BABSON

Individual and Institutional Investor's Trading in Weekly Options.

Aniket Manoj Shroff

Honors Thesis Research Paper Spring 2016- Fall2016

Advisor: Prof. Ryan Davies

Awarded 2017

X
Professor Ryan Davies

X
Professor Richard Bliss

X
Professor Virginia Soybel

Table of Contents

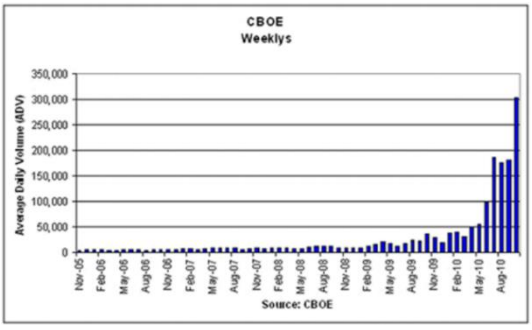
1. Abstract

Weekly options are fairly new derivative instruments that started to trade in 2005. The weekly options expire every week and there is a puzzle as to why investors are trading them, when investors are trading them and whether investors are generating any profits by trading them. This thesis studies different investor types and sheds light on the possible answers to the questions raised. An analysis of the intraday trading patterns and the investor profitability is conducted in order to derive possible answers to the questions. The thesis discovers evidence in support of individual investors holding opinionated traits where trades contain both gambling and hedging characteristics. While institutional investors are found to be informed traders who are either using private information or are hedging. Furthermore, evidence suggestive of individual investors being informed in the put options is found. Finally, the profitability results indicate that individual investors generate losses in the options market while institutional investors generate profits.

2. Introduction

Options are widely traded securities which allow investors to hedge, speculate or invest in the market. Stock options normally expire on the third Friday of the contract month, which is the month when the contract expires. However, when that Friday falls on a holiday, the expiration date is on the Thursday immediately before the third Friday. Baeur et al., Chakravarty et al., Lakonishok et al. are a few scholars that have conducted research around the functions of monthly options. Lakinishok et al. suggest that monthly options give enough time for investor to hedge their positions by trading covered calls. Meyer et al., Grinblatt et al., Han and kumar, Garett and Sobel are few papers that emphasize the profitability of options for certain investor.

Specifically Bauer et al. points out that Individual investors lose 1.81% per month in gross terms over a 3 year analysis of data. Baeur et al., Barber and Odean, Han and Kumar, Doran et al. Laonishok et al. Grinblatt et al. and Meyer et al. are few papers that credit the loss of individual investors to gambling or naked speculation. On the other hand, Bauer et al. talks about the exploitation by professional traders who possess proprietary information in the options market. In addition, to the existing literature on options, Chatrath et al. research talks about a new option termed the "weeklys" options. His research suggests that "weeklys" options are more volatile instruments compared to the normal options. In 2005 CBOE started a pilot program with "weeklys" options which expire every week. The weeklys are introduced each Thursday and they expire eight days later on Friday (with adjustments for holidays). The weekly expiration allow investors to enjoy 52 expirations a year. The traded volume of the weeklys increased exponentially by 2010 (Introduction 1).



Introduction 1 Average Daily Volume of weekly's options traded on the CBOE.

These options are scarcely researched and their short life span value to investors has to be yet identified. On the horizon, such options seem to provide less benefit for hedging as they cover risk for a very short period of time. Chatrath et al. suggests that these options are highly volatile; hence, "weeklys" could be thought of as a great speculating tool for gambling investors who want quick results in the highly leveraged options market.

This thesis sheds light on why investors are trading them, when investors are trading them and whether investors are generating any profits by trading them. An analysis of the intraday trading patterns and the investor profitability for different investor type is conducted in order to derive possible answers to the questions. The main focus of the paper is on the individual investors who invest in such short-lived instruments. This thesis starts by identifying trading patterns of weekly options by different investor types and investor trades. The trading pattern provide evidence that answers several questions which help to puzzle out the purpose of weekly options to the investors. The trading pattern analysis is compared to the stock and monthly options U-shape daily trading pattern in order to identify similarities and differences between the securities. The pattern also helps answer the question of when investors trade the weekly options. Furthermore, the trading pattern analysis identifies whether certain investors trade options in a haphazard or strategic way. This reveals information on the purpose of investment for certain investor types. The buy and sell pattern is also studied to find out whether institutional and individual investors have a buy-sell relationship where the latter buys from the former. Moreover, trades executed minutes prior to expiration is examined to identify the reasons of last minute weekly option trades by different investor types. Finally, the trading pattern analysis is concluded by shedding light on the trades by different investors in different moneyness options. Doran et al., Anderson et al. and Grinblatt et al. are a few papers which identify gambling investors as having a long shot bias in the options market. Specifically Doran et al. explains that individual investors invest in out of the money options in order to make large wins. However, not much is known about whether out of the money “weeklys” options are heavily preferred as gambling securities; hence, the trading patterns for different moneyness options is studied in this

thesis in order to identify different investors motives for investing in weekly options with varying moneyness.

This thesis further conducts empirical research on the profit generated by different investor types in the weekly options. The empirical research helps shed light on the profitability of investors in the weekly options market. Meyer et al., Grinblatt et al., Han and kumar, Garett and Sobel emphasize the loss of individual investors in the monthly options market; however, hardly any research studies which investors make losses in the "weeklys" options market. Therefore, calculating weekly options profit helps in identifying which investors lose or make money. This helps to explain the possible reasons of trading such short lived instruments by different investors. The profit analysis also helps to provide evidence whether weekly options are an additional way for institutional investors and exchanges to exploit individual investors or are value added instruments for individual investors. In addition, the weekly options profit is split by the underlying stock characteristics in order to identify which stock characteristics attracts different investors in the weekly stock options market. The stock characteristics builds an explanation for which weekly stock options are more attractive to investors. For example, analysis of the underlying stock price and underlying stock industry is tabulated against "weeklys" option profit to identify specific characteristics which contribute to the profitability of the investors. Along with the stock characteristics, a weekly options profit analysis is conducted against option moneyness. The profit by moneyness helps to identify whether certain investors trade weekly options as a means to conduct opinionated trades or whether they have proprietary information they want to act on quickly. The moneyness analysis in both the trading patterns and profitability is collaborated to identify certain investor trading pattern which could dictate profitability for different moneyness options. Finally, the profitability of investors is studied

against each expiring weeks in order to identify the stability of such instruments for different investor types.

The main goal of this thesis is to identify when investors trade, why they trade and whether they make profits trading. Therefore, the thesis identifies the individual and institutional investor profitability and trading pattern in the weekly options. The results of this analysis help in identifying evidence suggestive of when different investors trade, why they trade and whether they make profit from their trades. Identifying the reason for trading weekly options is extremely valuable to investors and policy makers. The investors could understand the implications of trading in the weekly options and could get a perspective on how individual and institutional investors trade. On the other hand, the policy makers could analyze whether weekly options require additional regulation or need to be completely abandoned. The results of this thesis could help them to analyze whether weekly options are new instruments introduced by exchanges to simply exploit investors or are value added securities.

This thesis identifies U-shape patterns in the weekly options market which suggest that investors heavily trade at the start and end of the day. Possible reasons for such trading patterns is attributed to the increased liquidity needs by investors to readjust their portfolio and for informed traders to trade on their information. Also, the exchange is closed before and after the start and end of the trading day. Hence, investors who are discretionary liquidity traders or informed traders may want to execute on their trade immediately after trading starts or before the trading day ends. Therefore, the weekly options may consist of both informed and liquidity traders who trade heavily at the start and end of the day.

In addition to the when the options are traded, evidence suggesting the reasons and profitability of trading weekly options is generated. The evidence suggests that individual

investors are opinionated traders because they mainly trade in attention grabbing weekly stock options which generate losses. The results indicate that individual investors are had a total combined loss of $1,412,019.75 by investing in INTC, IBM, RIMM, MSFT and AMZN (Result 2). These technology stocks are normally what covers the news and are attention grabbing stocks for investors. Therefore, the losses of individual investors in attention grabbing stock could indicate that individual investors are speculators who trade by popularity rather than information.

Also, all individual investors lost money by trading weekly stock options on the last day of weekly option. Their loss by trading hours prior to expiration suggest that individual investors are opinionated traders who lack information in the options market. On the other hand, almost all institutional investors generated profit by trading hours prior to expiration of the option. This results could suggest that institutional investors possess private information because it is difficult to generate profit hours prior to the expiration of the option.

Moreover, some institutional investors generated profit trading deep in the money options. Such options are too expensive to trade and rarely generate profits. However, some institutional investors generated the highest profit per option trading deep in the money options. This could highlight that such investors could be possessing information about the market.

On the other hand, institutional investor's results suggested that they were hedging. Some institutional investors sold and bought the same amount of in the money options. Therefore, their trade suggested that institutional investors engaged in hedging trades. The thesis further identifies evidence which imply that weekly options market are stable. The profit analysis against expiring weeks do no indicate any one sided investors that were either winners or losers; hence, it suggests that the market is balanced. Finally, individual investors generated profits in

the put option which could suggest that individual investors might possess some information when trading the put options or could be simply hedging using put options.

Overall, the thesis finds evidence which suggests that individual investors are opinionated traders who gamble and hedge via weekly options while institutional investors are informed traders who trade weekly options to generate profit on their proprietary information. The weekly options investor profitability is stable; hence, policy makers do not need to worry about the exploitation of individual investors.

The thesis starts with a brief introduction of options followed by an extensive literature review of research conducted on the stock and options market. Then the core question of the research is explained. The core question is followed by the data section and methodology section. The data section explains the source of the data and conducts some summary statistics on the datasets. On the other hand, the methodology section explains the procedures applied to arrive at the results. After the methodology section, the results and conclusion follows. These sections emphasize the findings of the thesis and talk about possible future research. Then the thesis has the exhibits which include the tables and graphs. Finally, the code written to achieve the results is included in the code section.

3. Options

Stock options are a very popular financially traded instrument. According to Chicago Boards Option Exchange (CBOE), in 2014, there were a total of 1,274,776,218 option contracts traded during the 252 trade day period. This trade summed to a total dollar volume of over half a trillion dollars. The dollar volume of 2014 boasted a more double volume figure from the 2005 dollar volume of 200 billion dollars. These heavily traded instruments derive their value from the

underlying stocks. Options ease the process of buying and selling stock exposure; therefore, an investor could take on the exposure of the stocks without purchasing the actual underlying stock. This allows investors to purchase expensive stocks at a much cheaper price with the help of stock options. However, options are redundant since they could be replicated by taking a leverage in risk free bonds and purchasing the underlying stocks. Why is the options market so big then? The obvious reason is transaction costs. Options avoid the increased costs of purchasing and selling stocks and bonds. Another attribute that makes options attractive is the leveraged advantage (Black). Options allow investors to purchase exposure to expensive stocks at a cheaper price. Hence, traders that could not afford expensive stock, utilized options to gain exposure to those stocks. Furthermore, options allow investors to easily hedge their portfolio risk at a lower price relative to setting up an opposite trade. There are two types of options, namely call and put options. Call options give the buyer the right to buy a stock in the future at a price and quantity that is agreed on today. The sellers of call options also known as the writer, sells the call option to take on the obligation to provide the stock if at all the call options are exercised by the buyer. On the other hand, the buyer of a put option buys the right to sell a stock in the future at a price and quantity agreed on today. The writer of the put options takes on the obligation to buy the stock if the buyer of the put option exercises the put. Investors buy calls and or write puts when the bullish on the market while they execute the complete opposite order when they have a bearish outlook on the market. Options are a zero sum trade; one party's profit is another party's loss. Hence there is always a winner and loser in the market. This feature makes options resemble gambling which indicates that options is a very risky instrument.

The prices of options are determined through the famous Black and Scholes formula (1973). This formula takes into account the volatility, stock price, strike price and time to expiration in order to price the option.

$$C = SN(d1) - N(d2)Ke^{-rt}$$

$$d1 = \frac{\ln\left(\frac{s}{k}\right) + \left(r + \frac{s^2}{2}\right)t}{s * \sqrt{t}}$$

$$d2 = d1 - s * \sqrt{t}$$

Black and Scholes option pricing formula

C is the call premium. S is the current stock price, t is the time until the option expires, K is the option strike price, r is the risk free interest rate, N is the cumulative standard normal distribution, and s is the standard deviation of the stock.

Before 1970, option trade occurred at the physical board of exchange in the trading pit. An investor had to call their broker for an order who would then send the order to an order clerk at the floor. The order clerk would relay the order to the floor broker who would then close an order and send information back up that chain. After 1970 a lot of improvements allowed brokers to execute orders through computers. After the year 2000 the electronic trading platforms were setup to allow trader to trade. CBOE Direct, an electronic trading platform was set up in 2001. Improvement in technology has enabled the average "Joe" to execute trades by sitting at a computer in the comforts of his home. This has contributed to the increased volume of options traded. Analyzing the trade data could reveal a lot about different investor types and their purpose for trading options. Research attributes "information" and or "opinions" as the driver of option trading. This thesis identifies evidence which suggest the major possible reasons for

trading in the weekly options market by different investor types (institutional investor or retail investor). The two major categories for trading is information based and opinion based (speculation or hedging) trading. Therefore, in order to bifurcate the two possible reasons, the intraday pattern and investor profitability is studied.

4. Literature Review

The literature related to our study is divided into three general categories. The first part of the literature focuses on the theoretical and empirical research around the reasons that drive the trading of stocks. The second part of the literature investigates the theoretical and empirical evidence of informational lead-lag between stocks and options. Finally, options role as an information tool is explored in the literature.

Researchers have come up with various explanations for trading in the stock market. Hellwig researched on the role of information in discovering the equilibrium price. He suggests that the equilibrium price is not an efficient aggregator of information; however, he claims that the inefficiency is irrelevant because the "market draws on many independent sources of information" hence, individual errors cancel out (Hellwig 493). Building on Hellwig's research of noise cancelling out due to aggregation of market information into the price, many researchers have found exogenous liquidity traders taking advantage of the information they possess. Glosten and Milgrom suggest that "presence of traders with superior information leads to a positive bid-ask spread" (Glosten and Milgrom 71). This illustrates that informed traders benefit from the information they possess. Furthermore, the spread causes realizable returns to be overestimated relative to the actual returns for traders without inside information. Hence, uninformed traders are at a disadvantage due to the movement of the spread.

On the other hand, Kandel and Pearson offer evidence of extensive trading around earnings announcements due to differing opinions (Kandel and Pearson 831). Their paper suggests that traders in speculative market do not interpret public information identically. They provide empirical evidence by studying the volume of traded stock and returns around public announcements. Hence, their paper suggests that traders trade based on different opinions rather than information. Bessembinder et al., Bamber et al., Diether et al., Hong and Stein, Chordia et al., and Sarkar and Schwartz all provide evidence of trade based on the dispersion of opinion. Barber and Odean showed in their paper, "All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors" that "individual investors" (785) have a choice set from which they buy stocks and it show that individual investors buy "attention grabbing stocks" (785). It claims, however, that individual investors selling patterns are not affected by attention grabbing stocks since they tend to "sell stocks they already own" (Barber and Odean 785). In addition, the research mentions that selling patterns of large investors are not the same as individual investors because large investors could "short sell" (Barber and Odean 787) and they have a lot of stock that they could choose to sell from. Hence, the buying and selling choice set for large investors is "identical" (Barber and Odean 787), and is not influenced by attention grabbing stocks. This pool of attention grabbing stock limits individual investors' knowledge about unpopular, high return stocks. Another scholar, Mark Grinblatt, conducted research on the Finland market and observed that past returns in the Finland stock market determine the future behavior of investors. His paper, "The Investment Behavior and Performance of Various Investor Types: A Study of Finland's Unique Data Set" found that "foreign investors tend to be momentum investors" (Grinblatt 43), who buy past "winning stock" (Grinblatt 43) and sell "past losers" (Grinblatt 43). On the other hand, "domestic investors,

particularly household" (Grinblatt 43), employ the opposite strategy. The research finds that "foreign investors" (Grinblatt 43) outperform the "households" (Grinblatt 43). Therefore, individuals are losing out due to their behavior of following an opposite strategy. These researchers illustrate that traders are trading on based on opinion rather than private information. The literature suggests that there is both informed and opinion based trading in the stock market.

The second part of the literature focuses on the relationship between the stock and the options market. Chuang-Chang Chang, Pei-Fang Hsieh and Huang-Neng Lai looked at the effects of predictive power. Their paper, "Do Informed Option Investors Predict Stock Returns? Evidence from the Taiwan Stock Exchange" proposed that foreign institutional investors had greater predictive power in the TAIEX options market (Chang, Hsieh and Lai 763). Hence foreign capital inflow could predict the options returns. Furthermore, Chakravarty et al. find direct evidence of significant price discovery in options. They conclude that informed traders utilize options as well as the underlying stock to trade (1235). Therefore, their paper suggests that informed trading is conducted in the option market. Some scholars looked at the similarities in returns for both markets. Researchers like Aamir Sheik and Ehud Ronn are example of scholars that explored the returns for both markets. In their paper, "A Characterization of the Daily and Intraday Behavior of Returns on Options," they found that similarity of "private information" (Sheik and Ronn 576) in the "stock and option markets" (Sheik and Ronn 576) lead to "similarities in the behavior of stock returns and adjusted option returns" (Sheik and Ronn 576). This suggests that investor's trade with private information in both the stock and options market.

Evidence is provided by other authors that option traders do not trade with information. Many scholars found that the stock market leads the option market. Jens Stephen and Robert

Whaley, in their article “Intraday Price Change and Trading Volume Relations in the Stock and Stock Option Markets" find that the “stock market lead[s]” (Stephen and Whaley 214) the option market in terms of price changes and trading activity. Marco Avellaneda and Michael Lipkin also conducted research on the option volume impact on the stock prices in their paper "A Market-Induced Mechanism for Stock Pinning." Their paper portray the phenomenon that is commonly called stock pinning. They find out that large “open interest” (Avellaneda and Lipkin 417), on a particular option contract leads to “delta hedging in aggregate” (Avellaneda and Lipkin 417), which causes the stock price to move to the “strike price of the option” (Avellaneda and Lipkin 417). The movement of the stock price to the strike price at option expiry is commonly referred to as stock pinning. They found that the pinning phenomenon of the stock price and the strike price occurred with a “finite probability” (Avellaneda and Lipkin 423). Therefore, this piece of literature illustrates that there is no informed trading in the options market and instead the options market trade data is used as information to trade in the stock market.

Furthermore, Vijh portrays that informed trading has a small influence on the liquidity of the CBOE options. His paper defines liquidity by the bid-ask spread in the option prices and the volume of trades conducted. Smaller spreads represents liquid markets and since, informed traders do not influence the liquidity, they do not affect the spreads. Since the spreads are small, it suggests that “option dealers charge only a small premium to recover losses inflicted by informed traders,” (Vijh 1178) which indicates that the options market is not dominated by informed traders. Vijh emphasizes, “What many option traders consider to be superior information may be just a different opinion” (Vijh 1178).

Therefore, the question arises of what is the main driving force of option trading if information is not a major driver. Hedging could be an obvious reason. However, hedging could not alone explain the large volume of trading, especially for customer traders. Also, Lakonishok et al. found that covered call was the major trading strategy in the options market (844 and 845). This hedge, however, does not appear to be a "logical hedge for the underling" (Choy and Wei 2300) because it does not completely protect the buyer from price movement risks. Hence, the discussion lead to discovering other possible motives for option trading.

Meyer, Schroff and Weinhardt examine trading patterns of retail investors in the highly leveraged products offered by the German investment banks. They find that retail investors purchase highly leveraged derivative to experience the adrenaline rush received from trading such products (Meyer et al. 112). Their findings portray that retail investors perform badly on a risk adjusted basis and they attribute the negative performance to the transaction costs (Meyer et al. 136). They also discover that the retail investors do not have any informational advantage and they are pure speculators and gamblers in the market (Meyer et al. 136). The literature portrays that investors are looking for entertainment (Dorn and Sengmueller 591) and are sensation seekers (Grinblatt and Keloharju 549); hence, trade much more frequently than others. Moreover, retail investors are attracted to assets which have characteristics of a lottery, such as a high skewness of returns (Han and Kumar; Brunnermeier and Parker; Garrett and Sobel; Gao and Lin). In addition, retail investors care less about the expected return of an asset and place much emphasis on the possibility to generate extreme positive returns. Therefore, retail investors are pure speculators that are deriving the casino pleasure through sitting at home and trading.

Doran et al. find that retail investors are more attracted to out of the money options, around New Year's Day (727). His paper finds that January call options that are out of the

money have higher retail demand and are the most expensive and actively traded options. He finds a similar trend with the lottery type Chinese stock options which have a higher demand during the Chinese New Years' month but not in January. Doran et al. show that retail sentiment is more bullish on lottery-type stocks in January. His paper illustrates that retailers use options as a gambling opportunity, especially during the months of January. Lakonishok et al. also talk about directional speculation constituting as one of the largest amounts of trade in the options market (846). They discover that investor's main trading strategy is writing covered calls. A covered call is when investors own a stock and short a call option in order to squeeze out some extra profit from the underlying stock. This strategy illustrates that investors speculate that the stock price would not rise as much and the options will end up out of the money; hence, investors will get to keep the premium from selling the call option.

Bauer et al. find evidence for gambling in the Euronext Liffe Amsterdam Options Exchange for trades that occurred between 2000 and 2006. They later go on to find that "single men with low income and little investment experience are most likely to engage in … option trading…" (732). Anderson empirically discovers that investors that are most likely to gamble are those with less capital in hand (28). These research papers point out that retail investors gamble through the options market (Anderson 28). However, not a lot of research has observed in the weekly options which are more likely to have gambling trades due to their nature of being highly volatile (Chatrath et al. 237). High volatility encourages investors to try out their luck because the high movement in the stock could grant them a chance to make some money.

Choy and Wei looked at returns in options around the earning announcement. They found that there is no informed trading around the earnings announcement. Their analysis suggests that

the increased option trading around announcement is due to "speculative trades" (Choy and Wei 2320). They attribute the speculative trades to retail investors.

The literature review mainly emphasizes the main reason of trading in the stock and options market for different investors. The stock market research papers suggest that investors who trade stocks are informed or opinionated. The research then talks about the possible reasons for trading options. Some papers suggest that options are traded in order to get more information for the stock market. Therefore, in those research papers, options are an information source for stock market investors. Other papers suggest that the purpose of trading options is to hedge their investments. Many other research sources, however, claim the options market to be a gambling tool for investors to satisfy their gambling needs. The research field identifies several reasons for options and stock trading; however, very little work has been done on identifying the purpose of weekly options. The purpose of the weekly options could be for conducting gambling trades, informed trades, hedging trades or getting information for other market trades. This thesis identifies the purpose of trading weekly options in the market by different investors.

5. Core Question

The core question of the thesis is to identify the purpose of trading weekly options. In order to understand the purpose of trading weekly options, the intraday trading patterns and investor profitability is studied. The intraday pattern trades are analyzed by posing several smaller research questions. These smaller questions helped in answering the overarching question of the purpose of trade for investors. The intraday research questions are:

a) Which pattern is followed by the daily trading of the weekly options?

b) Which options do investors trade more (in the money, at the money or out of the money)?

c) Do investors close all weekly options opened positions or do they let them expire in order to earn the intrinsic value?

d) Which investor had the highest traded volume relative to other investors?

e) Is there a buy-sell relationship between individual and institutional investors?

The intraday research questions are followed by research questions to study the profitability of each investor. The profitability research questions are:

a) Did the underlying stock prices drive certain investor profitability in the weekly call and put options?

b) Did investor's call and put weekly options profitability differ by underlying stock industry?

c) How did weekly options moneyness contribute to the weekly call and put options profitability of different investors?

d) Are investors call and put options profits stable over each options expiring week?

e) How did investor's weekly options profitability change days prior to expiration of the option?

6. Data

6.1. Data Summary and Sources

There are two datasets utilized in the thesis. The primary source of investor option trades is the International Securities Exchange (ISE) open close option trades from 28th June 2010 to 10th December 2010 for weekly options. The year of 2010 was selected because "weeklys"

options gained prominence in the year of 2010 where the average daily traded volume increased exponentially (Introduction 1).The database is called the ISE open/close trade profile and is obtained from the International Securities Exchange website. The open/close trade profile dataset contains 108 trading days and there are 1,090,810 observations in the dataset. In addition, there are 46 underlying tickers that have weekly options. These weekly options have traded volume which range from 8700 contracts of AXP to 837,581,500 contracts of SPY (Exhibit 10.1.1.1a). The strike price of these options range from $1 to $2325.

