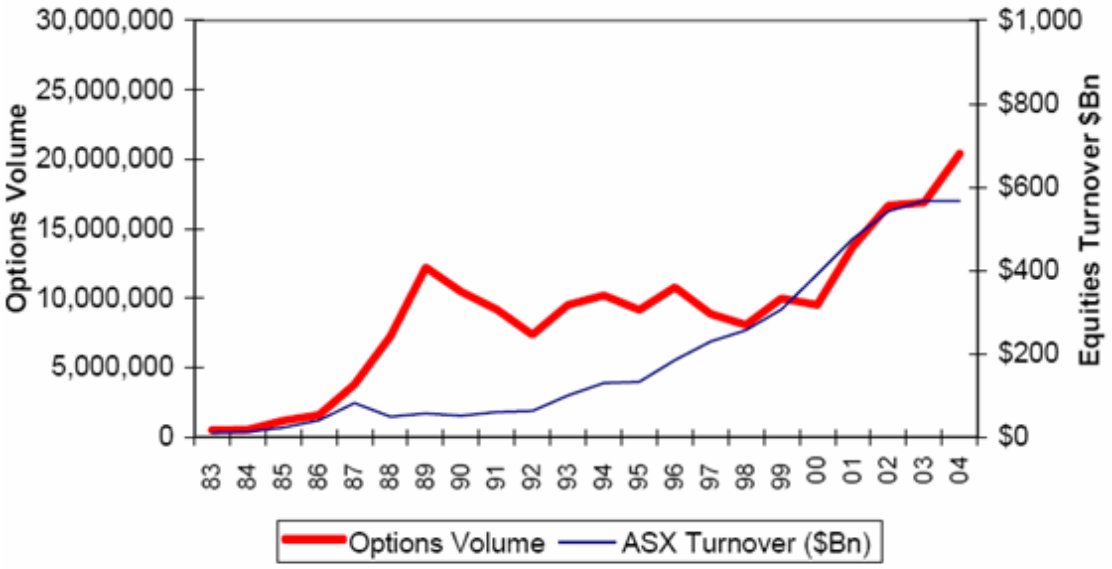
$$PTR_{2i} = \beta_0 + \beta_1 SPREAD_i + \beta_2 VOL_i + \beta_3 VOLAT_i + \beta_4 UACTIVITY_i + \beta_5 INFO_i + \beta_6 BSD_i + \beta_7 NOMM_i + \beta_8 MM_i + \beta_9 II_i + \beta_{10} OPEN_i + \beta_{11} CLOSE_i + \varepsilon_i$$

The dependent variables PTR_1 and PTR_2 represents the position-taking profits earned by retail traders, calculated using daily closing price and package closing price respectively. The model was estimated for retail trader transactions for the period from 3 January 2006 to 7 July 2006.

	PTR1: *Daily Closing Prices*				PTR2: *Package Closing Prices*			
Variable	Coefficient	t-stat	Pr > |t|		Coefficient	t-stat	Pr > |t|	
Intercept	44.7367	3.150	0.0016		125.3476	1.530	0.1254	
SPREAD	-749.9307	-9.990	<.0001	*	-1567.7302	-3.620	0.0003	**
VOL	-2.5206	-11.120	<.0001	*	-6.4042	-4.900	<.0001	*
VOLAT	-1.7630	-9.040	<.0001	*	-2.5410	-2.260	0.0238	^^
UACTIVITY	-0.0584	-5.750	<.0001	*	-0.0671	-1.140	0.2524	
INFO	20.4130	0.670	0.5042		-494.2476	-2.810	0.0050	^
BSD	100.8737	12.060	<.0001	*	81.0807	1.680	0.0928	^^^
NOMM	-13.3140	-0.450	0.6524		215.2770	1.260	0.2066	
MM	-113.6941	-8.930	<.0001	*	-92.1168	-1.260	0.2093	
II	8.2305	0.220	0.8240		-325.9169	-1.530	0.1267	
OPEN	-40.4685	-3.420	0.0006	**	77.9631	1.140	0.2536	
CLOSE	12.0435	0.740	0.4571		-48.2994	-0.520	0.6050	
Number of Observation	121,945				121,945			
Adjusted R-squared	0.49%				0.04%			
F-Value	55.27				5.27			
DW statistic	1.616				1.532			

* Significant at 0.01%
** Significant at 0.1%
^ Significant at 1%
^^ Significant at 5%
^^^ Significant at 10%

Figure 1
ASX Options Market Volume 1983-2004



Source: ASX Institutional Options Market Fact Sheet, ABN 98 008 624 691, February 2005

Figure 2