ISE is a similar platform to the Chicago Board Options Exchange (CBOE). CBOE and ISE both list exchange traded options. The exchange traded options are standardized option contracts; for example, the strike price, days to expiry and settlement information are all standard and there is no negotiation related to the option contract terms. This is different from 'over the counter' (OTC) trades. OTC trades involve 2 parties that draw an options contract and could add additional terms into the contract. There is no standardization to such contracts and they are open to wide covenants written in the contract. The easiest way for an option trader to trade and gain exposure to the market is by trading on exchanges such as the ISE and CBOE. In such exchanges it is easier for the option trader to avoid the hassle of finding a counter party that is willing to enter into a contract with them. Furthermore, the standardized contracts make pricing of the contracts easier for the investors. The exchange traded platforms charge commission for trades executed through them. The options contracts get cleared through a clearing house and the fulfillment of the contract is guaranteed by the Options Clearing Corporation (OCC). In the exchange traded options the counterparties remain anonymous; however, the enforcement of market regulations ensure that investors are not exploited and the markets operate in an orderly fashion when there are high volatile market conditions. For example, there are circuit breaks

which stop market trading if the market drops by a large percentage in a trading day. These regulations ensure fairness in the market. ISE was the "first all-electronic options exchange in the U.S."(McGregor). It was opened in 2006 and transformed the options market by creating an efficient market structure through its powerful technological approach to trading. There are more than 11 exchanges that compete for the market share of the options traded. Individual investor's trades get executed at the exchange which has the best price at the trading time. Therefore, when a retail investor trades an option on TD Ameritrade, their option gets executed at an exchange that provides the best price. The recent development in technology has allowed investors to select the exchange they prefer to execute their orders. One of the prominent exchanges is the CBOE. It was created in 1973. The exchange has added products including exchange-traded funds, interest rates and volatility indices.

The ISE allows traders to trade weekly options electronically. ISE holds an approximate of 20.8 % of the market share in 2010 (data 1). The 2010 data is analyzed because this is when the weekly options trade increased exponentially. The major investors are individual investors who represent 21.1% of the ISE's market share. Market makers and firms market share comes second with the market share of 20.8% and 19.9% respectively.

Equity and ETF Options Volume Statistics

	Current Month			Year-to-Date		
(000s)	Oct-10	Oct-09	% Change	Oct-10	Oct-09	% Change
ISE Average Daily Volume	2,903.9	3,907.7	-25.7%	2,949.4	3,941.9	-25.2%
ISE Total Volume	60,981.6	85,968.5	-29.1%	616,428.4	827,807.0	-25.5%
Industry Average Daily Volume	15,198.5	13,942.2	9.0%	14,168.3	13,572.8	4.4%
Market Share	19.1%	28.0%	(8.9) pts	20.8%	29.0%	(8.2) pts
Market Share: Customer	19.2%	29.7%	(10.5) pts	21.1%	31.0%	(9.9) pts
Market Share: Firm	19.0%	24.4%	(5.4) pts	19.9%	26.9%	(7.0) pts
Market Share: Market Maker	19.1%	27.4%	(8.3) pts	20.8%	27.9%	(7.1) pts

data 1: ISE Market Share: The above data illustrates the market share of International Securities Exchange for 2010. The market share focuses on the equity and exchange traded fund options only

The open close data contains weekly options on stock, which are similar to the monthly options except the expiration of these options is every Friday, unless Friday is a trading holiday. Every new options are listed on Thursday of each week for options that expire the following Friday (ise.com). This is different from the monthly options which expire every third Friday of the month. The weekly options are cash settled compared to other futures contracts that take the delivery of the underlying instrument. For example, if a call option, which give the buyer a right to purchase the underlying stock, expires and the strike price is lower than the stock price then the difference is credited to the clients account as profit. There are certain futures contracts where the client would receive the physical delivery of the stock at the agreed price and the client would have to turn around and sell the stock in order to cash out their profit. Weekly options are advantageous because they have a shorter life span; hence, they reduce the risk of the client has when trading the option because it is less likely that wild swings would occur over a shorter period of time. These options are a great way for some clients who have a short term insight on the market movements.

The trading hours for weekly stock options are 9:30 am (ET) until 4:15pm (ET) (Goldberg). The ISE data contains a daily breakdown of traded options volume into ten minute buckets. Therefore, each specific option trade is aggregated into ten minute buckets. For example, if BP call with a strike of $40 expires on 15th October 2010 and there were two trades of 5 contracts each traded on 13th October 2010 at 12:03 pm and 12:08 pm, the dataset aggregates this trade data into one bucket of 10 trades between 12:00 pm and 12:10 pm. Furthermore, the options traded volume is split by the trade type (open/close/buy/sell), size (small/medium/large), customer type (firm/customer/professional customer/proprietary/ broker), option type (put/call) and moneyness (in/at/out). This data has several advantages. First, the

breakdown by the trade type helps in differentiating whether the trade was a buy or a sell. Unlike the 2 choices (buy/sell) in the stock market, options have 4 trades that could be executed. Traders could open a position by either buying an option or selling an option. If a trader opens a position through buying an option, the trader could close the position by selling the option or waiting till the option expires. On the other hand, if a trader opens a position by selling an option, the trader could close his position by buying an option or waiting till the option expires. Therefore, these trade options demonstrate the 4 trade types, namely, open to buy, close to sell, open to sell and close to buy. Furthermore, a trader could open a position on another exchange and close it on another exchange; hence, the open and close trade do not necessarily match exactly. Secondly, the advantage distinguishing the size helps in identifying between the small and large traders. Small trades are orders that are less than 100 contracts, medium trades are between 100 and 200 contracts, and large trades consist of order sizes that are larger than 200 contracts. Thirdly, the trader type provides information on the type of trader. This helps in facilitating the difference between well informed traders and less informed traders. There are 5 categories of traders namely, broker/dealer, firm, customer, professional customer, proprietary.

Proprietary trading is when a trader trades option with the firm's own money rather than depositor's money in order to make a profit for the firm. This kind of trading had a very high value at risk and was a major contribution to large losses or profits earned by the firm. Big banks such as Goldman and Merrill Lynch had a special proprietary desk that engaged in trades for the firm. The banks had a separate desk that conducted such trades in order to avoid conflict of interest by front running depositor's money. The Volcker rule was essentially targeted to eliminate proprietary trading. The proprietary trading has reduced significantly at big banks; however, there are special companies such as Virtu Financial, Tower Research Capital LLC. etc.

These proprietary traders utilize highly complex quantitative model and engage in algorithm trading. These companies also take funds from investors and operate like hedge funds.

Firm traders are trades executed by large institutions. The trade size is normally very large for such clientele. Firms are similar to proprietary traders. They trade money for their own account and have a sophisticated quantitative models for trading. Mutual funds, pension funds and exchange traded funds could be thought of firm investors who actively manage client money and take a commission fee. There is very blur line that seperates firms from broker/dealers. To a major extent they are similar in type of trading characteristics, trade size and negotiating power. Broker-dealers execute trades in the interest of the client while a firm trades in the interest on the firm's account.

By definition a broker is any person engaged in the business of effecting transactions in securities for the account of others. Hence, they execute trades on behalf of other investors, business or retail and keep a commission for such transactions. TD Amertrade, Charles Schwab and options house are all examples of brokers who execute trade on behalf of their cleints. Brokers also tied to operations of an investment bank underwrite certain security and offer them for sale for their clientele.

On the other hand, according to the SEC definition a dealer is any person engaged in the business of buying and selling securities for his own account, through a broker or otherwise. Therefore, in a broad sense a dealer is anyone who buys and sells options and is in the business of trading options. Dealers normally advertise themselves as buyers and sellers of options contract.

Therefore, a broker-dealer is a combination of a broker and a dealer. Certain trades are executed for their own account while others are on behalf of the customer. The broker-dealers add liquidity to the market, consult the retail investors on investing strategies and issue analytical research on investment instruments.

The professional customers could be thought of as an algorithmic high frequency trader that executes orders based on slight market movements. The SEC commission definition of the professional customer is a person or entity that (i) is not a broker or dealer in securities, and (ii) places more than 390 orders in listed options per day on average during a calendar month for its own beneficial account(s). This number of trades is equivalent to one order per minute in a six and a half hour trading day. The 390 trades is a total of trades on all exchanges including the ISE. Hence, professional customers trade size indicate that these customers have equivalent technology to the broker dealers and in order to make it fair on the retail investors, such high frequency traders are classified as "professional customers." Hence, the fee and structure and trade execution at the exchange is equivalent to a broker-dealer.

Finally, the customer could be thought of as an average person that trades for himself. The customer orders are retail traders who typically have a lower trade size relative to the institutional investors. They execute trades through brokers. Customer trades normally get executed on several exchanges. The broker normally selects the exchange where the trade could be conducted at a lower price. Hence, there might be scenarios where an option could be opened on one exchange and closed on another.

Furthermore, the option type splits the data as a call or put option. Lastly, the moneyness provides information on whether the option was in the money, at the money or out of the money. In the money options allow traders to make money by exercising the options immediately, while

out of the money options will cause investors to lose money by exercising immediately. At the money options are neutral and the investor would neither lose nor gain money from immediate exercising. The general nature of the moneyness dictates that in the money option would be more expensive relative to out of the money options because in the money options give the investors an option to exercise immediately and make money. An example of in the money option is a call option that gives a buyer the right to buy BP at $32 when the stock is currently trading at $35 on the market. Hence, the buyer of the option could immediately exercise the option and purchase BP at $32. The investor could then turn around and sell BP at $35 in the market; however, the price of the option will be significantly higher which will make the inherent profit evaporate.

The ISE data had expiration dates which were holidays; hence, those options expired a day after on Saturday. Moreover the data had after hour corrections. In order to achieve consistency the abnormal expiration options and after hour corrections were deleted from the data set. This helped to achieve consistency and also improved visual understanding of the data.

The primary source is supplemented by a secondary source of data which helps in calculating profits for each option traded on the exchange. The second dataset is the trade and quote dataset for options from 21st October 2010 to 29th October 2010. This is a week of trading data that contains all the options traded on all exchanges including the ISE. The trade data is registered by the actual time at which the trade is conducted; hence, the data is not bucketed into ten minute intervals. Each row in this dataset represents an option that is traded by a client. This dataset has a lot of variables (Exhibit 10.1.1.1.b.). However, the main variable that is of importance to the scope of this research is the price the option was traded at. The secondary dataset only included a week of data. Hence, we received additional trade and quote data for 6 months from Tick Data LLC. The trade and quote data received consisted of 14 stocks symbols

(10.1.1.2.a.). The trade data from Tick Data LLC is similar to the secondary data we had for a week. Therefore, the weeks' worth of trade data was used along with Tick Data LLC's trade and quote data as the secondary data set. There are 131,048 trades on the ISE exchange in the trade and quote dataset. This dataset only includes trade for the 14 tickers. This data is compressed into ten minute buckets for matching purposes. The final dataset has 58402 observations.

6.2. Merging Dataset

The secondary data set does not specify the trade by the trader type. However, for the scope of this research, we need to identify trades based on the trader type. Therefore, both the primary and secondary datasets were merged. In order to merge the dataset, the trade data had to be filtered to delete the option trades that were committed on other exchanges. Furthermore, the ISE dataset provided the open close trade information per option in ten minute buckets while the trade dataset included time stamps for each trade. Therefore, the trade data needed to be bucketed into ten minute intervals for every option in order to match the dataset. Therefore, we took an average of the option price if there were two same options that were traded in the same time bucket. For Example, if BP call with a strike of $40 expires on 15th October 2010 and there were two trades of 5 contracts each traded on 13th October 2010 at 12:03 pm and 12:08 pm, then the two trades were aggregated into one bucket of 10 trades between 12:00 pm and 12:10 pm. Let say the individual price of the trade were $2 and $3 dollars respectively. Then the aggregated price will end up being $2.5 for the trade and the trade will be combined. This process was important because it is feasible to aggregate trades to match the aggregated data set in the open close dataset; however, it is not feasible to break the aggregated trade into its individual components.

Furthermore, there were only 14 stock symbols in the trade and quote data; hence the open close dataset was filtered to have only 14 symbols. Both the datasets required a numbered labelling of time; for example a trade that occurred between 9:30 and 9:40 was assigned a number '1.' This assigned number changed after every 10 minute interval; hence, 9:40 to 9:50 was assigned number '2.' This helped in creating a dummy variable which could identify the option by the exact time at which it traded throughout the day.

A dummy variable was created in both the primary and secondary dataset in order to facilitate the merging of trades (data 2). Before the merging process began, the datasets needed to be sorted by the ticker symbol, option type (call/put), strike price, trade date and trade time. This helped in aligning similar options from both datasets. Then the dummy variable was used as the primary key to merge the data. The primary key consisted of the option type (call/put), SAS expiration date, SAS trade date, underlying stock, strike price and time bucket dummy variable. A sample primary key is below:

C1861418564BP457

C-*Indicates it's a call option*

18614- *SAS date that indicates the option expiry date*

18564-*SAS date that indicates the option trade date*

BP- *the underlying stock is British Petroleum (BP)*

45- *Is the option strike price*

7- *Is the time interval which indicates that the option traded between 10 and 10:10 am.*

Data 2: The above key is an example of a primary id utilized in merging the trade and quote dataset and the ISE open close dataset. The primary key covers all variables which are required to uniquely point out a single option in the dataset

The above primary key was created for each distinct option that traded in a different time bucket and it was created in both datasets. The above primary key helped with uniquely identifying each option traded by the trade data of the option, its trade time, its ticker symbol, its strike price, its expiration date and finally its option type (call/put). These variables helped in picking out and labelling options and assisted in merging the dataset by uniquely identifying the pair between the datasets.

The merge command was used to merge the datasets by the primary key and the two databases were merged (Code 11.3.1). The single merged database helped in conducting research on the investor type and their profitability.

The example below gives a better visualization of how the trade data and the ISE open close data merged to become one dataset. In data 3, the trade and quote data has 3 trades that occurred on 28th of July 2010 for ABX. These 3 trades occurred for the same call option that is expiring on 30th of July 2010 and has a strike price of 39. The three trades have a combined size of 63 (ise_vol2 sum of 29, 23 and 11). A similar entry can be found in the open close data set that has an entry of a 63 contract trade for the same option on the same trade date. The only difference is that the trade is aggregated into a ten minute bucket which spans from 13:40 to 13:50. Hence both the data set have recorded the same trade in a different fashion. The trade and quote data has detailed trade while the open close has collated trade. It is more difficult to break the open close bucket time into individual trades because it is impossible to find the split of the 63 contract trade. Hence, the trade and quote data is summed and averaged by 10 minute buckets in order to mimic the open close dataset. Therefore, the traded volume is summed to total 63 and the option price is averaged to equal $1.20 (approx. $1.9976). The aggregation of the price could

introduce an error component to the profit calculated and more about this phenomena is discussed in the error section.

Both the trade and quote, and ISE open close data had to be merged in order to gain the benefit from both datasets. As can be observed the trade and quote data hold the price of the option contract; however, it does not release the trade who committed the trade and whether it was an open to buy, open to sell, close to buy or close to sell. On the other hand, the open close dataset does not have the price of the option; however, it holds information relating to the trade type which in this case is a small customer who bought 63 contracts and engaged in an open to buy trade. The combined merged data has both the datasets neatly aggregated and presented in a single dataset. The merging of the dataset was extremely beneficial in analyzing trader behavior and calculating profit by the trader type. The merging of the dataset was not always straightforward. There were many scenarios where there were records in one dataset that were missing or had different values. This mismatch of trade data from both the datasets led to a lot of elimination of trade data. The error of merging chapter further expands on the exact loss of data. However, the merged dataset held enough rows which could help in analyzing the profit by customer type and rendering an opinion on the profitable and unprofitable trades.

In addition to the merged data (combination of the trade and quote data and open close data), a tertiary dataset was required in order to facilitate the calculation of the profit generated. As illustrated in the Options chapter, the options profit can be made by selling or exercising the contract. In former scenario, the selling price dictates the trader profit while in the latter scenario the closing stock price on the expiration date and the strike price difference dictates the profitability of the trader. Hence, in order to calculate the intrinsic value the closing stock price on the expiry date was required. Hence, the merged dataset was combined with another tertiary

dataset that was extracted from the Wharton research data service. This dataset had the closing stock price along with the expiry date and underlying ticker. The same merge command was utilized to combine the datasets in order to have one complete dataset that could perform profitability calculations with ease (Code 11.5.1).

Trade and Quote Dataset

trade_dt2	blocktime1	indic	Exch	Price	ise_vol2	undlyexch	undly1	pc1	expr_dt2	atk	strk_prc2	dtm	undly	datetime	expr_dt1	time_num	interval	strk_prc1	primaryid
18471	13:41:21	T	I	1.19	29	N	ABX	C	18473		39	2	ABX	7/28/2020	7/30/2010	13:41:21	29	39	C1847318471ABX3929
18471	13:41:49	T	I	1.2	23	N	ABX	C	18473		39	2	ABX	7/28/2020	7/30/2010	13:41:49	29	39	C1847318471ABX3929
18471	13:42:22	T	I	1.2	11	N	ABX	C	18473		39	2	ABX	7/28/2020	7/30/2010	13:42:22	29	39	C1847318471ABX3929

ISE Open Close Dataset

TRADE_DT	UNDLY	SEC_TYPE	EXPR_DT	STRK_PRC	PC	MONEYNESS	DAYS_EXP	S_TYPE	COB_SM_TRD	COB_SM_VOL	ISE_VOL	blocktime	Weekday	trade_dt1	COB_SM_TRD2	COB_SM_VOL2	i	days_exp1	COB_tot_trd	COB_tot_vol	interval	primaryid
20100728	ABX	1	20100730	39	C	3	2	Weekly	5	63	63	1350	6	18471	5	63	74	-2	5	63	29	C1847318471ABX3929

Merged Dataset

TRADE_DT	UNDLY	SEC_TYPE	EXPR_DT	STRK_PRC	PC	MONEYNESS	DAYS_EXP	S_TYPE	COB_SM_TRD	COB_SM_VOL	ISE_VOL	blocktime	Weekday	trade_dt1	COB_SM_TRD2	COB_SM_VOL2	i	days_exp1	COB_tot_trd	COB_tot_vol	interval	primaryid
20100728	ABX	1	20100730	39	C	3	2	Weekly	5	63	63	1350	6	18471	5	63	74	-2	5	63	29	C1847318471ABX3929

trade_dt2	blocktime1	undly1	pc1	date	dtm	strk_prc1	sumvol	cnt	meanprice
18471	13:42:22	ABX	C	18473	2	39	63	3	1.19667

***Data 3**: The tables above illustrate the merging process of the ISE open close and the trade and quote data. The tables specifically illustrate a merging scenario by utilizing ABX options as an example. The tables have eliminated certain extra columns that had 0 values for this example. For example, firm open to buy volume was 0 in this*

6.3. Error Rate

Most of the data merged one to one, but in some cases, the data did not merge directly. There are two main sources of error in merging the ISE open close dataset with the trade and quote dataset. The first error is the error that arises from the averaging of the prices in order to aggregate the trade into a ten minute bucket. As illustrated in data 3, ABX had 3 trades in the 13:40 to 13:50 bucket and each trade had its unique price; however, the data in the open close had trades aggregated into 10 minute buckets. Hence, the prices of the 3 trades had to be averaged in order to get the average price of the total traded volume for that particular option. The assumption made was that trades in a ten minute span would not have wild swings. However, averaging the price still introduces an error in the calculation of profit. There were scenarios where a ten minute bucket had only one trade; therefore, in such a scenario there was no error as there were no trades that were averaged. In order to monetize the error rate that arose from averaging the price, the number of times trades were averaged was calculated. Therefore, if there were not more than 1 trade in any particular time bucket, the error rate would be 0%. The frequency of the primary id key was utilized in order to get the error rate. The primary key represented a time bucket for a certain option; hence if that option had more than one trade there would have been more than one primary id in the trade and quote data that would be merged into one ten minute bucket. For example, data 3 has the primary id frequency of 3 because the primary id repeats itself 3 times. Data 4 illustrates the number of times a certain frequency of primary key was observed in the dataset.

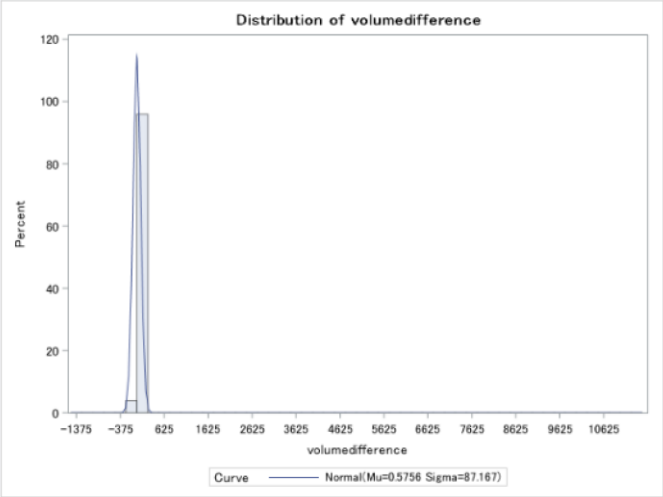
Primary key Frequency	Frequency	Percent
1	34222	58.6
2	11617	19.89
3	4753	8.14
4	2508	4.29
5	1511	2.59
6	1007	1.72
7	628	1.08
8	423	0.72
9	390	0.67
10	221	0.38

Data 4: The table above illustrates a snippet of the frequency of the primary id aggregated in order to calculate the error rate. The frequency of 1 indicates that there was no average price calculated in order to calculate the price of the option; hence there were no errors when the profit was calculated for trades where the price of multiple trades in a time bucket were not aggregated. The table indicates that 58.6% of the time the price was not averaged; hence 58.6% of the profit calculation is calculated utilizing the exact price.

Data 4 illustrates that 58.6% of the times there was only one trade in a ten minute time bucket; hence, there was only 1 primary id. This means that 58.6 % of the time the price of trades occurred in the ten minute bucket were not averaged. Therefore, 58.6 % of the times the actual traded price was used in calculating profit. Conversely, 41.4% of the time there were more than 1 trade in the time bucket; hence, there was an averaging of price and the exact price was not utilized to calculate the profit. The above table illustrates only up to 10 trades in a given time bucket; however, there were scenarios in which 241 trades occurred in one time bucket for one specific option. The positive note is that the percentage of times average pricing took place is under a 1% for trades above 7. Therefore, majority of times the prices averaged ranged from 1 to 7 prices.

The second source of error rate that arises is when the data is not merged 1 to 1. After aggregating the trades into ten minute buckets, there were several scenarios where the traded volume per option did not match in both datasets. There were also scenarios where one dataset had certain options traded which were missing on the other dataset. This imperfect matches led

to a lot of loss of data. The data that did not match one to one was eliminated from the dataset. In order to calculate the number of times a ten minute bucket for trades relating to an option was eliminated from the dataset, a frequency chart was created for the number times the match was perfect. In order to create the frequency chart, the two datasets were merged and the volume traded on the both the dataset were compared in the merged dataset. For example, data 3 shows that 63 contracts of ABX traded; therefore in order to verify the merge was perfect the volume on the trade and quote data is subtracted from 63. Since the aggregated volume on the trade and quote data add up to 63, the subtraction resulted in a value of 0. Hence, whenever the difference resulted in 0, the merge was perfect. The frequency table calculated the frequency of times a 0 is achieved in the merged dataset. This will illustrate the percentage of times the merge was perfect. One minus that percentage will illustrate the error rate of merging the two datasets. Data 5 illustrates the probability distribution along with the frequency table.



−6	48	0.11	1180	2.70
−5	96	0.22	1276	2.92
−4	73	0.17	1349	3.09
−3	61	0.14	1410	3.23
−2	103	0.24	1513	3.47
−1	218	0.50	1731	3.97
0	40031	91.73	41762	95.69
1	259	0.59	42021	96.29
2	146	0.33	42167	96.62
3	61	0.14	42228	96.76
4	77	0.18	42305	96.94
5	121	0.28	42426	97.21
6	44	0.10	42470	97.31

Data 5: The difference in volume histogram is plotted on the left. The right hand side is a snipped table of the histogram of the volume difference on the merged datasets. The "volumedifference" is a means to calculate the error rate. The ISE open close and the trade and quote data merge with 91.73% accuracy and conversely an 8.27% error rate. This error rate ignores all the missing rows. The error rate ignores the merged data which was not merged because of the difference in degree of accuracy of the strike price.

The figure portrays the frequency of the subtracted volume between both the datasets. It can be observed that the frequency for "0" is 91.73%. This percentage illustrates that out of 40,031 options that traded in 10 minute buckets matched exactly. Therefore, 91.73% of the time the match is one to one. Hence, the error rate for the data is 8.27%. Hence, 8.27% of the data is not matched exactly and there is a volume difference. However, this error rate ignores the rows that had a missing value because no combinations were found from the corresponding dataset. If the missing rows are included, then the total sum of rows will be 53,140 out of which 40,031 match exactly. Hence, dividing the two values results in matching rate of 75.33%. Therefore, the error rate for the merged file would be 24.67%.

After conducting an in depth research into the rows for possible reasons for missing values due to mismatches, a common issue was identified. The strike price in the ISE open close data was recorded to 1 decimal point while the strike price in the trade and quote data was recorded to 0 decimal points. Hence, the match was perfect but did not occur due to a decimal point difference. Below is an example of such an error.

TRADE_DT	UNDLY	EXPR_DT	STRK_PRC	PC	MONEYNESS	blocktime	exdate	trade_dt1	COS_SM_VOL2	interval	primaryid	trade_dt2	blocktime1	undly1	pc1	expr_dt2	expr_dt1	strk_prc1	sumvol	meanprice
										7	P1857818571RIMM537	18571	10:08:16	RIMM	P	18578	11/12/2010	53	5	0.31

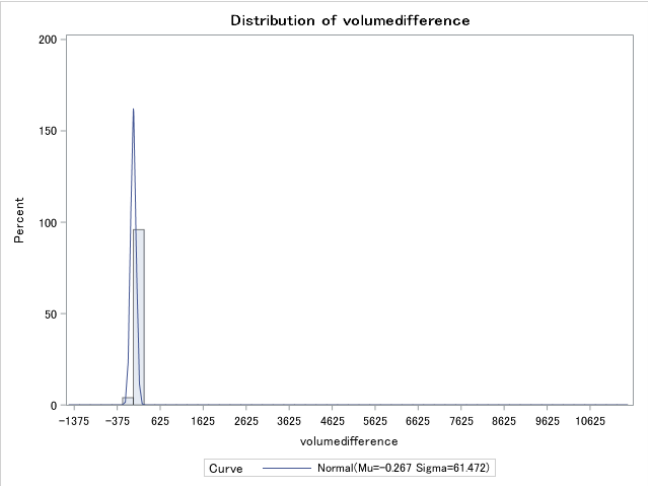
TRADE_DT	UNDLY	EXPR_DT	STRK_PRC	PC	MONEYNESS	blocktime	exdate	trade_dt1	COS_SM_VOL2	interval	primaryid	trade_dt2	blocktime1	undly1	pc1	expr_dt2	expr_dt1	strk_prc1	sumvol	meanprice
20101105	RIMM	20101112	52.5	P	4	1010	18578	18571	5	7	P1857818571RIMM52.57									

Data 6: The above table illustrates the error that caused missing rows. The error rate was higher because the strike rate for the data on ISE open close is to degree of accuracy of one decimal point while the trade and quote data has a degree of accuracy to 0 decimal places. Hence, the error rate is higher because such trades did not merge.

In the data 6 above it can be observed that the option is the same on both datasets. The first row is the trade and quote data while the second row is the open close dataset. The volume on both datasets is 5 contracts, the expiry date is 12th November 2010, the stock is RIMM, the option is a put and the trade date is 5th November 2010 and the block time is 10:00 to 10:10 in both the datasets. The only difference is the strike price which is 53 in the trade and quote data, and 52.5 on the ISE open close dataset.

The above scenario reduced the missing fields by 1374 rows; hence, the merging rate on the data is 77.33% (40,031/ (53140-1374)). While the error rate for the data is 22.67%. This rate would have been significantly reduced if the strike price was rounded and the dataset was matched. Rounding the dataset leads to an increase in the match rate of 79.79% which makes the error rate come down to 20.21%.

Finally, the error rate for the data used for this research is 20.21%. This error rate includes the missing values. If the missing values are ignored the error rate for the dataset is 6.72% (data 7). This error rate is calculated by dividing the matched rows by the total rows ignoring the missing value rows. The total merged rows are 41305 and the total rows are 44280 (51,766-7486).



−6	48	0.11	1228	2.77
−5	97	0.22	1325	2.99
−4	74	0.17	1399	3.16
−3	62	0.14	1461	3.30
−2	107	0.24	1568	3.54
−1	226	0.51	1794	4.05
0	41305	93.28	43099	97.33
1	171	0.39	43270	97.72
2	96	0.22	43366	97.94
3	45	0.10	43411	98.04
4	57	0.13	43468	98.17
5	77	0.17	43545	98.34
6	28	0.06	43573	98.40

Data 7: The difference in volume histogram is plotted on the left. The right hand side is a snipped table of the histogram of the volume difference on the merged datasets. The "volumedifference" is a means to calculate the error rate. The ISE open close and the trade and quote data merge with 93.28% accuracy and conversely a 6.72% error rate. This error rate ignores all the missing rows. However, the error rate includes the complete merged data where the strike price degree of accuracy is adjusted to be similar on both datasets.

For the scope of this research the dataset that had missing values was eliminated from the population used to calculate the profit and the strike price was rounded to get a better merging rate. There the low error rate indicated significant opportunity for further research where more stock options for different companies could be used to merge the data and calculate profit.

6.4. Summary Statistics

The summary statistics help to get a better understanding of the data. Therefore, ISE open close trade dataset is split by different variables. Below is the table that summarizes the dataset:

	Firm	Customer	Broker-dealer	Professional Customer	Proprietary	Total
Total Volume	3,158,870	13,744,187	836,811	676,558	2,322,059	20,738,485
Buy Volume	1,625,722	7,058,451	439,963	364,925	1,185,759	10,674,820
Sell volume	1,533,148	6,685,736	396,848	311,633	1,136,300	10,063,665
Call Volume	1,395,283	7,135,483	372,033	356,620	1,023,250	10,282,669
Put Volume	1,763,587	6,608,704	464,778	319,938	1,298,809	10,455,816
# of trades	107,707	891,146	36,768	72,945	70,939	1,179,505
# of Buys	55,255	433,628	19,430	39,724	35,825	583,862
# of Sells	52,452	457,518	17,338	33,221	35,114	595,643
Mean Buy Trade Size	29	16	23	9	33	18
Mean Sell Trade Size	29	15	23	9	32	17

Data 8: General summary of traded volume by different clients: the table is a general summary of the open close options traded on the International Securities Exchange from June 2010 till December 2010. The data excludes after hours corrections options and abnormal expiration options (ISE data). The datasets includes all the stocks traded and is not limited to 14 stocks.

The summary statistics illustrate that almost 66.27% of traded contracts volume is contributed by the retail customers. Hence, they are a major part of the market and an interesting clientele to conduct research on. Furthermore, over the 6 month period, the buy volume is generally higher than the sell volume for all clients. This could be attributed to the higher demand for the options. Moreover, the trade size for buy and sell orders are very similar. Also,

the trade size corresponds to the specific clientele. Firms, proprietary and brokers have larger trade sizes since they purchase in large quantities. However, customers generally tend to purchase in small quantities; hence their trade size is lower than the large institutions. Professional customers have the smallest trade size because they are high frequency traders who trade small sizes frequently throughout the day.

In addition to the general summary of the data, information on purchased and written call options and put options based on the moneyness is illustrated below.

Moneyness	Purchased Call		Purchased Put		Written Call		Written Put	
Firm								
1	352	0.05%	388	0.04%	180	0.03%	210	0.02%
2	2949	0.40%	9383	1.05%	4337	0.66%	12915	1.48%
3	682662	92.89%	824155	92.51%	613599	92.91%	794209	91.00%
4	39726	5.41%	49972	5.61%	33195	5.03%	58285	6.68%
5	9198	1.25%	6937	0.78%	9085	1.38%	7133	0.82%
Customer								
1	6576	0.18%	15865	0.46%	6488	0.18%	15088	0.48%
2	49869	1.39%	48806	1.41%	43256	1.22%	51632	1.64%
3	3157418	87.98%	2945875	84.90%	3214051	90.62%	2758862	87.89%
4	299455	8.34%	417966	12.05%	215713	6.08%	277048	8.83%
5	75340	2.10%	41281	1.19%	67317	1.90%	36281	1.16%
Professional Customer								
1	1902	0.99%	2087	1.20%	779	0.47%	1411	0.96%
2	5819	3.04%	3142	1.81%	3085	1.87%	2167	1.48%
3	163042	85.10%	141943	81.88%	139498	84.52%	125361	85.52%
4	16851	8.80%	22788	13.15%	17655	10.70%	15777	10.76%
5	3965	2.07%	3386	1.95%	4024	2.44%	1876	1.28%
Broker-dealer								
1	136	0.07%	36	0.01%	31	0.02%	32	0.01%
2	296	0.15%	5780	2.36%	1774	1.00%	6778	3.09%
3	181946	93.45%	223105	90.97%	168809	95.20%	193019	87.93%
4	9197	4.72%	13323	5.43%	5800	3.27%	19455	8.86%
5	3132	1.61%	3012	1.23%	912	0.51%	238	0.11%
Proprietary								
1	216	0.04%	352	0.05%	149	0.03%	178	0.03%

2	2653	0.49%	3603	0.56%	2563	0.53%	6137	0.94%
3	500716	92.69%	601050	93.10%	444790	92.08%	601190	92.03%
4	30529	5.65%	36649	5.68%	27395	5.67%	38830	5.94%
5	6066	1.12%	3925	0.61%	8173	1.69%	6895	1.06%

Data 9: General summary of traded volume by moneyness and option type: the table is a summary of the volume traded by different investors for options that are different moneyness levels. The trades are further sliced by the type of transaction. The data is the open close options traded on the International Securities Exchange from June 2010 till December 2010. The data excludes after hours corrections and abnormal expiration options (ISE data). The data includes all the stock from the ISE dataset and is not limited to the 14 stocks.

Moneyness is ranked on a scale of 1 to 5 where 1 represents deep in the money options, 2 represents in the money options, 3 represents at the money options, 4 represents out of the money options and 5 represents deep out of the money options. Data 9 illustrates that all clients purchase and sell mostly at the money options. At the money options consist of more than 90% of their trade. This could illustrate that majority of clients are taking speculative positions that consist of lower risk because purchasing a deep out of the money option is risky since the option might never end up in the money. Moreover, data 9 portrays that the second highest trades are in the deep out of the money options. Clients purchase this because they tend to be cheaper relative to at the money or deep in the money options. Finally, deep in the money options consist of a minuscule percentage of the total volume traded because these options are more expensive relative to the at the money options.

Data 9 further illustrates that customer's trade more at the money written calls compared to other positions. Lakonishok et al. find that the most popular option-trading strategy is covered call writing, followed by purchasing calls and writing puts (Lakonishok et al. 844 and 845). Covered calls are where calls are written for stocks that the trader owns. Hence covered calls avoid traders from naked exposure in the market. The results of Lakonishok et al. is consistent with the ISE data which illustrates that written calls consists of the majority of trades conducted by customers.

The volume of options traded also changes significantly as expiration approaches. Data 10 illustrates the trading pattern for customers before expiration.

CCS	MONEYNESS					
DAYS_EXP	1	2	3	4	5	Total
0(Friday)	1,004	9,622	356,033	12,416	1,527	380,602
1(Thursday)	2,294	6,550	311,861	30,035	4,908	355,648
2(Wednesday)	850	5,489	262,523	30,563	5,410	304,835
3(Tuesday)	683	10,100	194,512	32,192	6,377	243,864
4(Monday)	536	2,653	117,869	18,284	4,166	143,508
7(Thursday)	247	1,354	62,446	6,628	1,899	72,574
TOTAL	5,614	35,768	1,305,244	130,118	24,287	1,501,031

COB	MONEYNESS					
DAYS_EXP	1	2	3	4	5	TOTAL
0(Friday)	170	2,994	365,464	16,322	1,388	386,338
1(Thursday)	3,149	6,567	421,445	37,996	9,894	479,051
2(Wednesday)	1364	6,386	404,233	73,611	9,418	495,012
3(Tuesday)	2218	17,281	412,074	97,103	17,232	545,908
4(Monday)	2765	6,107	379,445	103,395	25,260	516,972
7(Thursday)	2181	5,188	260,853	70,261	13,966	352,449
TOTAL	11,847	44,523	2,243,514	398,688	77,158	2,775,730

Data 10: General summary of customer trade before expiration: the tables illustrates the trading pattern prior to expiration for different moneyness. The tables focus only on the customer open to by and customer close to sell trades. The data utilized for the summary is the open close options traded on the International Securities Exchange from June 2010 till December 2010. The data excludes after hours corrections and abnormal expiration options (ISE data). The data includes all the stock from the ISE dataset and is not limited to the 14 stocks.

Data 10 illustrates two different trades namely CCS and CCB. CCS represents customer close to sell while CCB represents customer open to buy. Therefore, these trades consist of both call and put options which are purchased to open a position and sold to close a position. From the table it can be observed that customers tend to increase buying of at the money options consistently over days prior to expiration. The traded volume of at the money options is highest a day before expiration. However, the buy volume drops on the day the option expires. This trend is different for deep out of the money options where the bought volume drops during the week of

expiration. Overall, it can be observed that at the money options comprise of a higher volume of the bought options.

The selling pattern is different from the buying pattern of options. At the money options sold, increase significantly as expiration approaches. The expiration day has the highest volume of sold options. This might be attributed to the fact that traders might be closing out their options prior to the expiration. However, for out of the money options, most of the positions are closed some days before expiration. On the day of expiration, out of the money options have a lower amount of contracts sold. This might be because traders might have wanted to sell their options when it held some time value. Hence, they might have sold it earlier to gain some money from the options.

In order to have a clear understanding of the trading patterns prior to expiration, graphs of different trade types (open to buy, close to sell, open to sell and open to buy) are plotted against time of the day and day of the week. Furthermore, each particular graph represents a certain moneyness. The graphs of all trader types and option types with different moneyness are attached in the Exhibit section (Exhibit 10.2).

The trading volume prior to expiration for each type of investors illustrates the investor trading patterns. The table below indicates the purchased and written position for each investor against day to expiration.

Days to Expiry	Firm Purchased Volume	Firm Written Volume	Customer Purchased Volume	Customer Written Volume	Brokerdealer Purchased Volume	Brokerdealer Written Volume	Professional Customer Purchased Volume	Professional Customer Written Volume	Proprietary Purchased Volume	Proprietary Written Volume
0	246528	227308	1680416	1073066	58683	61042	72664	78455	187845	166266
1	364403	372753	1393493	1191666	105059	112170	68000	63976	259344	260583
2	317218	261070	1115111	1243235	79798	74846	54887	48411	237420	186224
3	322741	280731	1181416	1121981	81573	57486	59584	48822	241168	223245
4	229179	229591	1049269	988305	51915	51379	52574	40129	177264	178212
7	145653	161695	638746	1067483	62935	39925	57216	31840	82718	121770

Data 11: General summary of customer trade before expiration: the tables illustrates the trading pattern prior to expiration for different investor. The table focuses on the purchased and written position volume. The data utilized for the summary is the open close options traded on the International Securities Exchange fr ***om June 2010 till December 2010. The data excludes after hours corrections and abnormal expiration options (ISE data). The data includes*** *all the stock from the ISE dataset and is not limited to the 14 stocks.*

It can be observed that customer buying pattern increases daily towards the last day of expiration. Also, customers have the largest volume of purchased position. This could imply the opinionated trader qualities possessed by customers. They are increasing their bets every day prior to expiration; hence, they could be considered gamblers who are conducting more trades every day. Moreover, customers purchased trades are almost 150% higher than their written positions. The firms, broker-dealers, professional customers and proprietary traders also conduct a large share of trades on the last day of the option. Their trade could also be considered opinionated. Since most of those investors are writing more positions than purchasing, they could be considered to possess information. However, analyzing their profit will give a better picture on the purpose of the investors (Results 8.2.7 and Results 8.2.8).

7. Methodology

7.1. Intraday Trading Pattern

The intraday graphs were created to observe the trading pattern from issuance day of the option until expiry day. Since we are conducting research on weekly options, this trading time frame normally ran from the previous week's Friday till the following Friday. The weekly options gave investors 6 days to trade the option. The weekly option did not trade on the third week of the month since the monthly options expired then. Furthermore, certain holidays on the Friday extended the option expiry to Saturday. The weekly options also consisted some after trading hour trades; however, for consistency, such trades were ignored in the analysis.

The graphical analysis is conducted for 7 months of weekly option data that traded on the International Securities Exchange between June 2010 and December 2010. The graphs portray the percentage of volume of options traded in ten minute buckets between the previous Friday

and the Following Friday. The International Securities Exchange trades options from 9:30 am till 4:15 pm. The graphs visually portray the normal trading day of the options.

The trading patterns for different investors (firms, customer, professional customers, broker dealers and professionals) are identified by splitting the graphs by different investor types. Therefore, the graphs illustrated trading emotions and behavior held by different investors in the market. The graphs were further split by moneyness (2,3,4) in order to visualize trading behavior under varied circumstances. The moneyness is the measure of whether the option is in the money, at the money or out of the money option. The graphs portray that differences in moneyness change the trading volume drastically. Different moneyness options may end up having drastically different trading patterns executed by the same investor type. Additionally, as mentioned in the data section, option trades consist of 4 trades namely, open to buy, close to sell, open to sell and close to buy. This different trade types are broken down into different graphs. Hence the user will be able to visualize the trading pattern over a week's period of a particular investor at a particular moneyness with a specific trade type. These extreme details of investor behavior resulted in 60 varied graphs (Exhibit 10.2). The graphs are weekly time series data where the y axis is the percentage of total volume of options traded on the ISE from June 2010 to December 2010. The percentage of volume traded relative to the total volume eases the process of comparing graphs and helps in illustrating the market share represented by each investor's specific trade. Furthermore, the percentage helps in providing perspective of the impact certain trades have in the market. The total volume of options contract traded on the ISE in the 7 months period is 17,718,594 (ISE open close). In addition to converting the y axis data, the negative traded volume are deleted. These trades are corrections by the exchanges. However, these trades makes the graphs misleading and creates confusion regarding the trade information. Indeed,

deleting them creates a positive bias on the traded volume; however, there was no method to identify the individual trades that were errors and the amount of deleted negative trades are immaterial. The traded volume that is above 20% of the market is also deleted because these trades are too high to be conducted by a certain investor on a certain day at a specific time with a specific trade type. These trades are too few and are immaterial abnormalities in the data.

7.2. Investor Profitability

The core question illustrates that the profitability of different investor types aids in identifying the main metrics that drives profit for individual and institutional investors. The merged dataset represents trade conducted by the investors; however, it does not clearly represent what each investor's portfolio consists of because it does not identify each customer trade by a client id. Hence, a loss at ISE could have been offset by a profit at another exchange. Furthermore, investors might use the trade as a hedging strategy; hence, the profit or loss is not a complete representation of the investor. Therefore, when conducting this research, we assumed that traders mainly traded on the ISE and if they opened a position on the ISE, then it could only be closed by selling to close, buying to close or letting the option expire and colleting the intrinsic value. Furthermore, profit is calculated for an option that traded within a specific bucket; hence if an option was purchased within time bucket 1, only the cost of the option would be reflected. Therefore, that option trade for that particular time bucket would show a loss; however, when an option is sold, the revenue is recognized in the consequent bucket and the aggregation of the bought and sold time bucket will eventually portray the profit made by the investor.

The profit is calculated by each option (Code 11.5.2). Therefore, in order to calculate the profit, the following formula is used.

$$\sum_{i=0}^{n}[(N_{os} \times P_{os}) + (N_{cs} \times P_{cs}) + CI_v] - \sum_{i=0}^{n}[(N_{ob} \times P_{ob}) + (N_{cb} \times P_{cb})]$$

Methodology 1: The above equation is utilized to arrive at the profitability of investors.

N_{os} is the number of open to sell contracts, $P_{os,}$ is the price of the open to sell contracts. N_{cs} is the number of close to sell contracts, $P_{cs,}$ is the price of the close to sell contracts. I_v is the intrinsic value of the option. N_{ob} is the number of open to buy contracts, P_{ob}, is the price of the open to buy contracts. N_{cb} is the number of close to buy contracts, $P_{cb,}$ is the price of the close to buy contracts. The n takes the sum of the volume for each option. The intrinsic value, I_V, and composite intrinsic value, CI_V is calculated as follows for different types of option types (call/put).

Call Option

$$CI_v = buying\ intrinsic + selling\ intrinsic$$

$$I_v = (Max\{s - x, 0\})$$

Put Option

$$CI_v = buying\ intrinsic + selling\ intrinsic$$

Methodology 2: The above 2 equations calculate the composite intrinsic value and the option intrinsic value. The top equation is used to calculate the intrinsic value of a call option while the bottom one is used for put options. "S" is the closing stock price of the stock on the expiration date of the option and "X" is the strike price of the option.

$$I_v = Max\{x - s, 0\}$$

The closing stock price on the day of expiration is utilized to calculate the intrinsic value of the stock. The profit and intrinsic value calculation is done for each investor types opened and closed positions. The intrinsic value is calculated per row. Therefore, there are 2 types of intrinsic values calculated per row - buying intrinsic and selling intrinsic. The formula for each intrinsic value for a small customer call option is below.

$$Buying_{intrinsic} = Max\{s - x, 0\} * \{customer\ open\ to\ buy - customer\ close\ to\ sell\}$$

$$Selling_{intrinsic} = -(Max\{s - x, 0\} * \{customer\ open\ to\ sell - customer\ close\ to\ buy\})$$

The buying and selling intrinsic is created because the intrinsic value had to be calculated per row. The buying intrinsic is added to the profit when it is a call option because the buyer of

Methodology 3: The above 2 equations calculate the buying intrinsic and selling intrinsic. This 2 formulas are used to calculate intrinsic per row. The aggregation the buying and selling intrinsic result in the composite intrinsic value of the option. The above 2 equation values are not of any use when independent; however, a combination of the two result in the intrinsic value used to calculate profit.

the call will make the intrinsic value as profit if he/she does not sell the stock. However, the seller of the call will make a loss if the option is exercised by the buyer of that option. Hence, the selling intrinsic value is subtracted to arrive at the profit of the seller of the option. There will be rows where the intrinsic value will create an artificially high profit however, the corresponding row will create an artificially low profit to compensate. Therefore the aggregate option will result in the actual profit generated by that customer type. Below methodology 5 and 6 clearly illustrates this phenomena of artificial profit by working down a calculation of where the intrinsic value cancel out each other.

The profit is calculated by splitting the call and the put options into different working datasets because the intrinsic value calculation for the call is different from the put options. The

first part of methodology 1 calculates the revenue by summing the sales by the price. The second part of the equation calculates the cost of the option. Therefore, the difference between the revenue and costs results in the profit for the trade. The summation function helps to aggregate all revenues and costs in order to retrieve the profit per customer type.

Finally, options are a zero sum game; hence one investor's loss is the market makers profit. The market maker is the trader that adds liquidity to the market and can be thought as a broker who buys and sells the options from customers who want to exit and enter positions. The market maker helps a customer have a counter party when they want to conduct a trade. Therefore, in order to back out the market makers profit, Mp, the sum of the profit was equated to zero and the market makers profit was backed out. The formula for the market makers profit calculation is below:

$$\left\{\sum_{i=0}^{n}[(N_{os} \times P_{os}) + (N_{cs} \times P_{cs}) + CI_v] - \sum_{i=0}^{n}[(N_{ob} \times P_{ob}) + (N_{cb} \times P_{cb})]\right\} + Mp = 0$$

Methodology 4: The above equation calculates the profit made by the market maker, Mp. Options is a zero sum game; hence the profit of one investor would be considered to be a loss made by another investor.

Below is an example of a calculation of a profit for an investor closing to sell a call option on the 24th August 2010.

Obs	undly	stockprice1	TRADE_DT	EXPR_DT	STRK_PRC	PC	MONEYNESS	CCS_SM_TRD2	CCS_SM_VOL2	interval	primaryid	blocktime1	meanprice	smallCbuyincost	smallsellingcost	smallcirmbuyintr	I	smallcirmsellintr	smallcirmprofit	marketmaker
1	BP	35.56	20100824	20100827	35	C	3	1	100	36	C185011849BP3536	14:54:49	0.59	0	59	-56.0001	0	0	299.986	-299.986

The above option had an expiry on the 27th August 2010 with a strike price of 35. The mean price of the stock is 0.59 per option or $59 per option contract. There are a total of 100 option contracts that traded on the 24th August 2010. The profit calculation is as follows.

$$\sum_{i=0}^{n}[(0 \times \$59) + (100 \times \$59) - 5600] - \sum_{i=0}^{n}[(0 \times \$59) + (0 \times \$59)] = \$300$$

$$Buying_{intrinsic} = Max\{\$35.56 - \$35, 0\} * \{0 - 10000\} = -5600$$

$$Selling_{intrinsic} = -(Max\{\$35.56 - \$35, 0\} * \{0 - 0\}) = 0$$

Methodology 5: Above is a sample calculation for profit generated in the small customer column for call options. The trade is a customer close to sell trade and 100 contracts were sold.

Below is an example of another row where the transaction is buying to open a contract on the 24th of August at 14:00. This trade could be related to the previous trade where the customer opened 100 contracts at 14:00 and closed the 100 contracts at 14:54. However, there is no way in verifying the relationship between these trades as there is no customer id to verify the trade source. Irrespective of the trade relationship the sum of the profit from both trades will lead to the summed profit generated by small customers. In the trade below the option expires on 27th August 2010 and the underlying stock is BP. The option trades at $0.55 an option ($55 a contract). The final profit is calculated as follows:

DATE	undly	stockprice1	TRADE_DT	EXPR_DT	STRK_PRC	PC	MONEYNESS	ISE_VOL	blocktime	COB_tot_trd	COB_tot_vol	primaryid	meanprice	smallCbuyincost	smallsellingcost	smallcirmbuyintrin	I	smallcirmsellintrin	smallcirmprofit
20100827	BP	35.56	20100824	20100827	35	C	3	256	1400	5	100	C1850118498BP3530	0.55	55	0	56.0001	0	0	100.014

$$\sum_{i=0}^{n}[(0 \times \$55) + (0 \times \$55) + 5600] - \sum_{i=0}^{n}[(100 \times \$55) + 0 \times \$55)] = \$100$$

$$Buying_{intrinsic} = Max\{\$35.56 - \$35, 0\} * \{10000 - 0\} = 5600$$

$$Selling_{intrinsic} = -(Max\{\$35.56 - \$35, 0\} * \{0 - 0\}) = 0$$

Methodology 6: Above is a sample calculation for profit generated in the small customer column for call options. . The trade is a customer open to buy trade and 100 contracts were bought.

The above calculation indicates a profit of $100 made. The overall trade if thought of one customer generated a profit of $400. However, the split of the trade and the lack of customer id caused us to create an artificially low profit of 300 in one scenario and an artificially high profit in another scenario of $100. Overall the trade generated a profit of $400. The simple calculation would have been to subtract the selling revenue from the buying cost to get $400 ($5900-$5500). However, all trades did not cancel out in the same fashion and there were certain scenarios where the opening and closing contracts did not match up exactly and the intrinsic value calculation had to be conducted in such a scenario. Finally, since the profit is aggregated the artificially high and low profits do not affect the final summed profit per customer type because the artificial values cancel themselves out when the data is aggregated.

The above profit calculation was generated for each customer type. In order to gain a better insight at variables that could cause certain profit patterns, the data is sliced by different metrics. The profitability of each investor type is sliced by the underlying stock, expiring date, moneyness and option type (put/call). The summed profit gives an understanding of the profits generated by each customer type. The split by the stock helps to understand the profit generated by a customer for a particular profit and could aid in gaining stock characteristics that drive profitability. Also the expiration date slice helps in understanding profitability over expiring weeks. This process helps in identifying certain months were option profitability could be higher. Finally, the summed profit against moneyness could answer the question of whether buying in the money option is the way to make money or not.

The summed profit does not paint a complete picture of the profitability of each investor because some investors might have traded more volume and the profit could have been lower per contract. Hence, the profit was divided by opened contracts and the cost of the contract. These

two divisions helped in identifying the profit per contract and the return on investment for each investor. The profit per option and return on investment gave a better proxy for analyzing the profitability of each investor. It helped in weeding out the main criterion that is important to increase the return on investment for each investor.

The profit per option was calculated by the number of contracts that were opened (open to sell or buy) because those were a total number of contracts that were traded in order to start a trade. The closing trades were not used because some closing trades were not closed by buying or selling and were rather exercised to gain the intrinsic value. However, the assumption of all contracts opening and closing on the ISE exchange was made. The results have certain areas where the options were opened on another exchange and closed on the ISE. This was observed because more options were closed than opened. Hence, such scenarios are highlighted in blue by asterisks in the results section and more about the findings is deeply explained in the results section of the paper.

Calculation for return on investment is also calculated by utilizing the contracts that were opened. These contracts are multiplied by the price per contract in order to achieve the cost. However, only open to buy contract is utilized because no investment is made to conduct an open to sell trade. The formulas to calculate the profit per contract and the return on investment are as follows.

$$Profit\ per\ contract = \frac{profit}{open\ to\ buy + open\ to\ sell}$$

$$Return\ on\ Investment = \frac{profit}{(open\ to\ buy) * average\ price\ per\ contract}$$

Methodology 7: Above are the equations to calculate profit per option (top) and return on investment (bottom).

The formula above helped in creating the return on investment. In the results for the ROI several cells are left blank. The blank cells occur due to two reasons: (i) the return on investment is infinity because profit is made with no investment because contracts are opened by selling; hence, the denominator of money invested is a negative number since the investor receives rather than pays money to open by selling and (ii) the return cannot be calculated because the contracts were opened on another exchange and the return on investment will not be available because the denominator of the formula would be a 0. There are certain scenarios where investors open by selling and invest by receiving money. Such investments are a risk taking investment and return on risk is a better metric to evaluate the profit received for the risk taken on.

The market makers return on investment is shaded out because it could not be calculated. The market makers gain a benefit due to the bid ask spread. Therefore, their costs need to take the bid ask spread into consideration. In addition, the average of other investor's returns could not be used to back out the market makers return on investment because averaging creates a cancelling effect of positive and negative returns. Below is an example of how the return on investment calculation is done for other investors.

$$Return\ on\ Investment = \frac{773{,}395.31}{923{,}785.60} = 84\%$$

Methodology 8: Above is an example of a return on investment for an investor. The rate is not annualized and is calculated per trade.

The above investor earned $773,395.31; however, his initial cost as $923,785.60. Therefore, the investor earned a return of 84% on the trade. The ROI returns are not annualized

and are observed per trade. Annualizing the ROI would result in a hypothetical return because such investments in options do not arise frequently.

8. Results

8.1. Intraday Trading Pattern

The 60 graphs all portray similar intraday trading behavior in terms of time of the day trades are executed. Irrespective of the investor type, almost all graphs followed the U-shape pattern of trading during the day. This phenomenon is largely researched in the stock market. Several studies have looked at the intraday pattern that exists in the equity markets. Jain and Joh break down the trade by the hour of the day. They observe that average volume is highest "during the first hour" (Jain and Joh 2811) of the day and declines "monotonically until the fourth hour, but increases again on the fifth and sixth hour" (Jain and Joh 281). This pattern portrays a U-shape traded volume pattern throughout the day (Jain and Joh 273).

Aggarwal and Gruca observe the pattern that exists in the equity options market. Equity options are a derivative of equity; therefore, the pattern of trade could be hypothesized to be similar. Aggarwal and Gruca conducted a research on options traded on the CBOE from 1st July 1986 to 31st Dec 1986 and realized a strong U-shape pattern in the volume of stock options traded (Aggarwal and Gruca 290). They failed to reject the null hypothesis and concluded that option traded volume follows a similar U-shaped pattern as the equity market (Aggarwak and Gruca 285). Their research results are partly attributed to the trading behavior of investors. According to Aggarwal and Gruca, most investors place their orders out of trading hours and those orders get executed in the morning (Aggarwal and Gruca 287). Therefore, this contributes to the increased volume traded in the morning. They observed that most trades in the morning

are buy trades and they speculated that casual traders might be the bulk of the buy traders because less risk and margins are required (Aggarwal and Gruca 292).

On the other hand, the increased trades at the end of the day are caused by the difference in trading hours between the NYSE and the CBOE. The NYSE closes at 4 pm EST; however, the CBOE allows trades for an extra 15 minutes. Aggarwal and Gruca noticed increased trade during this time frame since most customers are closing their positions or trading after the close of the stock market (287). Therefore, this explains why the trades are higher at the close of trading hours (Aggarwal and Gruca 291). ISE also trades options for the extra fifteen minutes and the graphs portray the increased trades towards the end of the day.

Admati and Pfleiderer observe that the U shape pattern is consistent with exogenous patterns in the demand for trades in anticipation of and after non trading periods (Admati and Pfleiderer 4). They also talk about endogenous interactions between informed and liquidity or noise traders which account for the observed pattern (Admati and Pfleiderer 6). Also, Brock and Kleidon suggest that liquidity demand by traders for re-adjusting their portfolios before and after market closures creates a U-shape pattern in volume (469). Therefore, transactions at the start of the day are inelastic because they need to execute their orders (Brock and Kleidon 455). Chiang, Huang, Lin and Yun studied the TAIFEX options market to observe the intraday pattern. They concluded that options trade in a U-shaped pattern throughout the day with the trades being highest at the start of the day and lower towards the midday but climb up towards the end of the day (Chiang, Huang, Lin and Yun 32). Finally, Foster and Viswanathan, and Chan, Chung and Johnson also confirm the existing U-shape pattern in the options market.

Many researchers have studied the pattern in the stock market. Some researchers have studied the options market and have observed trends on the CBOE while others have observed

trends on the TAIFEX. However, such researches were mainly conducted on options that traded on exchanges that were not fully electronic. This thesis studies the weekly options intraday graphs on the fully electronic ISE market. The results of the graph concur with the literature. According to the graphs, the ISE traded options follow a U-shape pattern. This can be observed visually from the graphs that are attached in the exhibits (Exhibit 10.2). The U-shape pattern could be attributed to the increased liquidity needs by investors to readjust their portfolio and for informed traders to trade on their information. The exchange conducts no trade before and after the start and end of the trading day. Hence, investors who are discretionary liquidity traders or informed traders may want to execute on their trade immediately after trading starts or before the trading day ends. Therefore, the weekly options may consist of both informed and liquidity traders.

The intraday trading graphs illustrate interesting differences among different investors who trade the weekly options. The graphs that portray the trading behavior of firms depict a great amount of knowledge of their trading behavior. It can be observed that firms buy and sell more at the money options (ATM) relative to in and out of the money (ITM) options (Exhibit 10.2, graph 1,2 and 3). Firms might be engaging in such trade in order to lower their risk with out of the money (OTM) option contracts since OTM contracts require large swings in order for the option to be valuable. Furthermore at the money options costs are lower than the in the money options which make investing the former option a bargain. Firms purchase such contracts for their large institutional investors such as banks. These institutions might be buying contracts to hedge their portfolio risk. Hence, entering into an at the money option gives these institutions an option to lock in their buying or selling price and makes them immune from price swings. Furthermore, the option helps them to avoid buying and storing the commodity. This could be a

major reason why firms are mainly trading high volumes of at the money options. In addition, the firms are not selling most of their options and are rather letting them expire worthless or executing them. This bolsters the previous claim about hedging because it shows that firms are purchasing such instruments to lock in their rates rather than buy and sell them. Only 12% of contracts that are open to buy are actually closed by selling. The close to sell represent an approximate average daily volume of 0.0175% (Exhibit 10.2, graph 1,2 and 3) of the market while the open to buy represents an average daily volume of 0.143% of the market (Exhibit 10.2, graph 1,2,3). This shows that few contracts are closed by selling.

The same can be observed with open to sell contracts where there are 0.054% open to sell contracts while only 0.0213% that are closed by buying the contracts (Exhibit 10.2, graph 1,2 and 3). Therefore, these contracts could also be used for hedging purposes and the options might have been either executed or expired worthless.

Furthermore, the firms are trading mostly on Tuesday, Wednesday and Thursdays (Exhibit 10.2, graph 1,2 and 3). This might be attributed to the high volatility that exists on Monday's and Friday's because of the start and end of the weekend. Also, on Friday, the following week's option contracts start trading and this might have an effect on the volume traded of the options. This could be an adding factor to the increased trade volume on Thursday.

The customer's volume traded is approximately 4 times higher than that of firms (Exhibit 10.2, graph 4, 5 and 6). The customers are the bulk of investors in the options market and they represent an important aspect of the market. Similar to the firms, the majority of customer trades come from at the money options (Exhibit 10.2, graph 4, 5 and 6). This illustrates that majority of customers purchase options to get the right to perform an action in the future at the current trading prices. Hence, customers utilize options to postpone their decision making and receive

similar benefits at a future date. Moreover, the out of the money traded volume is a very small percentage of the options traded by the customers. This illustrate that majority of option traders are not gamblers who purchase out of the money options in order to hit a big jackpot if the prices turn in the favorable direction. The OTM options are cheaper relative to the other options because it is less likely that the stock price might move in the favorable direction. It is interesting to observe that the out of the money options for customers is almost double that of firms (Exhibit 10.2, graph 6). This might be attributed to the increased gambling trades customers might execute relative to firms. However, this number could also be attributed to the sheer volume of customers relative to firms.

The customers open to sell and close to buy volumes is almost equal compared to firms where the open to sell was higher than close to buy (Exhibit 10.2, graph 2 and 5). This might indicate that customers are purchasing options as an investment opportunities where they are selling them before the option expires. Such a trade could be classified as an investment trade because options are worth more alive than dead. Therefore, a similar open to sell and close to buy indicates that customers are not waiting to earn the intrinsic value and are rather generating profit by trading the options as investment. Therefore, customers could be classified as opinionated traders in the options market. This is different from when the customer open to buy and close to sell averages are observed. The customer open to buy has twice the volume of the close to sell. Therefore, this could mean that customers are buying options to hedge their portfolio from downside risk. For example, the customers might be buying put options to lock in their price at which they are looking to sell their stock. This allows the customer to gain an insurance on the stock. In such a scenario, it is less likely that the customer will engage into selling the option to close out his or her position.

The professional customers open to buy on average 0.008% and open to sell 0.005% of ATM options (Exhibit 10.2, graph 7, 8 and 9). This is higher than the ITM and OTM trades. Therefore, it could imply that professional customers are market makers and are purchasing an ATM option to meet the liquidity needs of the market. It could also imply that they are hedging their other positions. This investors opened more positions than closed which again indicates that this trades could be for hedging rather than trading. The professional customers wrote more positions than bought for OTM (Exhibit 10.2, graph 7, 8 and 9). This could indicate that they were opinionated traders because they might have stock portfolios whose prices might have been stable for a while. Hence, this investors might be speculating small price movements; hence, could be selling OTM call options in order to generate small profits on the stock portfolio without risking to sell the underlying stock at a heavy discount. Finally, the majority of trades for professional customers were on the Tuesday, Thursday and Friday. Friday was when they had the highest volume of written positions. This could imply that they were trying to earn money by selling options right before the expiration because there could rarely be extreme stock price movements against them. Also, if there were to be rare scenarios where extreme price movements takes place, the professional customers would have stock portfolios to hedge their losses. The phenomenon of holding stock portfolios and writing call options is called delta hedging.

The broker-dealer has its larges trades in ATM options at 0.03% open to buy and 0.03% open to sell trades (Exhibit 10.2, graph 10, 11 and 12). They could also be considered as hedgers because their trade size is heavily consolidated in ATM options. Their trades in OTM options is 0.003% of the market in total open to buy and open to sell positions. Therefore, they are clearly hedging their position by purchasing neutral options. Their volume of OTM options indicates

that very few trades are speculative. Furthermore, since their OTM options have more sell trades than buy trades, they could be hedging their existing stocks by selling OTM options to generate a small profit. Furthermore, these investors are opening more trades than closing, which could again hint at the hedging nature of such investors (Exhibit 10.2, graph 10,11 and 12).

The proprietary traders are also trading more ATM options compared to ITM or OTM options (Exhibit 10.2, graph 13,14 and 15). However, most of their ATM trades are more selling trades than buying trades. This could indicate that such traders possess a bit of information because they are taking a riskier bet by hedging their existing portfolio by selling ATM options rather than OTM options. The ATM options are more expensive; hence, selling them generates more profit. However, they are more risky as there is a greater chance of such options to end up in the money and cause professional customers to make a loss on their stock portfolio. Therefore, proprietary traders might be possessing information to take on the extra risk. However, they could also be considered speculative traders trying to generate more profits by taking on additional risk. Overall, the profit analysis will be able to clearly distinguish if proprietary traders are gamblers or informed traders. Furthermore, such proprietary trader's trades are heavy on Tuesday and Thursday prior to expiration (Exhibit 10.2, graph 13,14 and 15). However, the other days also have fairly similar amount of traded volume (Data 9). Since the volume is almost similar in the expiration week, the investors could be thought to have information.

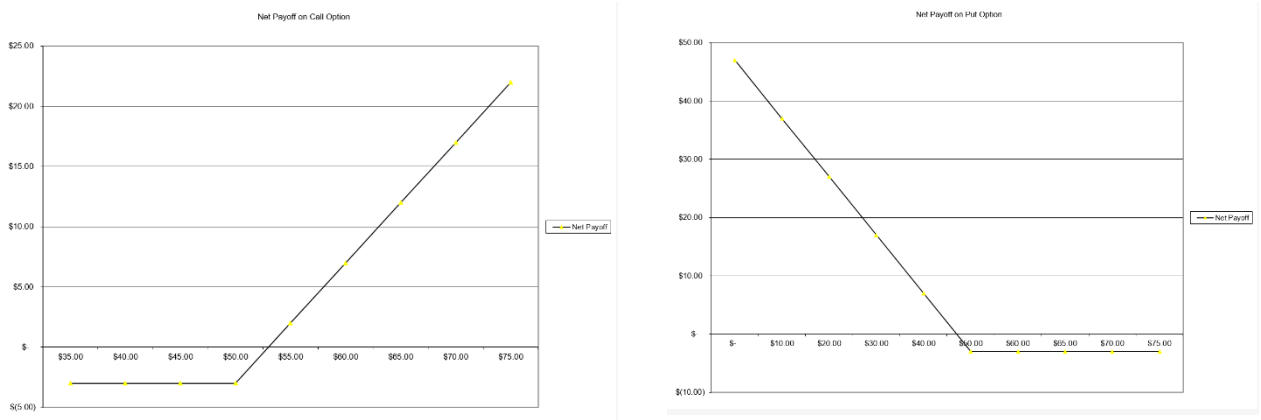
Overall the customers represent the highest percentage of open to buy and close to buy trades (Exhibit 10.2, graph 4, 5 and 6). The customer open to buy and open to sell trade represents an average of 0.15% of daily traded volume relative to the total traded volume. The majority of the selling for the bought position comes from the firms and the proprietary traders. The firms have an average daily sales of 0.07% of the total volume of the market (Exhibit 10.2,

graph 1,2 and 3). While proprietary traders have an average daily sales of 0.10% of the total volume of the market (Exhibit 10.2, graph 13, 14 and 15). Therefore, the customers could be having a buy-sell relationship with the proprietary traders and the firms where the latter is the seller and the former is the buyer. In addition, the customer also has the highest volume of daily sales at an average of 0.15% of the total traded volume (Exhibit 10.2, graph 4, 5 and 6). This sales is mostly bought by the firm, broker-dealer and the proprietary traders. Hence, there is a buy-sell relationship between these investors too, where the customer is the seller of the options. Therefore, investors put on both hats of being a buyer and seller in the options market.

8.2. Investor Profitability

The results illustrate a breadth of insights into the options market (Exhibit 10.3). The major difference to focus on is the difference in profitability between call and put options. Overall, the profit or losses for all investors is on a higher dollar value for call options relative to put options. For example, an average call profit per contract for a medium professional customer is $1.14 per option while for put options it is $0.09 per option for the same investor type (Exhibit 10.3.1 and Exhibit 10.3.2). The call option is 1167% higher than the put option per profit. The major discrepancy could be attributed to the relative simplicity of call options, volume of call options traded and the higher upside potential of calls. The results illustrate that the general dollar of profit or loss per contract is higher for call options. Call options have unlimited upside gain while limited downside risk; however, put options have a cap on the profit or loss that can

be generated. This limits the amount of gains put options can observe. An example of a profit chart for a put and call option is below (results 1).



Results 1: The graph illustrate the profit of a long call and long put option that costs $3 and has a strike of $50. The graph on the left hand side is a call option and it illustrates an unlimited upside potential and a limited downside risk. The graph on the right illustrates that a long put has a limited downside and upside potential.

In the example, the buyer of a put option buys the right to sell a stock at $50 while the buyer of call buys the right to purchase the stock at $50. The price of the call and put option is $3 each. According to the graph the maximum potential for gain is $47 for the buyer of the put option and the maximum loss is $3. This is the invested sum. The cap of the put option is between these two points because the buyer of the put is betting on a bear market; hence, the stock price could drop to a maximum of $50 to make the investor $47 after paying the price of the option. The other extreme scenario is where the price rises or remains above the strike price of $50. In this case the right to sell is useless and the investor loses $3 because the investor is better off selling his stock in the market rather than using the put option to sell his stock lower than the price he or she can get in the market.

On the other hand, the call option maximum loss is $3, the invested value; however, the upside gain is unlimited. The buyer of the call will have a maximum loss of $3 when the stock price is below the strike price of $50 and exercising the option is worthless relative to buying the

stock in the market. The buyer has an unlimited upside potential in an event where the stock price quadruples above the strike price of $50 because they will still possess the right to purchase the option at $50. Hence, this major difference in options could explain the high dollar difference in profitability for the call option and put options. Overall, if an investor is a risk taker and is willing to have uncertainty with options return, then they should purchase or sell call options where the possible profit or loss earned has no limits.

The profitability of different investors is compared in the call and put options. In the call options, firms made the highest profit of $1,177,781.33 for the 14 ticker symbol options that traded on in the last 7 months of 2010. Broker-dealers made the second highest profit of $1,123,682.54. On the flip side, the highest loss maker was generated by large customers. The large customer made a loss of $1,574,883.16. This huge loss was followed by a loss generated by the small customer of $1,148,526.89 (Exhibit 10.3.1). These statistics illustrate that the institutional investors are better off than individual investors. The firms and broker-dealers may possess information relating to the market or may have high negotiating power attributed to the large trades they execute. Furthermore, such traders utilize sophisticated quantitative models which are difficult for the normal user to utilize in order to make wiser decisions. Majority of retail trader's trade on emotion or market news sentiments. Barber and Ordean illustrate the retail trader's news related trades in their paper, "All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors." Furthermore, in aggregation retail traders could be having lower sophisticated models to analyze and execute a trade relative to institutional invesors. Also, the relative trade size is smaller for retail traders. Hence, they gain significant disadvantage in negotiating in the call options market. Additionally,

retail traders might be utilizing options to satisfy their gambling urge. Therefore, they might be losing more money in the options market.

The profit per option for call options illustrate an interesting point where the quality of the options traded is important relative to the quantity. The firms earned the highest profit in dollar value; however, their profit per option is only $0.10 per option. On the other hand, the medium and large professional customer who had a dollar profit of $132,672.86 and $28,823.86 ended up with the high profits per option of $1.14 and $0.24 respectively (Exhibit 8.2.1). The medium professional customers had the highest profit per option. These traders are high frequency traders who execute trades based on an algorithm. This enables them to take advantage of slight market movements and capture a higher overall profit for their trade. Furthermore, they trade mainly on an algorithm which tends to be quicker and more accurate relative to humans entering transactions. Also, broker-dealers made higher profits per option. Many brokers work with underwriters and this may help them with information which could be a contributing factor to their higher profits per option relative to firms. Therefore, the broker-dealers might be possessing certain insider information that could enable them to pull off higher profits per call option traded.

The profit in the put option is different relative to the call option. In the put options, all institutional investors lost money while a few individual investors made money. The highest profit was generated by small customers of $623,629.75 (Exhibit 8.2.2). It is astonishing to observe retail traders making the highest dollar profit in the put options market when a lot of research indicates the complete opposite. The medium customers and medium professional customers came in second and third in terms of profitability. Their profit figures are $24,653.21 and $8263.63 respectively (Exhibit 8.2.2). On the other hand, the largest two profit makers in the

call options were the biggest losers in the options market. The firm and broker-dealer generated the biggest losses of $577,241.99 and 402,352.20 respectively (Exhibit 8.2.2). This disparity could be attributed to the trading style of institutional and individual investors. Furthermore, the institutional investors might have used put options as a method to hedge their call option exposure. Therefore, a huge loss in the put option could have been offset by profits in the call options. The same could be said for individual investors who covered their call option loss by making money in the put options. Medium professional customers generated profit in both markets. They could possess sophisticated algorithm that could enable favorable returns in both markets. The medium professional customers profit per option is the highest too at $0.09; hence, they could be having information which allows them to generate more income per option in both options (Exhibit 8.2.2).

The profit of investors in call and put options is further subdivided by the underlying stocks, moneyness and expiry date. These characteristics aid in providing a better insight into possible reasons for profitability differences amongst investors.

The total profit against the 14 underlying stock points out several patterns in terms of stock characteristics and investor profitability (Exhibit 10.3.1)

8.2.1. Call profit against underlying stock

An interesting pattern to note is the small customer's profitability against the 14 underlying stocks. The small customers lost profit in 10 underlying stock options out of the 14 (Exhibit 8.2.1). However, they made a significant profit in the bank options. There were only 2 bank options of Citi Group (C) and Goldman Sachs (GS). The small customers earned $11,401.94 and $217,585.60 respectively (Exhibit 8.2.1). GS was the highest profit making

option for the retail trader. This could be due to a better year for the banking options after the crisis; however, several other investors such as proprietary traders and professional customers lost money in the same option. Therefore, there are other reasons that could be a contributing factor in bank stock option profitability for small investors. Smaller investors might possess information in the banking sector because they made profit on aggregate in the banking option. Furthermore, after the crash many institutional investors might be reluctant to invest while small customers might have had confident to invest in the bank stocks. This could be a possible explanation for the profitable banking stock options.

The medium customers seem to be uninformed in the options market because they made losses in all the stock options except the LVS stock. LVS is a casino stock and that could be the medium customer's winning lottery in the options market. All investors lost money in the LVS stock option; however, medium customers made $505 in the LVS stock option. Overall, this could imply that medium customers are gamblers who lost in all stock options, but might have information on the gambling stock. Barber, Lee, Liu and Odeon point out that individual investors normally trade for entertainment purposes (628). Their paper explains how Taiwan clients use the market for a sensation of entertainment because of the illegality of gambling in Taiwan. Therefore, this abnormality in the profit result could imply that individual investors are gamblers who had information on gambling stocks.

Furthermore, all individual investors lost money in technology stocks. Small, Medium and large customers had a total combined loss of $1,412,019.75 by investing in INTC, IBM, RIMM, MSFT and AMZN (Result 2). The technology stocks are normally what covers the news and are attention grabbing stocks for investors. The investors could be clearly attracted by the highly spoken about stocks. This could cause them to invest in these stocks without

understanding the clear dynamics. Barber and Odean, in their paper "All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors," points out that individual investors buy "attention grabbing stock" (785). The fact that investors are continually losing in the technological stock options could indicate that Barber and Odeon's finding in the stock market follows into the options market where investors are attracted by stock options that are attention grabbing.

Small customers lost their largest amount and made the largest gain in the 2 most expensive stock options. AMZN and GS had an average closing stock price of $150.77 and $157.28 respectively (Results 3). Small customer made their largest loss of $657,146.36 in AMZN and their largest gain of $217,585.60 in GS (Results 3). This two extreme scenarios for the most expensive stock hint the possibility of investors utilizing leverage trades in order to gain exposure to the expensive stocks. Hence, investors are purchasing options for these pricey stocks and are hoping to make it big. Some stocks made a large win and ended up earning them their largest win while other leveraged trade cost them to lose a big sum in the market.

On the other hand, firms, proprietary traders and broker-dealers made money in the options market for the 3 most expensive underlying stock (Results 3). Institutional investors have enough funds to purchase the stocks in order to gain exposure to the expensive stocks. However, options give them an opportunity to invest less dollars by taking on the timing risk of price movement. The institutional investors might possess some extra information in order to take the risk to purchase the most expensive stock option and make money in them. The results could not be associated with gambling because all of them made money in the stock options for the most expensive stock.

Average closing stock price	Stock Category	Investor weekly call options	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional	Medium Professional	Large Professional	Proprietary	Broker Dealer Profit
10.03	BA	C	$ 344,221.05	$ (154,292.38)	$ 11,401.94	$ (3,776.86)	$ (42,693.37)	$ 2,243.23	$ (4,790.00)	$ 1,978.77	$(154,353.13)	$ 60.75
12.93	CAR	F	$ 114,426.81	$ 56,557.54	$ (198,504.12)	$ (6,059.57)	$ (16,985.56)	$ 9,904.91	$ (17,924.62)	$ 2,027.07	$ 51,507.59	$ 5,049.95
19.43	DIV	GE	$(392,127.97)	$ 191,365.12	$ (107,170.29)	$ (611.97)	$ 100,527.94	$ 15,896.07	$ 756.00	$ –	$ 179,878.12	$ 11,487.00
20.71	T	INTC	$ 224,829.38	$ (982.84)	$ (134,707.61)	$ (4,158.25)	$ (101,837.31)	$ 16,769.46	$ 1,070.00	$ –	$ 750.15	$ (1,733.00)
24.59	BT	DNDN	$ 7,892.74	$ 7,871.29	$ (21,678.24)	$ (398.00)	$ –	$ (1,559.08)	$ –	$ –	$ 2,888.79	$ 4,982.50
25.99	T	MSFT	$ 78,545.73	$ (16,555.21)	$ (118,064.27)	$ (8,768.23)	$ (33,451.62)	$ 55,416.57	$ 35,614.21	$23,818.02	$ (10,364.96)	$ (6,190.25)
38.16	NR	ABX	$ 126,810.01	$ (76,646.27)	$ (4,320.32)	$ –	$ 35,829.84	$ (5,026.98)	$ –	$ –	$ (76,575.28)	$ (71.00)
41.52	NR	BP	$(991,846.66)	$ 1,171,264.02	$ (171,392.12)	$ (29,684.80)	$ (1,197,390.03)	$ 44,123.57	$ 2,662.00	$ 1,000.00	$ 192,254.32	$ 979,009.70
47.38	CAS	LVS	$ 112,927.50	$ (39,946.79)	$ (7,289.97)	$ 505.00	$ (7,142.93)	$ (19,106.03)	$ –	$ –	$ (37,507.46)	$ (2,439.33)
70.37	T	RIMM	$ 535,688.54	$ (271,991.76)	$ (4,511.17)	$ (14,759.96)	$ (11,999.97)	$ 39,566.07	$ –	$ –	$(297,527.68)	$ 25,535.93
122.28	AGR	POT	$ 106,175.35	$ (99,255.73)	$ 36,428.61	$ –	$ –	$ 55,907.50	$ –	$ –	$ (72,444.38)	$ (26,811.35)
129.73	T	IBM	$ 51,621.41	$ 7,731.24	$ 10,841.43	$ –	$ –	$ (77,925.31)	$ –	$ –	$ 1,306.25	$ 6,424.99
150.77	T	AMZN	$ 5,121.25	$ 365,779.20	$ (657,146.36)	$ (33,716.26)	$ (299,740.17)	$138,637.88	$115,285.26	$ –	$ 254,403.37	$ 111,375.83
157.28	BA	GS	$(218,765.51)	$ 36,883.93	$ 217,585.60	$ (16,156.97)	$ –	$ (56,430.98)	$ –	$ –	$ 19,883.09	$ 17,000.84
		Profit	$ 105,519.65	$ 1,177,781.33	$ (1,148,526.89)	$(117,585.87)	$ (1,574,883.16)	$218,416.89	$132,672.86	$28,823.85	$ 54,098.79	$ 1,123,682.54

Results 2: the table above illustrates the options dollar profit of investors against the stock, stock price and stock type. The profit is derived from the ISE exchange trades from June to Dec 2010. The profits are sorted by stock price of the underlying stock.

Average closing stock price	Stock Category	Investor weekly call options	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional	Medium Professional	Large Professional	Proprietary	Broker Dealer Profit
122.28	AGR	POT	$ 106,175.35	$ (99,255.73)	$ 36,428.61	$ -	$ -	$ 55,907.50	$ -	$ -	$ (72,444.38)	$ (26,811.35)
10.03	BA	C	$ 344,221.05	$ (154,292.38)	$ 11,401.94	$ (3,776.86)	$ (42,693.37)	$ 2,243.23	$ (4,790.00)	$ 1,978.77	$ (154,353.13)	$ 60.75
157.28	BA	GS	$ (218,765.51)	$ 36,883.93	$ 217,585.60	$ (16,156.97)	$ -	$ (56,430.98)	$ -	$ -	$ 19,883.09	$ 17,000.84
24.59	BT	DNDN	$ 7,892.74	$ 7,871.29	$ (21,678.24)	$ (398.00)	$ -	$ (1,559.08)	$ -	$ -	$ 2,888.79	$ 4,982.50
12.93	CAR	F	$ 114,426.81	$ 56,557.54	$ (198,504.12)	$ (6,059.57)	$ (16,985.56)	$ 9,904.91	$ (17,924.62)	$ 2,027.07	$ 51,507.59	$ 5,049.95
47.38	CAS	LVS	$ 112,927.50	$ (39,946.79)	$ (7,289.97)	$ 505.00	$ (7,142.93)	$ (19,106.03)	$ -	$ -	$ (37,507.46)	$ (2,439.33)
19.43	DIV	GE	$ (392,127.97)	$ 191,365.12	$ (107,170.29)	$ (611.97)	$ 100,527.94	$ 15,896.07	$ 756.00	$ -	$ 179,878.12	$ 11,487.00
38.16	NR	ABX	$ 126,810.01	$ (76,646.27)	$ (4,320.32)	$ -	$ 35,829.84	$ (5,026.98)	$ -	$ -	$ (76,575.28)	$ (71.00)
41.52	NR	BP	$ (991,846.66)	$ 1,171,264.02	$ (171,392.12)	$ (29,684.80)	$ (1,197,390.03)	$ 44,123.57	$ 2,662.00	$ 1,000.00	$ 192,254.32	$ 979,009.70
20.71	T	INTC	$ 224,829.38	$ (982.84)	$ (134,707.61)	$ (4,158.25)	$ (101,837.31)	$ 16,769.46	$ 1,070.00	$ -	$ 750.15	$ (1,733.00)
25.99	T	MSFT	$ 78,545.73	$ (16,555.21)	$ (118,064.27)	$ (8,768.23)	$ (33,451.62)	$ 55,416.57	$ 35,614.21	$23,818.02	$ (10,364.96)	$ (6,190.25)
70.37	T	RIMM	$ 535,688.54	$ (271,991.76)	$ (4,511.17)	$ (14,759.96)	$ (11,999.97)	$ 39,566.07	$ -	$ -	$ (297,527.68)	$ 25,535.93
129.73	T	IBM	$ 51,621.41	$ 7,731.24	$ 10,841.43	$ -	$ -	$ (77,925.31)	$ -	$ -	$ 1,306.25	$ 6,424.99
150.77	T	AMZN	$ 5,121.25	$ 365,779.20	$ (657,146.36)	$ (33,716.26)	$ (299,740.17)	$138,637.88	$115,285.26	$ -	$ 254,403.37	$ 111,375.83
		Profit	$ 105,519.65	$ 1,177,781.33	$ (1,148,526.89)	$ (117,585.87)	$ (1,574,883.16)	$218,416.89	$132,672.86	$28,823.85	$ 54,098.79	$ 1,123,682.54

Results 3: the table above illustrates the options dollar profit of investors against the stock, stock price and stock type. The profit is derived from the ISE exchange trades from June to Dec 2010. The profits are sorted by stock type of the underlying stock.

Underling Stock	Average Closing Stock Price
ABX	38.16
AMZN	150.77
BP	41.52
C	10.03
DNDN	24.59
F	12.93
GE	19.43
GS	157.28
IBM	129.73
INTC	20.71
LVS	47.38
MSFT	25.99
POT	122.28
RIMM	70.37

Stock Category	Industry
BT	Biotech
NR	Natural Resources
T	Technology
BA	Banking
CAR	Automobile
CAS	Gambling
AGR	Agriculture
DIV	Diverisified

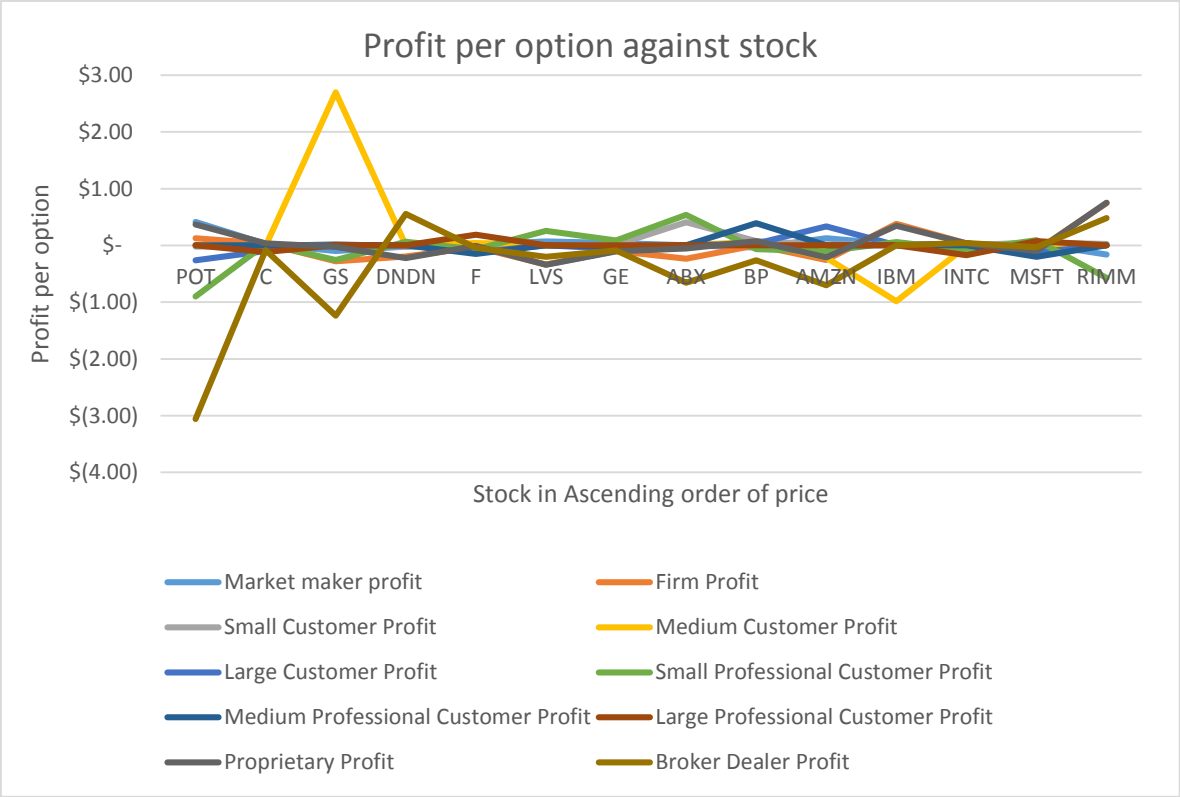
Results 4: The table on the left includes the average closing stock price against the underlying stock The table on the right includes the Stock category coded by industry of the underlying stock.

8.2.2. Put profit against underlying stock

The profit is organized in relation to the stock price, stock type and underlying stock ticker. The results 6 table illustrates that all institutional investors made a loss in the two most expensive stocks while the customers generated profit. This could be a gamble where they betted on the right side. Hence, they are possibly speculating the underlying stock price movement and investing in the market. However, the institutional investor's loss could be attributed to a hedging strategy because the large investors such as the broker-dealers or the proprietary traders generated a profit in the call options market for the same underlying stock. The graph below analyzes the profit per option by stock whose stock price increase in ascending order along the y axis (Results 5). Hence, the first stock is the cheapest while the last stock is the most expensive stock.

According to the graph broker/dealers are generating losses per option for the cheaper, mid-priced and high priced stock. Furthermore, the medium customers are generating modest of profits per option. However, for BP they are generating the highest profit per option. This is a onetime win and could be attributed to information possessed or lucky speculation. On the other

hand, the small customer have consistent profit per option and end up having an overall profit. This trading results could indicate that all retail traders are not opinionated, and some might possess knowledge or information in the put options market.



Results 5: The graph above plots the profit per put option against the underlying stock. The underlying stock is arranged in terms of the stock's average closing price. The stock prices increase in ascending order from left to right of the y axis.

Average closing stock price	Stock Category	Underlying Stock	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
10.03	BA	C	$ (58,511.35)	$ 68,622.53	$ (20,299.82)	$ (2,427.00)	$ (39,950.30)	$ 233.80	$ –	$(16,290.39)	$ 69,305.53	$ (683.00)
12.93	CAR	F	$ 89,555.41	$ (64,188.52)	$ 59,899.34	$ 14,705.31	$ (27,685.73)	$ (8,651.91)	$ (3,587.37)	$ 4,142.00	$ (4,833.50)	$ (59,355.02)
19.43	DIV	GE	$ 98,682.83	$ (51,215.32)	$ 15,242.22	$ (3,259.50)	$ (22,317.00)	$ 10,478.08	$ (284.00)	$ 3,888.00	$ (44,317.76)	$ (6,897.56)
20.71	T	INTC	$ (231.08)	$ 1,419.87	$ 2,484.98	$ (727.00)	$ 3,542.43	$ (3,047.06)	$ –	$ (4,862.00)	$ 791.87	$ 628.00
24.59	BT	DNDN	$ 54,185.45	$ (25,516.49)	$ (4,140.75)	$ (1,408.00)	$ –	$ 2,396.27	$ –	$ –	$ (28,512.49)	$ 2,996.00
25.99	T	MSFT	$ 174,257.65	$(113,434.87)	$100,699.96	$ 6,775.36	$ (69,735.85)	$ 15,635.11	$ (2,540.00)	$ 1,777.51	$(106,704.85)	$ (6,730.02)
38.16	NR	ABX	$ 23,403.92	$ (15,746.46)	$ 2,689.00	$ –	$ –	$ 5,400.00	$ –	$ –	$ (2,546.46)	$ (13,200.00)
41.52	NR	BP	$(294,571.79)	$ 4,163.67	$289,819.51	$ 18,467.24	$ 7,999.23	$ (44,716.54)	$14,675.00	$ –	$ 54,444.24	$ (50,280.57)
47.38	CAS	LVS	$ 100,267.71	$ (53,297.70)	$ (1,479.24)	$ –	$ –	$ 7,806.93	$ –	$ –	$ (52,651.03)	$ (646.67)
70.37	T	RIMM	$(312,655.65)	$ 166,468.99	$ 27,433.48	$ –	$ –	$ (47,715.80)	$ –	$ –	$ 165,988.99	$ 480.00
122.28	AGR	POT	$ 21,286.51	$ 6,605.23	$ (1,433.46)	$ –	$ (6,682.00)	$ (26,381.50)	$ –	$ –	$ 17,621.24	$ (11,016.02)
129.73	T	IBM	$ (7,418.38)	$ 5,161.90	$ 5,936.33	$(10,528.80)	$ –	$ 1,687.05	$ –	$ –	$ 4,671.90	$ 490.00
150.77	T	AMZN	$ 575,376.23	$(313,884.97)	$102,150.39	$(24,972.40)	$ 48,572.71	$ (73,356.98)	$ –	$ –	$(234,628.45)	$ (79,256.52)
157.28	BA	GS	$ 360,827.63	$(192,399.85)	$ 53,627.82	$ 28,028.00	$ –	$ (57,683.74)	$ –	$ –	$ (13,519.02)	$(178,880.83)
		Total Profit	$ 824,455.08	$(577,241.99)	$632,629.75	$ 24,653.21	$(106,256.51)	$(217,916.29)	$ 8,263.63	$(11,344.88)	$(174,889.79)	$(402,352.20)

Results 6: the table above illustrates the put options dollar profit of investors against the stock, stock price and stock type. The profit is derived from the ISE exchange trades from June to Dec 2010. The profits are sorted by stock price of the underlying stock

Average closing stock price	Stock Category	Underlying Stock	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
122.28	AGR	POT	$ 21,286.51	$ 6,605.23	$ (1,433.46)	$ –	$ (6,682.00)	$ (26,381.50)	$ –	$ –	$ 17,621.24	$ (11,016.02)
10.03	BA	C	$ (58,511.35)	$ 68,622.53	$ (20,299.82)	$ (2,427.00)	$ (39,950.30)	$ 233.80	$ –	$(16,290.39)	$ 69,305.53	$ (683.00)
157.28	BA	GS	$ 360,827.63	$(192,399.85)	$ 53,627.82	$ 28,028.00	$ –	$ (57,683.74)	$ –	$ –	$ (13,519.02)	$(178,880.83)
24.59	BT	DNDN	$ 54,185.45	$ (25,516.49)	$ (4,140.75)	$ (1,408.00)	$ –	$ 2,396.27	$ –	$ –	$ (28,512.49)	$ 2,996.00
12.93	CAR	F	$ 89,555.41	$ (64,188.52)	$ 59,899.34	$ 14,705.31	$ (27,685.73)	$ (8,651.91)	$ (3,587.37)	$ 4,142.00	$ (4,833.50)	$ (59,355.02)
47.38	CAS	LVS	$ 100,267.71	$ (53,297.70)	$ (1,479.24)	$ –	$ –	$ 7,806.93	$ –	$ –	$ (52,651.03)	$ (646.67)
19.43	DIV	GE	$ 98,682.83	$ (51,215.32)	$ 15,242.22	$ (3,259.50)	$ (22,317.00)	$ 10,478.08	$ (284.00)	$ 3,888.00	$ (44,317.76)	$ (6,897.56)
38.16	NR	ABX	$ 23,403.92	$ (15,746.46)	$ 2,689.00	$ –	$ –	$ 5,400.00	$ –	$ –	$ (2,546.46)	$ (13,200.00)
41.52	NR	BP	$(294,571.79)	$ 4,163.67	$289,819.51	$ 18,467.24	$ 7,999.23	$ (44,716.54)	$14,675.00	$ –	$ 54,444.24	$ (50,280.57)
150.77	T	AMZN	$ 575,376.23	$(313,884.97)	$102,150.39	$(24,972.40)	$ 48,572.71	$ (73,356.98)	$ –	$ –	$(234,628.45)	$ (79,256.52)
129.73	T	IBM	$ (7,418.38)	$ 5,161.90	$ 5,936.33	$(10,528.80)	$ –	$ 1,687.05	$ –	$ –	$ 4,671.90	$ 490.00
20.71	T	INTC	$ (231.08)	$ 1,419.87	$ 2,484.98	$ (727.00)	$ 3,542.43	$ (3,047.06)	$ –	$ (4,862.00)	$ 791.87	$ 628.00
25.99	T	MSFT	$ 174,257.65	$(113,434.87)	$100,699.96	$ 6,775.36	$ (69,735.85)	$ 15,635.11	$ (2,540.00)	$ 1,777.51	$(106,704.85)	$ (6,730.02)
70.37	T	RIMM	$(312,655.65)	$ 166,468.99	$ 27,433.48	$ –	$ –	$ (47,715.80)	$ –	$ –	$ 165,988.99	$ 480.00
		Total Profit	$ 824,455.08	$(577,241.99)	$632,629.75	$ 24,653.21	$(106,256.51)	$(217,916.29)	$ 8,263.63	$(11,344.88)	$(174,889.79)	$(402,352.20)

Results 7: the table above illustrates the put options dollar profit of investors against the stock, stock price and stock type. The profit is derived from the ISE exchange trades from June to Dec 2010. The profits are sorted by stock type of the underlying stock

According to the table above small customers made money in all the stock options except gambling, biotech, banking and agricultural stock (Results 7). According to the results, almost all investors lost money in the LVS gambling stock option. Therefore, the loss could be counted as a generic loss faced by all. Hence, this finding illustrates that individual investors are not always the loss takers. In 2010, individual investors generated the largest profit in put options for the 14 underlying stocks.

8.2.3. Call profit against moneyness

The call option profit per option against moneyness provides great insights into call options that could lead to higher profitability. From the results it can be observed that the largest amount profit per option was made from deep out of the money options with moneyness of 5. The deep out of the money options tend to be cheaper because the likelihood of making a profit from them is low. According to the research, however, although the probability of getting a hit is low, on average, most investors made money per option by trading deep out of the money options. On the other hand, almost all investors lost money trading deep in the money options with moneyness of 1. However, small professional customer and medium customers generated the highest profit per option trading deep in the money options. This could highlight that such investors could be possessing information about the market because deep in the money options are generally expensive and are hardly used for speculative trades. Therefore, there might be information possessed by these investors, which might have helped them generate the highest profit per option traded.

On average, small investors lost money on all option moneyness. This indicates that such investors might have a lack of knowledge about the options market and might be overconfident investors who end up burning their capital in the hope of making money. On the flip side, small

professional customers made money on average in all moneyness options. This hints that such investors are not gamblers and have some proprietary knowledge or quantitative model which allows them to make money on all types of option contracts.

Medium and large customers made money in the deep out of the money options while lost money in almost all other moneyness options. Therefore, such investors could be gamblers trying their luck by buying out of the money options as lottery tickets. Doran et al. explained that retail investors are more attracted to out of the money options in the hope of getting a large win. The medium and large customers illustrate this phenomenon where they ended up making money only in the deep out of the money options.

Furthermore, most of the firms and broker/dealers money was generated from at the money options. This could be attributed to the fact that such investors might have bought neutral investments to hedge their existing portfolios. Therefore, such investors could have bought exposure into the options market by having an opportunity to cover their position if at all a large swing happens in other markets. However, such hedging portfolios might have ended up making them money in the options market. All institutional investors made money by investing in at the money options. The graphical results illustrate a similarity in trades of all institutional investors at the money trades (Exhibit 10.2 graph 2, 8, 11and 14). The institutional investors had more open to buy contracts that close to sell. This implies that most of the institutional investors ATM options were left to expire and earn the intrinsic value. However, the individual investors (a.k.a the customer) had the same average open to buy and close to sell contract (Exhibit 10.2, graph 2). The profitability of the investors could imply that the customer strategy might not be beneficial in generating profit. According to the way options are set up, options are always worth more when sold than exercised. This is the case because options profit is comprised of time value

and intrinsic value. Therefore, if the option is exercised the time value is lost and only the intrinsic value is earned. However, if there is a large dividend payout then it is better to exercise the option and earn the dividend. There might have been a large dividend payout for the stocks trading on the ISE; hence, exercising the option might have been more worthwhile than selling the option for the institutional investors.

In addition, small professional customers were the only investors who made money by trading in the money options. The small professional customers made a dollar profit of $18,298.79 and profit per options of $0.16 (Exhibit 8.2.3). Their profit was the highest relative to all other investors who made losses. The trade style of the professional customer relative to the other investors explains strategies that might have contributed to the profitability (Exhibit 10.2, graph 7). All investors bought more contracts to open a position relative to selling. However, professional customers had a similar average of options bought and sold to open a position. Buying similar number of open to buy and open to sell contract is similar to hedging risk and betting both sides of the market. Open to buy in the call market indicates a bullish view on the market while open to sell indicates a bearish view of the market. However, many other investors had more bullish (open to buy) trades than bearish (open to sell) trades. Therefore, hedging trades could be a safe investment to earn a modest return rather than taking on naked positions.

Finally, a similar trend of hedging is prevalent in the out of the money options. All customers lost money on out the money options while institutional investors made money on those options. The institutional investor trading strategy revealed that they are opening buying and selling options average daily volume is similar (Exhibit 10.2, graph 9). However, customers had a higher open to sell relative to open to buy in the out of the money options (Exhibit 10.2, graph 6). Therefore, this illustrates that there is some correlation between the hedging strategy

and profitability where similar open to buy and open to sell contracts return in profit for the investor.

8.2.4. Put profit against moneyness

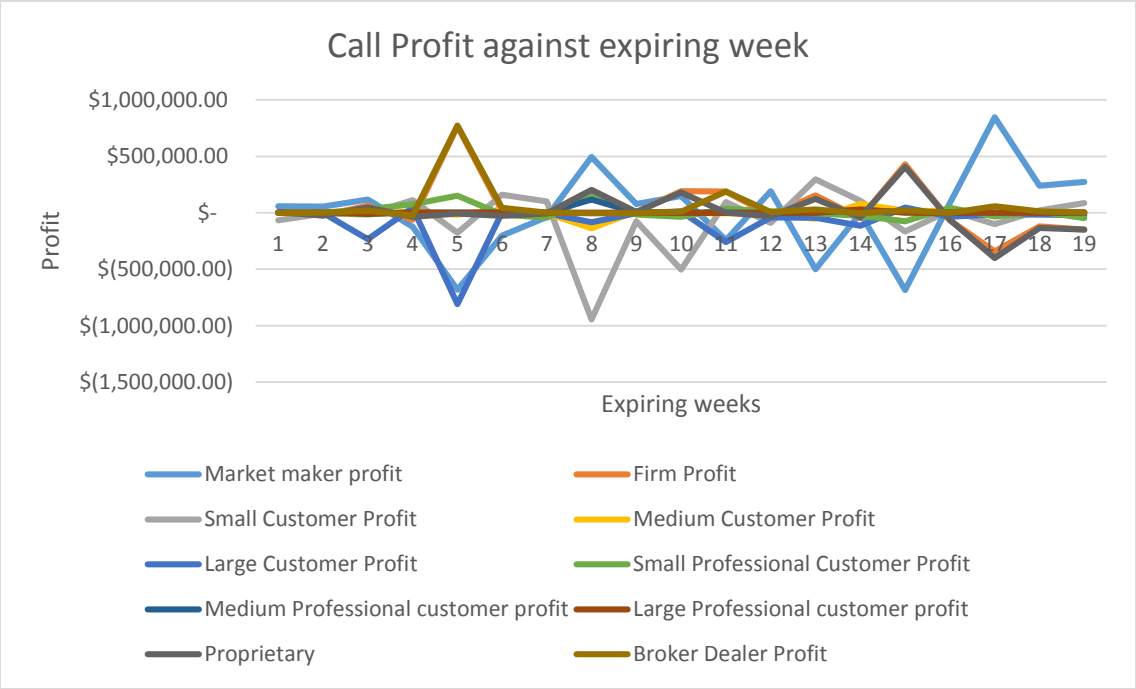
Small customers generated profit in options that were in, at and out of the money. However, they did not generate profit on the options that were deep in or out of the money. One possible explanation could be the wild swing required to achieve profit. It is rare for large movements to occur in the stock market. On the other hand, all institutional investors generated profit by trading in deep out of the money options. This could imply that institutional investors were speculating in the market by investing in deep out of the money options. Furthermore, it could also imply that institutional customer were hedging their existing portfolios by investing in deep out of the money options.

The professional customers generated profits in out of the money options. However, two of the three professional customer categories lost money. The trading strategy of the professional customers could illustrate the reason for the loss. The professional customer bought more contracts to open a position for at the money options while sold more contract to open a position for out of the money option. In the put options market, selling more than buying could have benefited more because the stock price might have not gone down. Therefore, selling to open a contract generated money for the seller of the put option if the option did not end up getting exercised by the buyer. Hence, the seller did not lose anything. This trade generates money up front and cause loses if the price moves against the seller. Therefore, it could be implied that in 2010 the markets were bullish and all professional customers would have generated a profit by selling ATM options. Hence professional customers should have sold more at and in the money

options, in order to benefit by selling more expensive options. Overall, selling put options generates more profit for the professional customers.

Furthermore, the hedging of trades by buying and selling similar amounts benefited the broker-dealer and the proprietary trader. Both the broker/dealer and proprietary trader bought and sold the same amount of in the money options to open their trade. Both the investors made money by executing such a trade. This kind of trades reduces the stock price risk because the trades are hedged. The investors do make moderate profit because their profit is capped into a certain region. Such trades are similar to split strike trades where the spread of the strike is the region in which an investor could generate profit in.

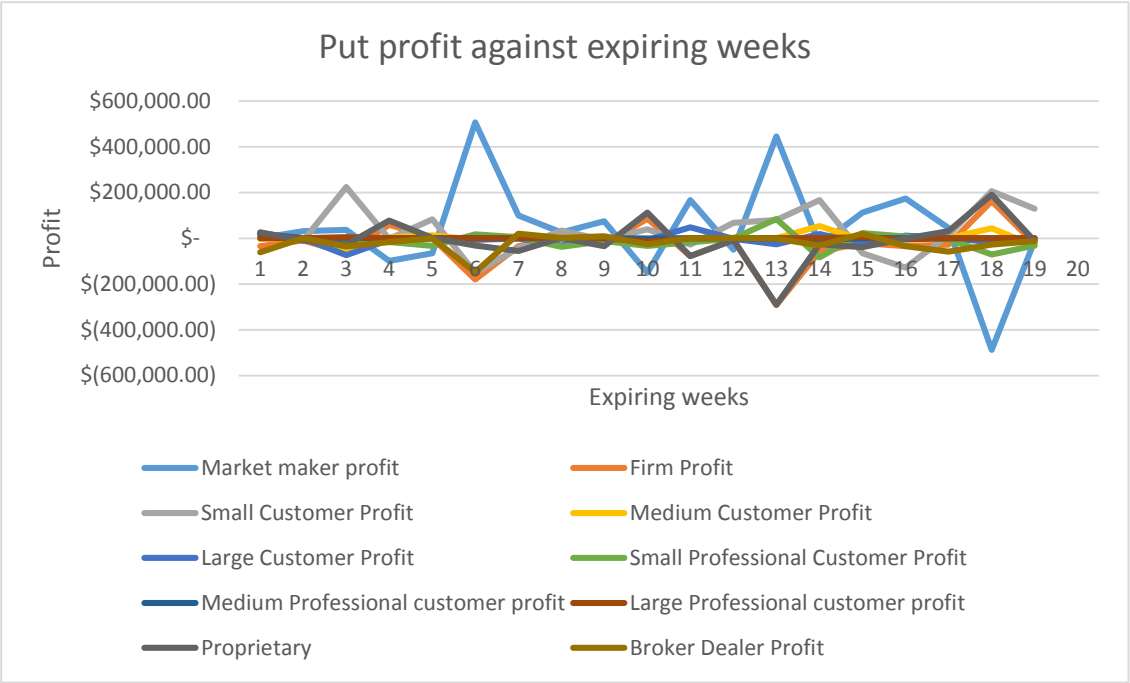
8.2.5. Call profit against expiry date



Results 8: The chart illustrates the call profit of investors for the 14 underlying options against the expiration week. There are 19 expiration weeks in the dataset for June 2010 to Dec 2010.

The above chart analysis the profitability against the expiring week. There were abnormal spikes on the 5th, 8th 13th, 15th and 17th expiry. These dates are 20100806, 20100903, 20101022, 20101105 and 20101126. There are more negative spikes with small and large customers being amongst the major loss makers. Overall, the profit is spread fairly amongst customers with no one sided losses. Therefore, policy makers do not need to worry about one sided exploitation.

8.2.6. Put profit against expiry date



Results 9: The chart illustrates the call profit of investors for the 14 underlying options against the expiration week. There are 19 expiration weeks in the dataset for June 2010 to Dec 2010.

The put option profitability over time illustrates 3 expiring dates where the profit is abnormal. The 6th, 13th and the 18th are the four expiring weeks. The dates for these weeks are 20100813, 20101022 and 20101203. However, the options profit is stable for most of the expiring weeks. Therefore, the weekly options market could be thought as any other market where a mix of investors come with certain investors possessing more information over some specific weeks. There is no complete imbalance in terms of information possession.

8.2.7. Call profit against days to expire

Days to Expiration Call Profit	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
0	$ 160,078.44	$ (16,719.38)	$ (43,295.63)	$ (20,899.63)	$ (105,339.47)	$ 41,008.26	$ 3,732.00	$ (1,845.23)	$ (25,517.41)	$ 8,798.04
1	$(1,136,489.36)	$ 915,799.23	$ 509,985.75	$ (60,446.08)	$(1,139,077.23)	$ (8,118.17)	$ 4,233.16	$ (1,686.54)	$ 61,482.28	$ 854,316.96
2	$ (259.80)	$ (68,264.85)	$ 38,964.04	$ (92,796.60)	$ (97,360.71)	$132,878.88	$134,940.80	$ 20,163.09	$ (32,830.46)	$ (35,434.40)
3	$ 493,455.22	$ (79,982.98)	$ (389,872.17)	$ 319.50	$ (52,893.11)	$ 79,900.47	$ 4,655.51	$ 24,400.54	$(123,691.14)	$ 43,708.16
4	$ 252,642.69	$ 243,397.76	$ (615,182.64)	$ (4,169.95)	$ (46,134.29)	$ (70,126.32)	$ (3,825.00)	$ –	$ 231,034.94	$ 12,362.82
7	$ 336,092.46	$ 183,551.55	$ (649,126.24)	$ 60,406.91	$ (134,078.35)	$ 42,873.76	$ (11,063.61)	$(12,208.01)	$ (56,379.42)	$ 239,930.97
Total Profit	$ 105,519.65	$1,177,781.33	$(1,148,526.89)	$(117,585.87)	$(1,574,883.16)	$218,416.89	$132,672.86	$ 28,823.85	$ 54,098.79	$1,123,682.54

Results 10: the table above illustrates the call options dollar profit of investors against the days to expire. The profit is derived from the ISE exchange trades from June to Dec 2010. The 0 indicates Friday (the option expiry day) and the 7 indicates the prior week's Friday (a week before expiration option trading day).

The call profit against expiring day helps in understanding whether last minute trades are profitable. According to the table, market maker, small professional customers, medium professional customers and broker dealers generated profit by trading options on the last day of expiration. This last minute trades could be only executed by gamblers or very well informed traders. The fact that on aggregate the above investors generated profit indicates that these investors are highly informed in the options market. On the other hand, the firm, small customer, medium customer, large customer, large professional customer and proprietary investor could be bucketed as gamblers because on average the investor class lost money. There might be some trader in the buckets who are informed; however, the data does not reveal individual positions by customer id. Therefore, on a generalized note the investors could be classified as gamblers who are executing trades on the last day of the option. The small and large customers could be classified as opinionated gamblers with a bit more surety because their losses are significantly higher compared to other investors.

Furthermore, trading a few days before expiration did help medium customers generate some profit. This could imply that investors could generate profit if there is a few days left for some movements in the stock price that could result in profits.

8.2.8. Put profit against days to expire

Days to Expiration Put Profit	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
0	$ 30,956.13	$ (32,993.05)	$ 10,107.33	$ (6,594.51)	$ 52,203.64	$ (19,839.48)	$ (847.00)	$ –	$ (23,221.82)	$ (9,771.23)
1	$ 142,419.66	$(114,240.74)	$125,788.42	$(31,140.59)	$ (15,141.56)	$ 9,095.55	$ (2,540.00)	$ –	$(104,611.90)	$ (9,628.84)
2	$ 498,815.67	$(223,880.82)	$ 16,769.59	$ (6,975.73)	$ (72,224.68)	$ 11,376.80	$ –	$ –	$(236,214.44)	$ 12,333.61
3	$ 245,941.40	$(173,125.37)	$183,471.85	$ (1,767.60)	$ 3,022.77	$ (66,337.37)	$ (3,567.43)	$ (14,512.88)	$ 38,829.66	$(211,955.04)
4	$ 12,725.68	$ 17,913.68	$ (20,101.71)	$ 30,820.96	$ (43,397.26)	$ (28,157.38)	$ 12,282.35	$ –	$ 117,375.76	$ (99,462.07)
7	$(106,403.47)	$ (50,915.69)	$316,594.27	$ 40,310.68	$ (30,719.40)	$(124,054.40)	$ 2,935.70	$ 3,168.00	$ 32,952.95	$ (83,868.64)
Total Profit	$ 824,455.08	$(577,241.99)	$632,629.75	$ 24,653.21	$(106,256.51)	$(217,916.29)	$ 8,263.63	$ (11,344.88)	$(174,889.79)	$(402,352.20)

Results 11: the table above illustrates the put options dollar profit of investors against the days to expire. The profit is derived from the ISE exchange trades from June to Dec 2010. The 0 indicates Friday (the option expiry day) and the 7 indicates the prior week's Friday (a week before expiration option trading day).

The put profit on the day of expiration illustrates a different picture. The small customers, large customers and market makers generate profit by trading on the last day of expiration. This is opposite to what is observed in the call options. The profit could suggest that these traders had information on the underlying stock that was traded because on aggregate the investor bucket generated profits. Furthermore, small customer seemed to have proprietary information throughout. They generated profits by trading on almost all day prior to expiration. This could indicate that there might have been an information leak to retail traders. It could also indicate that institutional investors might be executing trades in smaller buckets to be disguised as individual traders and take benefit of the favorable options trading possessed by retailers. Finally, the profit could also be attributed to insider trading by company staff members who possess information. The underlying stock option that generated the majority of the profit is BP (Exhibit 10.3.3). This could imply that there is certain information that was used by small investors to generate profit.

Furthermore, trading some days in advance enables several investors to generate profit because it gives those investors enough time to benefit from market movements. Firms, medium customer, small professional customer, medium professional customer, proprietary and broker-dealer lost money on the last day of the option. They could be considered opinionated traders who are either gambling or hedging their bets in the put options market.

9. Conclusion and Future Research

The ISE weekly options follows the U-shape pattern which is observed in the stock and options market. The U-shape pattern could be attributed to the extra 15 minutes the exchange has for trading. The pattern could also help in explaining the investor behavior and motive. Admati

and Pfleiderer suggest that a U-shape pattern indicates that the market has both discretionary liquidity traders and informed traders. Both the traders want to exercise their trade as soon as the market opens or closes. The informed trader wants to take advantage of the information he/she possesses while liquidity trader want to readjust their portfolio before the end of trading. Their paper suggests that liquidity trades are normally executed at the end of the day and liquidity trading releases a lot of price information. Therefore, the informed traders use this information to their advantage the following day. Overall, the u-shape pattern indicates that the weeklys are traded by both informed and liquidity traders.

Furthermore, the intraday pattern suggests that ATM options is the most popular traded options relative to the other options. The customers traded the highest amount of average daily volume of ATM options. The customers are also the highest OTM options traders relative to other investors. The ATM options could classify customer investors as opinionated traders who are hedging their positions by trading ATM options. However, the largest OTM options are traded by them; hence, some of the customers could also be classified as gamblers who are betting on OTM options which are cheaper compared ATM options. Furthermore, the OTM options has a lower chance of success which makes them have lottery ticket like features. The firm, professional customers and broker dealers could all be considered opinionated traders because bulk of their trade comes from ATM options which are safe investments to hedge underlying positions. On the other hand, although proprietary traders trade more of the ATM options, they could be considered informed or gambling investors. All investors, other than the proprietary traders, have higher or equivalent buying to selling ratio; however, proprietary traders have a higher selling to buying ratio for ATM options. Hence, this investors are selling more ATM options which are more risky than selling OTM options because ATM options have a

better chance of turning in the money. Since Proprietary traders have taken the selling position, the closer they are to in the money options the higher the loss they would generate. Therefore, this traders might be taking extra risk by selling ATM rather than OTM options. Since, this traders are taking extra risk, they could be thought of as gamblers or informed traders who are taking a riskier bet.

Firms could be also thought of as hedgers because they have a higher opening position than closing position. Hence, they trade options to hedge risk rather than open and close positions. For example, Firms made a loss when trading put options. Hence, they might have bought put options to get downside protection for their stock portfolio. Therefore, they might have not cared of closing out the position and would have rather let the positions remain till expiry. In this case, firms might be closing fewer positions because they want downside protection till the expiry date.

Furthermore, a buy-sell relationship is observed where in certain scenarios the customers were the buyers while firms and proprietary traders were sellers. On the other hand, broker dealer and proprietary traders were buyers while customers were sellers. Hence, the weekly options market is balanced where there is no one sided trades. Therefore, the policy makers do not need to worry of exploitation by larger institutions.

Moreover, individual investors (small, medium and large customers) lost a total of $1,412,019.75 by investing in call options of INTC, IBM, RIMM, MSFT and AMZN (results 2). The technology stocks are normally what covers the news and are attention grabbing stocks for investors. The investors could be clearly attracted by the highly spoken about stocks. This could cause them to invest in these stocks without understanding the clear dynamics. Barber and Odean, in their paper “All That Glitters: The Effect of Attention and News on the Buying

Behavior of Individual and Institutional Investors," points out that individual investors buy "attention grabbing stock" (785). The fact that investors are continually losing in the technological stock options could indicate that Barber and Odeon's finding in the stock market follows into the options market where investors are attracted by stock options that are attention grabbing. This clearly indicates that individual investors are opinionated traders who lack information about the market.

The Institutional investors (firms, proprietary, broker-dealer and professional customers) generated profit by trading the most expensive stock. These investors have enough funds to purchase the underlying stock; however, they bought weekly options on these stocks in order to lever up the trade. The fact that all individual investors generated a profit by trading weekly options on the 2 most expensive underlying stock indicate that institutional investors have information relating to the underlying stock. This can be the case because institutional investors generated a profit by investing in a short lived risky asset for the most expensive underlying stock.

Professional customers, medium customers and broker-dealers are informed in the weekly call options market because they generated a profit by trading deep in the money options (DITM). DITM options are very expensive and rarely generate profit unless the stock price moves a lot. These investors generated profit on the DITM options which rarely generate a profit due to the high cost. Hence, this may indicate that these investors were informed when trading the weekly call options.

The analysis of the profit against the expiring week suggests that the weekly options market is stable and there is no major exploitation of either investor type. Finally, the profit against days to expiry supports the claim that market makers, small professional customers,

medium professional customers and broker dealers are informed traders in the weekly call options market. These traders generated a profit by trading on the last day of the option. Such profits could occur if the investor is informed and is knowledgeable of the market movements. However, the results in the put options market suggest that small customers, large customers and market makers possess information in the weekly options market. These investors traded on the last day of the option and generated profits. Furthermore, the small investor's generated profit in ITM, ATM and OTM put options and they generated profit in most of the underlying put stock options. This could indicate that the retail trader do possess information when it comes to trading put option or they might be gamblers who are hedging their bets by trading put options.

Overall, the findings indicate that individual traders are opinionated traders that are either hedging or gambling in the weekly options market while Institutional investors are informed or hedging traders. However, there is an exception in the put options market where retail traders are seen to possess information. The main purpose of trading weekly options for retail traders is to have a security which could allow short quick wins. While the main purpose of trading weekly options for institutional investors is to take advantage of information which causes short price movements. The weekly options profit return are highly stable with no one party getting completely exploited. Therefore, policy makers do not need to worry about the weekly options investor exploitation. Finally, investors are benefiting from the securities as each investor is receiving utility from trading weekly options. The individual investors are receiving the gambling sensation and hedging benefit while the institutional investors are earning high profits with a short hedging opportunity.

For future research, the profit could be analyzed around earnings announcement in order to see profit movements. Around the earnings announcement period a lot of information is

released. Therefore, observing the profitability around such an event will help in clearly attributing the profit to a certain event. Analyzing the profits around the earnings announcement was not in the scope of this thesis.

10. Exhibit

10.1. Dataset

10.1.1. Variables

10.1.1.1. Open close dataset

10.1.1.1.a.

Symbol	Traded Contracts
AXP	8,700
VXX1	29,100
AIG	61,000
MEE	78,200
JPM	79,200
XOM	406,600
GM	408,400
ABX	595,400
PFE	984,100
POT	1,112,900
DIA	1,230,200
DNDN	1,366,200
RIG	1,599,100
IBM	1,638,100
TBT	2,887,200
INTC	5,115,700
PCLN	6,092,600
LVS	6,194,300
VXX	6,665,400
RIMM	7,783,200
GE	8,415,000
NDX	8,803,100
TLT	9,063,300
USO	11,694,700
EEM	12,280,400
XLF	15,725,100
GS	16,334,000
FAZ	17,061,000
MSFT	18,070,000
SLV	18,409,600
CSCO	20,463,000
C	22,089,500
F	22,767,400
BP	24,645,900
GDX	25,708,500

BIDU	25,740,900
FAS	26,835,900
NFLX	31,600,800
GOOG	35,688,200
AMZN	36,717,500
BAC	48,304,700
GLD	84,093,400
IWM	110,761,600
AAPL	110,770,900
QQQQ	127,897,900
SPY	837,581,500

Exhibit 10.1.1.1. a Ticker symbol and traded options contracts: the table illustrates the number of options contracts traded under different ticker symbols. The data utilized for the summary is the open close options traded on the International Securities Exchange from June 2010 till December 2010. The data excludes after hours traded options and abnormal expiration options (ISE data).

10.1.1.1.b.

Variable Name	Variable Definition	Sample Data
SYM_ROOT	Underlying Asset	BP
MONEYNESS	1-deep in the money, 5-deep out of the money	5
EXPR_DT	Expiry Date	20100702
TRADE_DT	Trade Date	20100628
PC	Put/Call	C
FOB/PFOB/COB/BDOB/POB	Firm/Professional Customer/Customer/Broker Dealer/Proprietary Open Buy	12
FCB/PFCB/CCB/BDCB/PCB	Firm/Professional Customer/Customer/Broker Dealer/Proprietary Close to Buy	15
FOS/PFOS/COS/BDOS/POS	Firm/Professional Customer/Customer/Broker Dealer/Proprietary Open to Sell	20
FCS/PFCS/CCS/BDCS/PCS	Firm/Professional Customer/Customer/Broker Dealer/Proprietary Close to Sell	22
Blocktime	Ten minute trade bucket	0950

Exhibit 10.1.1.1. b: Above is the brief variable list and description for the ISE open close weekly options data which spans from June 2010 to Dec 2010.

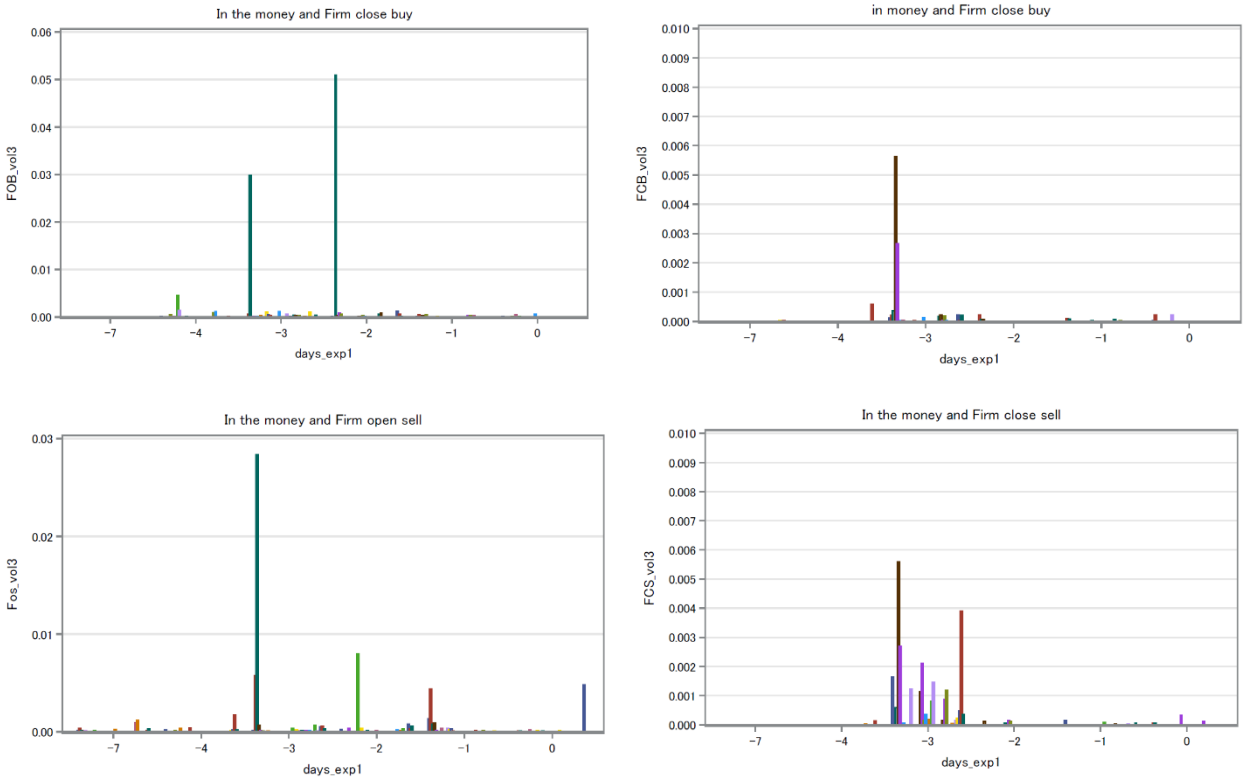
10.1.1.2. Trade and quote dataset

10.1.1.2.a.

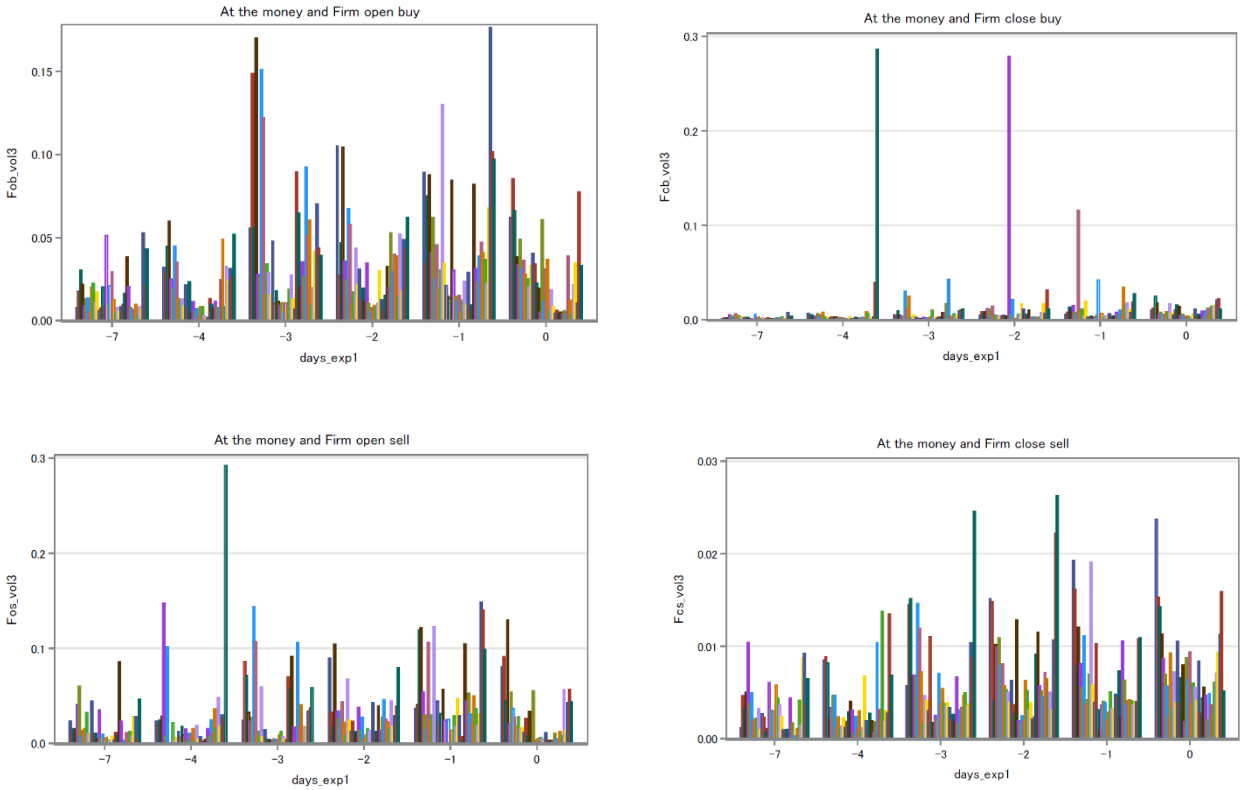
Trade and Quote Option Volume	sumvol
	Sum
undly1	
ABX	6441.00
AMZN	432514.00
BP	283296.00
C	304018.00
DNDN	14852.00
F	272588.00
GE	105174.00
GS	182912.00
IBM	24870.00
INTC	58164.00
LVS	115111.00
MSFT	224051.00
POT	21472.00
RIMM	104665.00
Total Volume	2150128.00

Exhibit 10.1.1.2.a: The table illustrates the 14 ticker symbols and its corresponding traded volume for the trade and quote dataset. This trade and quote dataset spans from June 2010 to Dec 2010

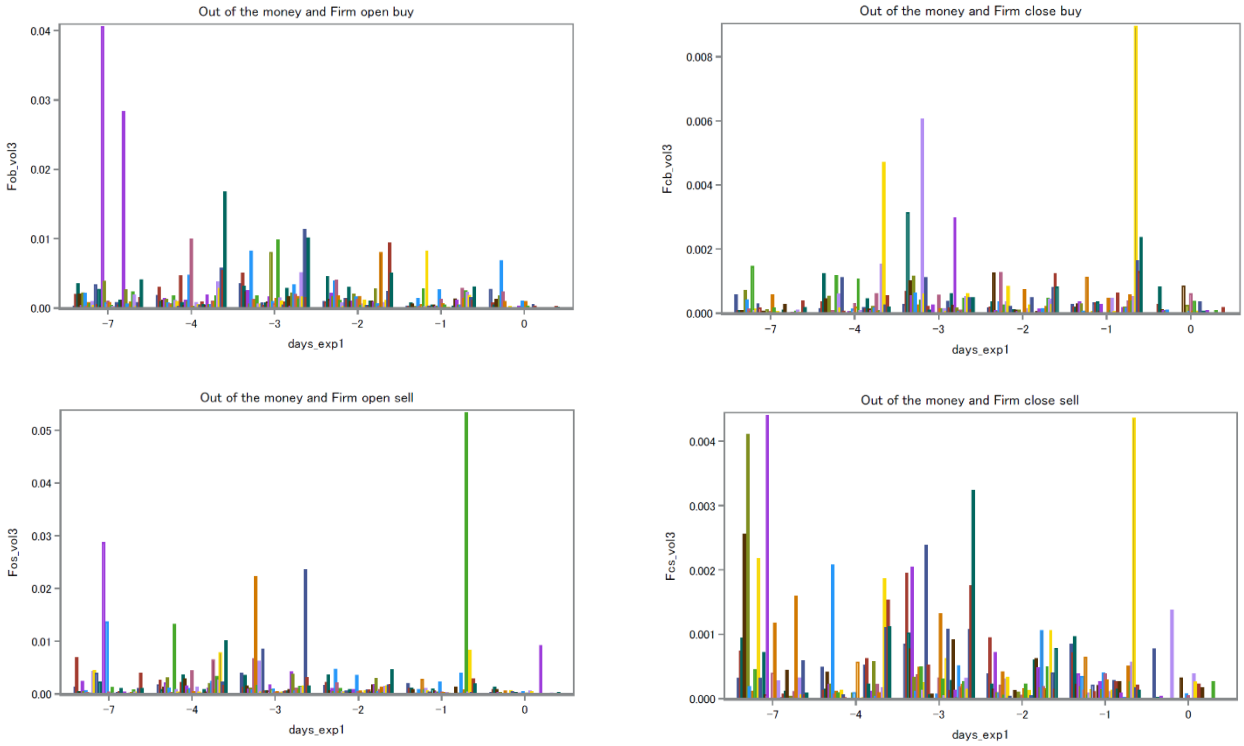
10.2. Intraday Trading Pattern Graphs



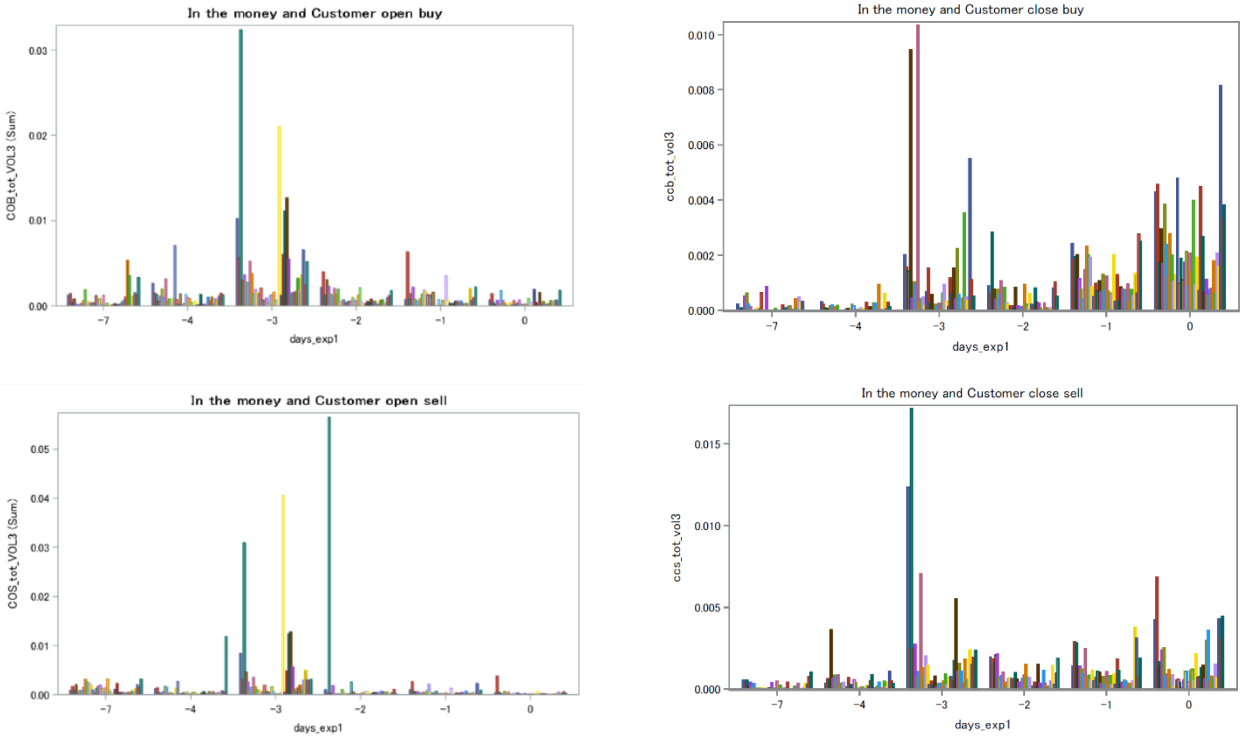
Graph 1: The above graphs represent "in the money" weekly options percentage trade for Firms that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



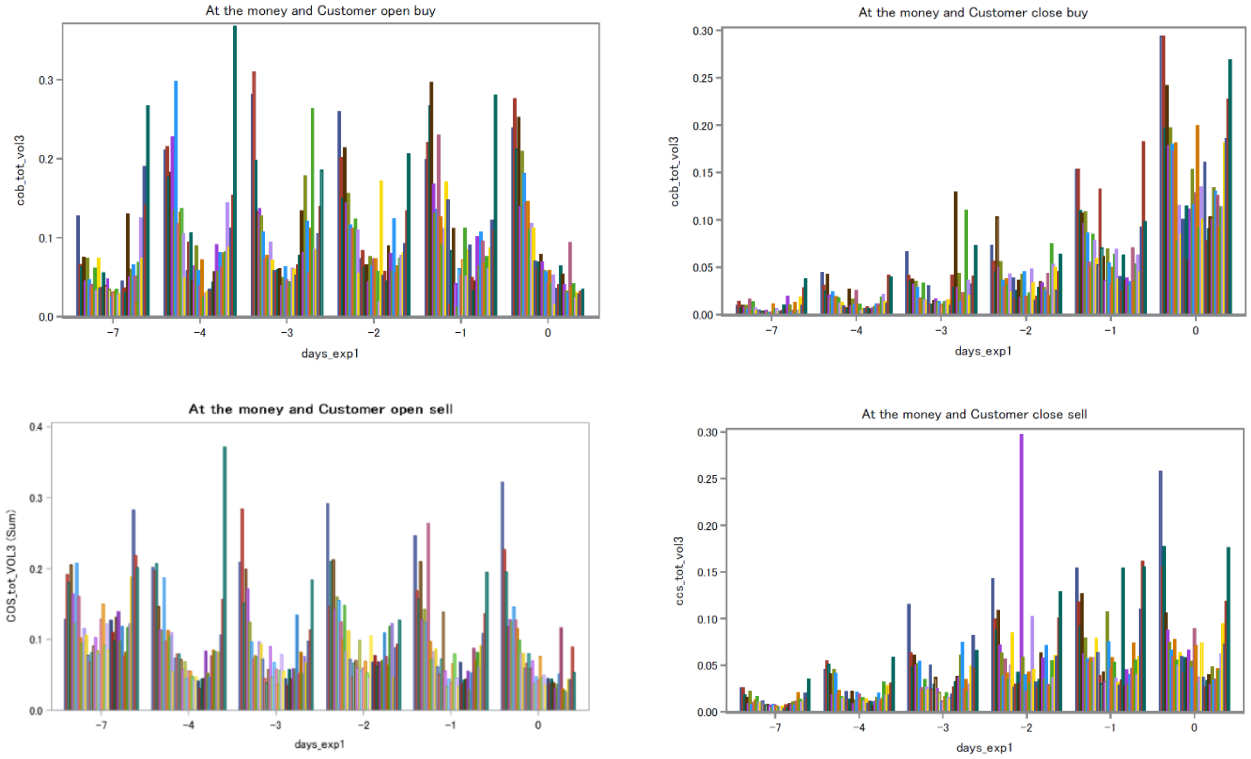
Graph 2: The above graphs represent "at the money" weekly options percentage trade for Firms that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



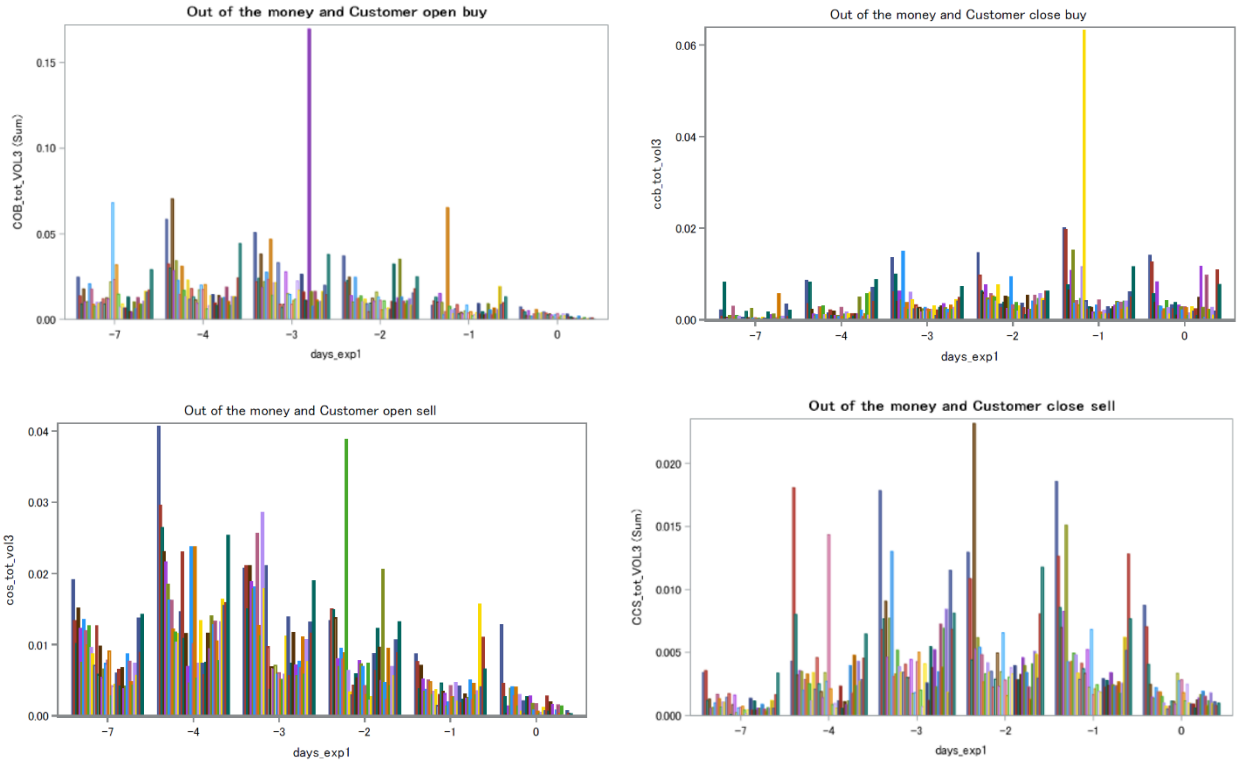
Graph 3: The above graphs represent "out the money" weekly options percentage trade for Firms that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



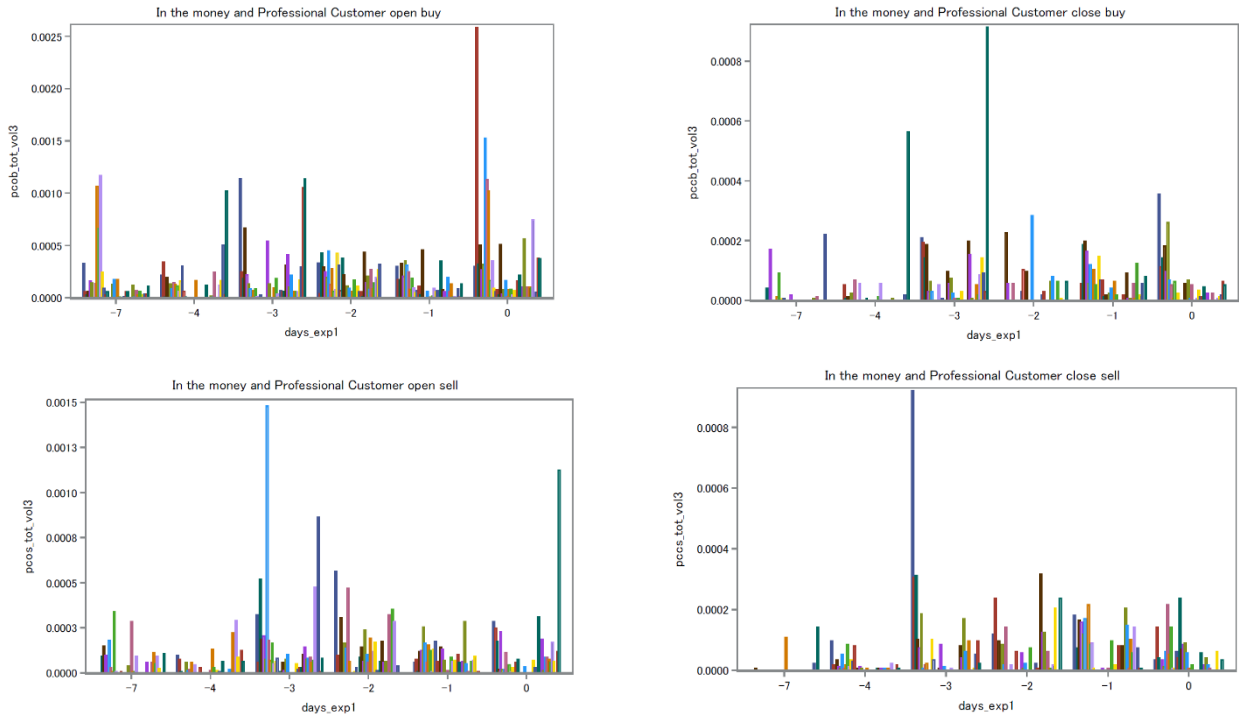
Graph 4: The above graphs represent "in the money" weekly options percentage trade for Customers that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



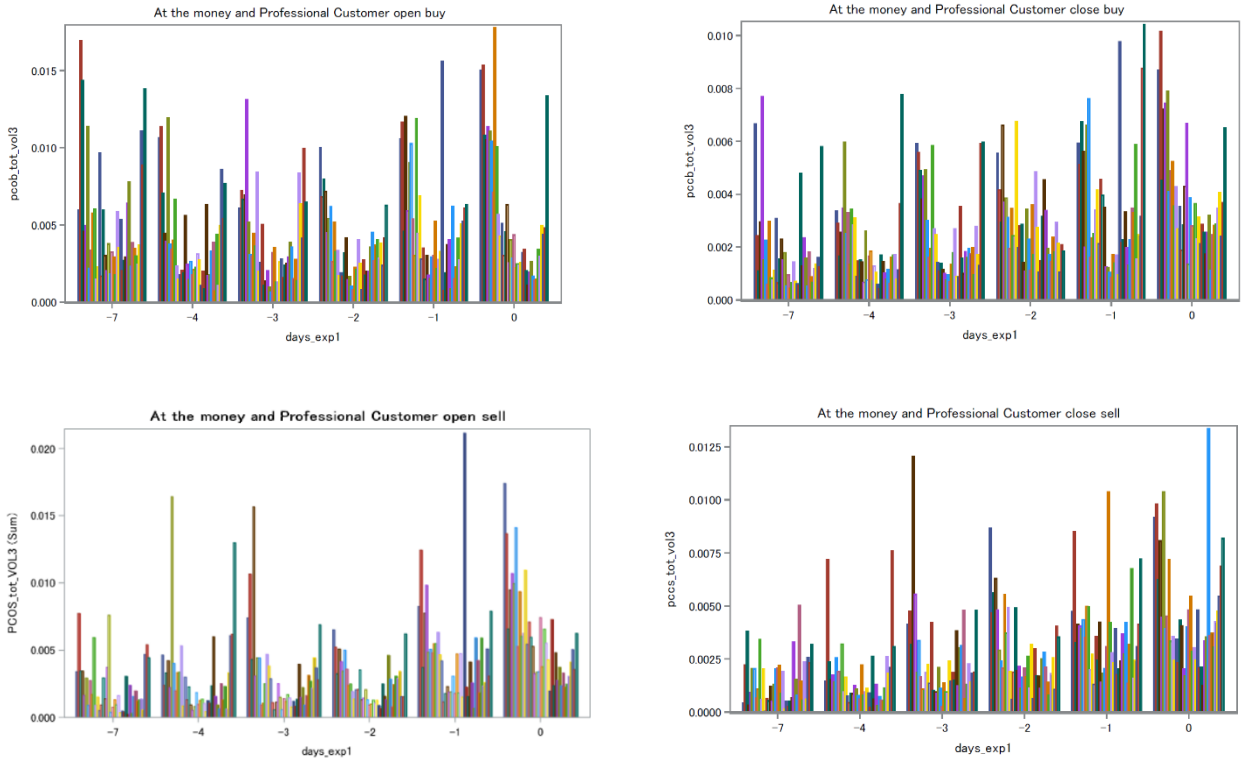
Graph 5: The above graphs represent "at the money" weekly options percentage trade for Customers that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



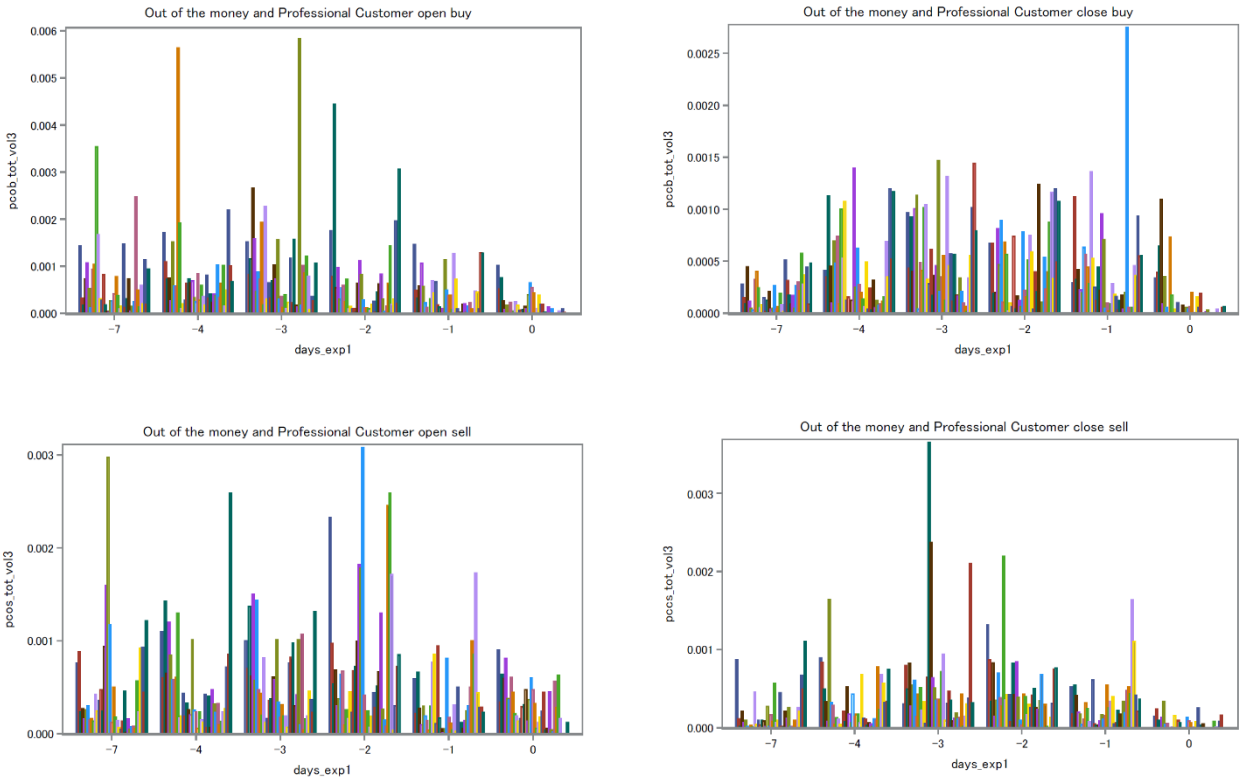
Graph 6: The above graphs represent "out the money" weekly options percentage trade for Customers that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



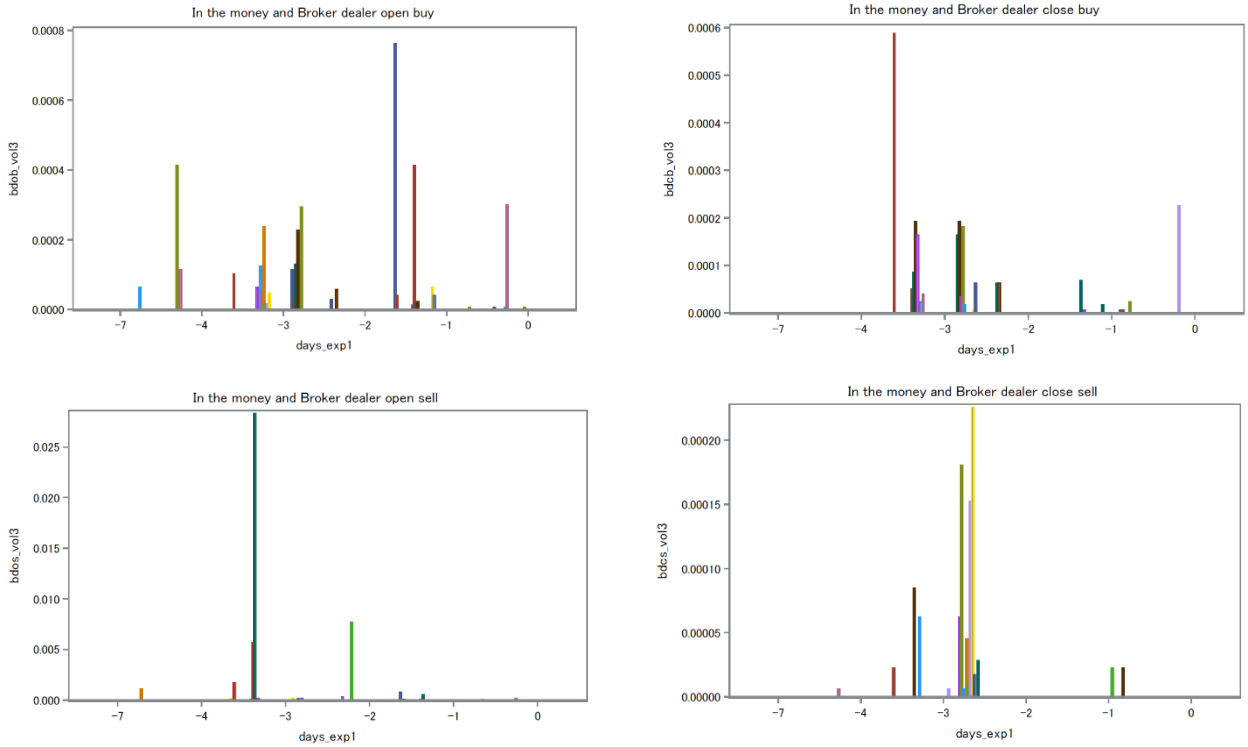
Graph 7: The above graphs represent "in the money" weekly options percentage trade for Professional Customers that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



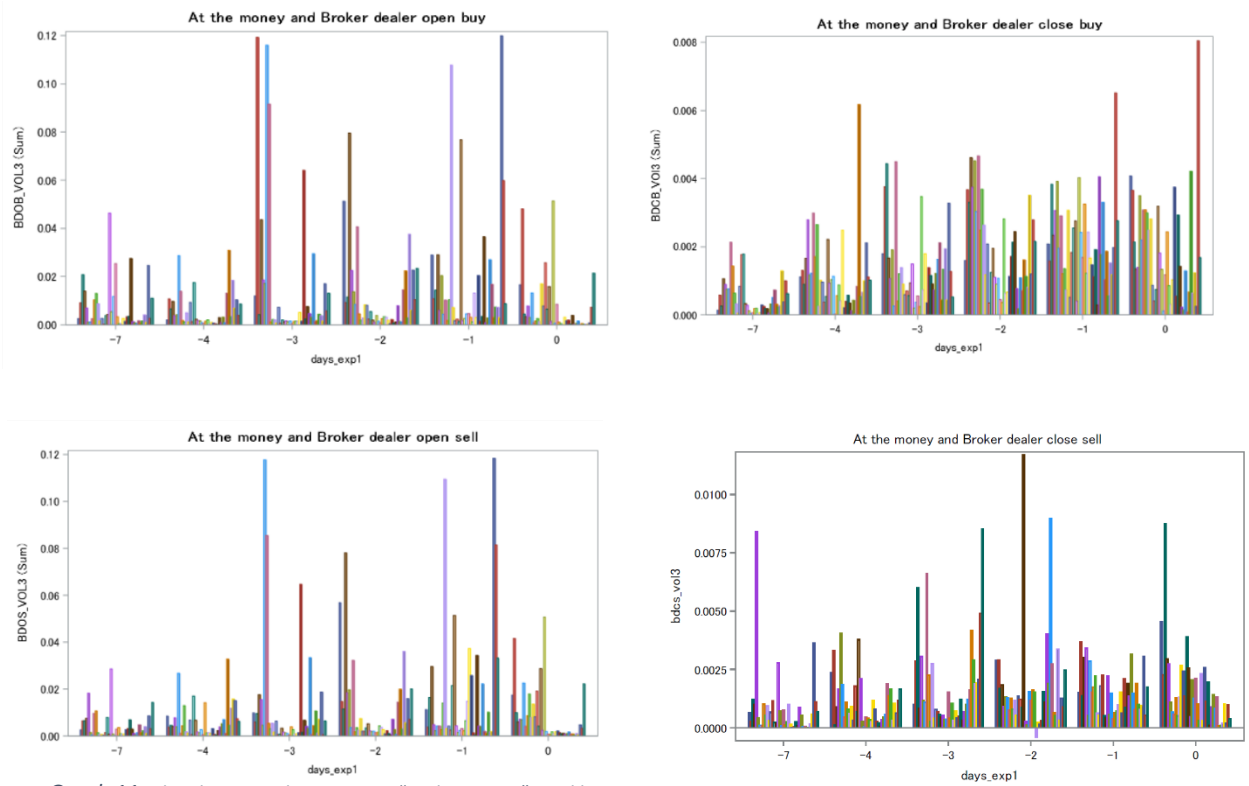
Graph 8: The above graphs represent "at the money" weekly options percentage trade for Professional Customers that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



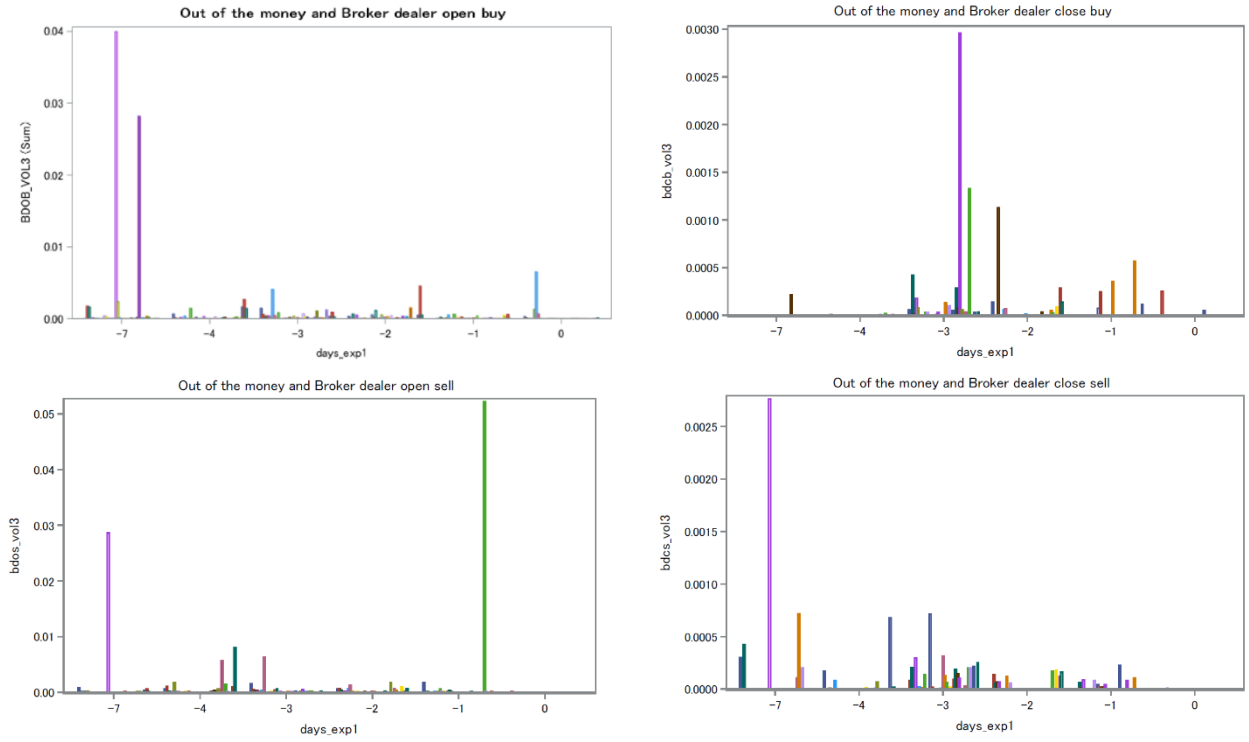
Graph 9: The above graphs represent "out the money" weekly options percentage trade for Professional Customers that traded on the ISE exchange from June 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



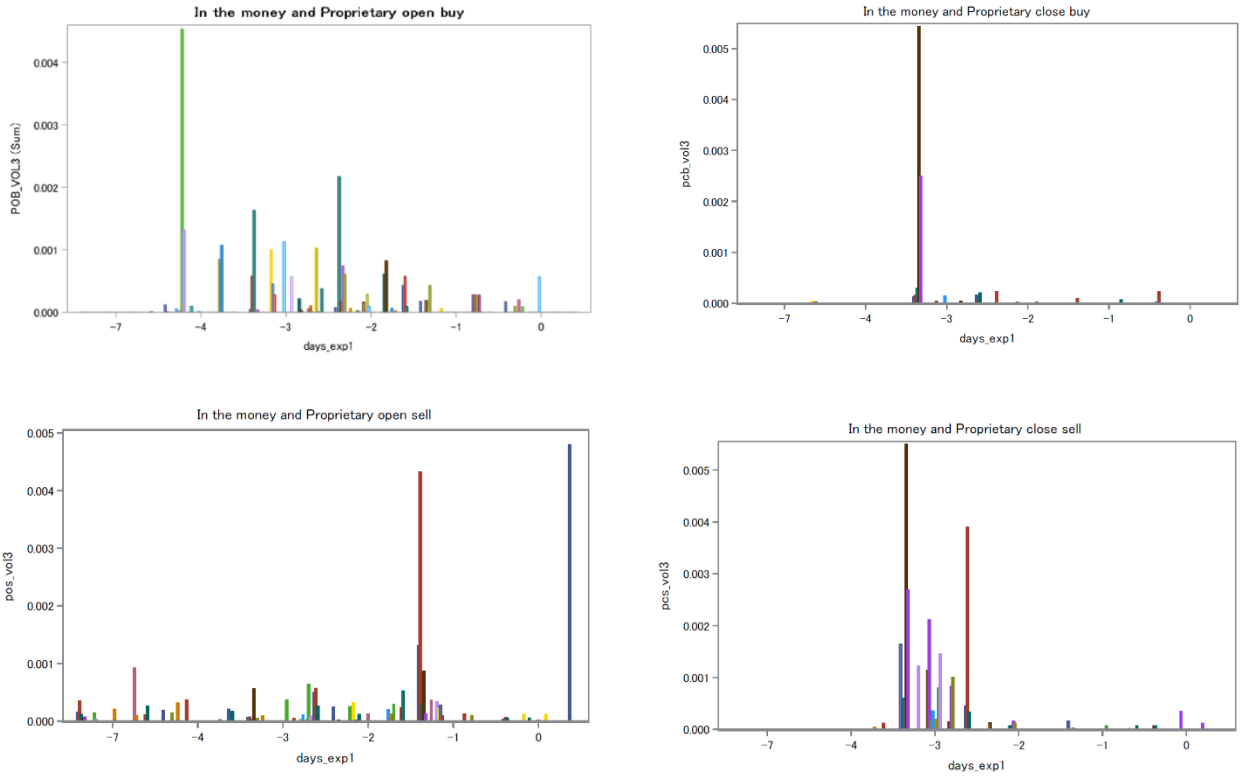
Graph 10: The above graphs represent "in the money" weekly options percentage trade for Broker Dealer that traded on the ISE exchange from June 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



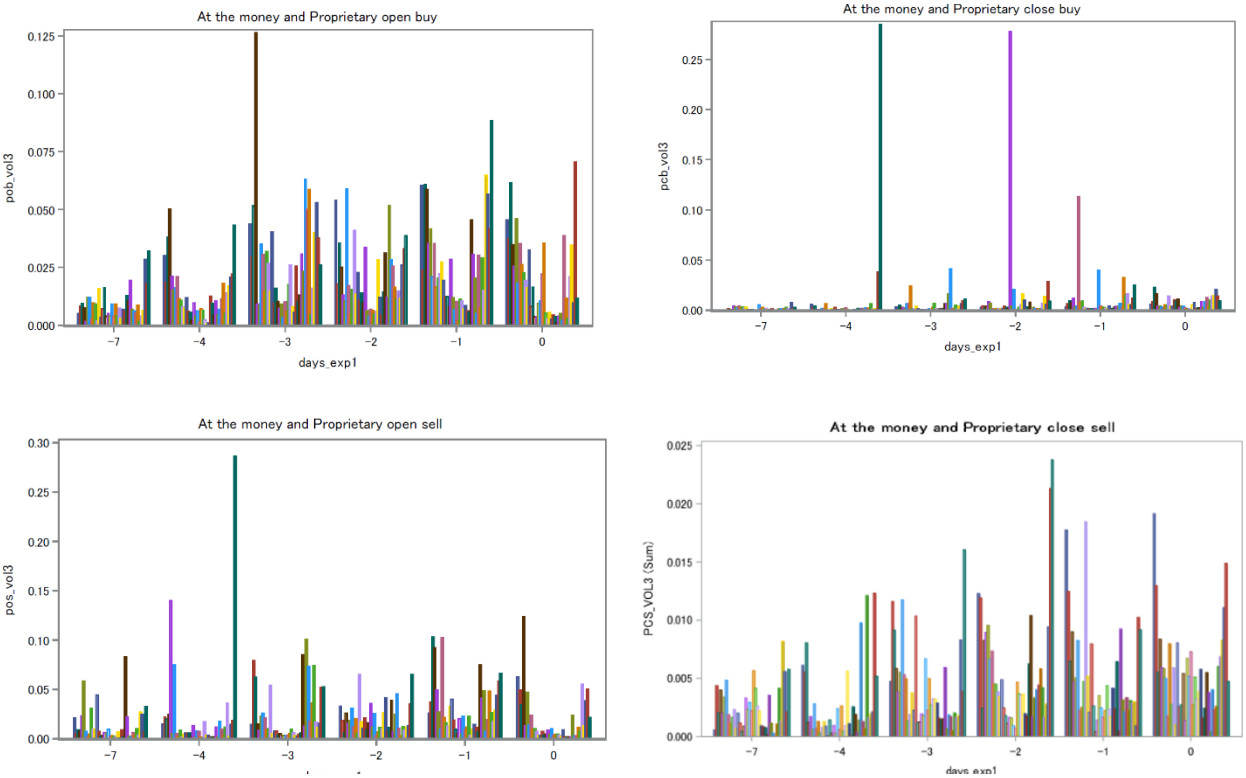
Graph 11: The above graphs represent "at the money" weekly options percentage trade for Broker Dealer that traded on the ISE exchange from June 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



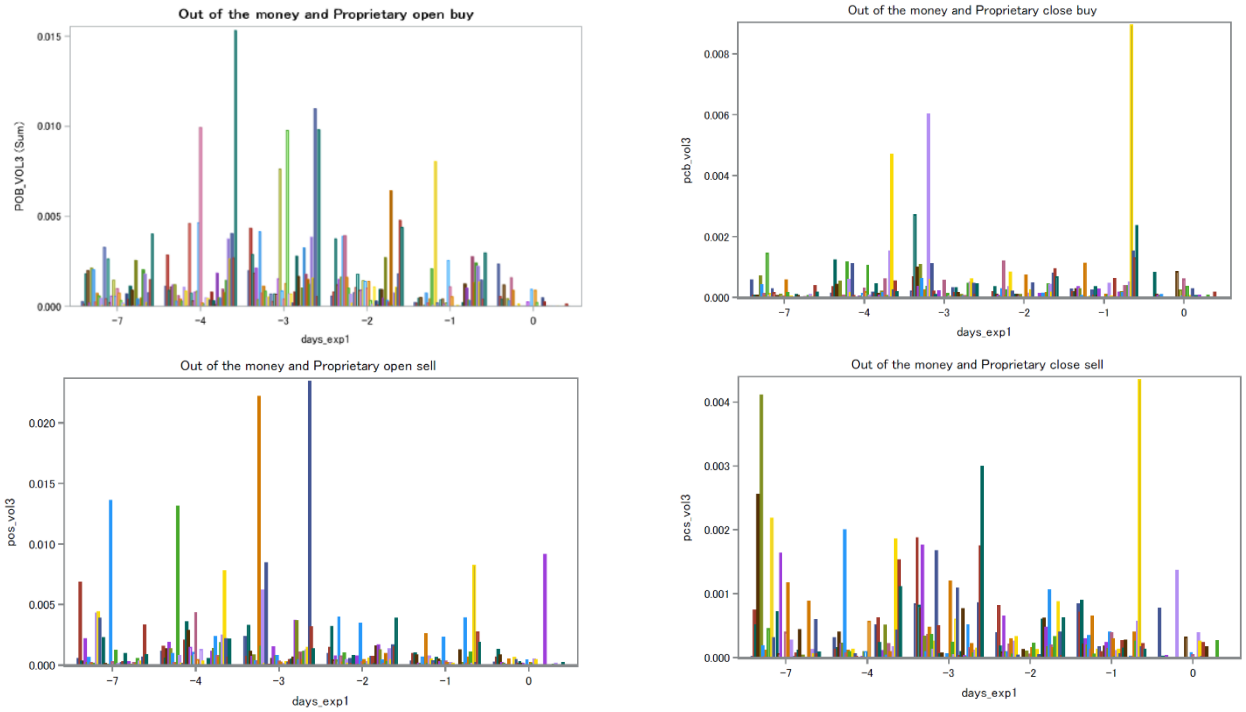
Graph 12: The above graphs represent "out the money" weekly options percentage trade for Broker Dealer that traded on the ISE exchange from June 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



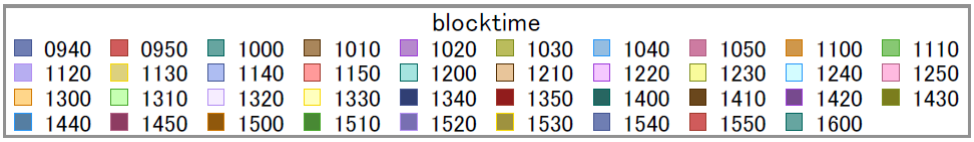
Graph 13: The above graphs represent "in the money" weekly options percentage trade for Proprietary that traded on the ISE exchange from June 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



Graph 14 The above graphs represent "at the money" weekly options percentage trade for Proprietary that traded on the ISE exchange from July 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



Graph 15: The above graphs represent "out the money" weekly options percentage trade for Proprietary that traded on the ISE exchange from June 2010 to December 2010. The percentage traded volume is plotted against a timeline which represents the 7 days to the expiry of the option.



10.3. Investor Profitability

10.3.1. Call profit against underlying stock

10.3.1.1. Call weekly profit

Investor weekly call options Return on investment by stock from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
ABX	$ 126,810.01	$ (76,646.27)	$ (4,320.32)	$ –	$ 35,829.84	$ (5,026.98)	$ –	$ –	$ (76,575.28)	$ (71.00)
AMZN	$ 5,121.25	$ 365,779.20	$ (657,146.36)	$ (33,716.26)	$ (299,740.17)	$138,637.88	$115,285.26	$ –	$ 254,403.37	$ 111,375.83
BP	$ (991,846.66)	$1,171,264.02	$ (171,392.12)	$ (29,684.80)	$(1,197,390.03)	$ 44,123.57	$ 2,662.00	$ 1,000.00	$ 192,254.32	$ 979,009.70
C	$ 344,221.05	$ (154,292.38)	$ 11,401.94	$ (3,776.86)	$ (42,693.37)	$ 2,243.23	$ (4,790.00)	$ 1,978.77	$(154,353.13)	$ 60.75
DNDN	$ 7,892.74	$ 7,871.29	$ (21,678.24)	$ (398.00)	$ –	$ (1,559.08)	$ –	$ –	$ 2,888.79	$ 4,982.50
F	$ 114,426.81	$ 56,557.54	$ (198,504.12)	$ (6,059.57)	$ (16,985.56)	$ 9,904.91	$ (17,924.62)	$ 2,027.07	$ 51,507.59	$ 5,049.95
GE	$ (392,127.97)	$ 191,365.12	$ (107,170.29)	$ (611.97)	$ 100,527.94	$ 15,896.07	$ 756.00	$ –	$ 179,878.12	$ 11,487.00
GS	$ (218,765.51)	$ 36,883.93	$ 217,585.60	$ (16,156.97)	$ –	$ (56,430.98)	$ –	$ –	$ 19,883.09	$ 17,000.84
IBM	$ 51,621.41	$ 7,731.24	$ 10,841.43	$ –	$ –	$ (77,925.31)	$ –	$ –	$ 1,306.25	$ 6,424.99
INTC	$ 224,829.38	$ (982.84)	$ (134,707.61)	$ (4,158.25)	$ (101,837.31)	$ 16,769.46	$ 1,070.00	$ –	$ 750.15	$ (1,733.00)
LVS	$ 112,927.50	$ (39,946.79)	$ (7,289.97)	$ 505.00	$ (7,142.93)	$ (19,106.03)	$ –	$ –	$ (37,507.46)	$ (2,439.33)
MSFT	$ 78,545.73	$ (16,555.21)	$ (118,064.27)	$ (8,768.23)	$ (33,451.62)	$ 55,416.57	$ 35,614.21	$ 23,818.02	$ (10,364.96)	$ (6,190.25)
POT	$ 106,175.35	$ (99,255.73)	$ 36,428.61	$ –	$ –	$ 55,907.50	$ –	$ –	$ (72,444.38)	$ (26,811.35)
RIMM	$ 535,688.54	$ (271,991.76)	$ (4,511.17)	$ (14,759.96)	$ (11,999.97)	$ 39,566.07	$ –	$ –	$(297,527.68)	$ 25,535.93
Profit	$ 105,519.65	$1,177,781.33	$(1,148,526.89)	$(117,585.87)	$(1,574,883.16)	$218,416.89	$132,672.86	$ 28,823.85	$ 54,098.79	$1,123,682.54

10.3.1.2. Call weekly profit per option

Investor weekly call options profit per option by stock from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
ABX	$ 0.10	$ (0.22)	$ (0.14)	$ –	$ 0.18	$ (0.47)	$ –	$ –	$ (0.22)	$ (0.02)
AMZN	$ (0.98)	$ 0.26	$ (0.11)	$ (0.19)	$ (0.57)	$ 0.15	$ 7.95	$ –	$ 0.19	$ 1.12
BP	$ (0.05)	$ 0.36	$ (0.04)	$ (0.11)	$ (0.53)	$ 0.06	*	*	$ 0.21	$ 0.41
C	$ 0.04	$ (0.12)	$ 0.01	$ (0.01)	$ (0.02)	$ 0.02	$ (0.17)	$ 0.03	$ (0.13)	$ 0.00
DNDN	$ (0.02)	$ 0.07	$ (0.11)	*	$ –	$ (0.06)	$ –	$ –	$ 0.03	$ 0.25
F	$ 0.04	$ 0.02	$ (0.05)	$ (0.01)	$ (0.04)	$ 0.05	$ (0.49)	$ 0.09	$ 0.05	$ 0.00
GE	$ (0.13)	$ 0.22	$ (0.08)	$ (0.00)	$ 0.28	$ 0.12	$ 0.06	$ –	$ 0.22	$ 0.33
GS	$ 0.02	$ 0.06	$ 0.05	$ (0.23)	$ –	$ (0.19)	$ –	$ –	$ 0.04	$ 0.11
IBM	$ 0.04	$ 0.56	$ 0.05	$ –	$ –	$ (2.02)	$ –	$ –	$ 0.23	$ 0.80
INTC	$ (0.01)	$ (0.01)	$ (0.16)	$ (0.03)	$ (0.22)	$ 0.49	$ 0.10	$ –	$ 0.02	$ (0.06)
LVS	$ 0.16	$ (0.25)	$ (0.01)	$ 0.05	$ (0.09)	$ (0.63)	$ –	$ –	$ (0.25)	$ (0.27)
MSFT	$ (0.35)	$ (0.03)	$ (0.04)	$ (0.03)	$ (0.07)	$ 0.24	$ 2.80	*	$ (0.02)	$ (0.07)
POT	$ 0.05	$ (0.47)	$ 0.30	$ –	$ –	$ 0.61	$ –	$ –	$ (0.54)	$ (0.36)
RIMM	$ 0.16	$ (0.76)	$ (0.00)	$ (0.35)	$ (0.60)	$ 0.44	$ –	$ –	$ (0.93)	$ 0.73
Average Profit	$ (0.17)	$ 0.10	$ (0.04)	$ (0.05)	$ (0.22)	$ 0.07	$ 1.14	$ 0.24	$ 0.01	$ 0.26

10.3.1.3. Call weekly return on investment per option

Investor weekly call options Return on investment by stock from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
ABX		-78%	-29%	#DIV/0!	30%	-5914%			-78%	-14%
AMZN		29%	-17%	-17%	-49%	16%	947%		23%	79%
BP		77%	-18%	-31%	434%	14%		*	65%	80%
C		-85%	8%	-16%	-149%	17%			-93%	0%
DNDN		18%	-53%	*		-10%			7%	
F		19%	-40%	-27%	-26%	8%	-3528%		31%	4%
GE		209%	-142%	-2%	284%	138%		0%	203%	446%
GS		13%	8%	-62%		-16%			8%	41%
IBM		91%	11%			-796%			155%	84%
INTC		-20%	-135%	-45%	-115%	67%			20%	-131%
LVS		-52%	-2%		-20%	-176%			-50%	-124%
MSFT		-12%	-30%	-10%	-51%	121%		*	-8%	-61%
POT		-141%	40%			106%			-198%	-80%
RIMM		-307%	-1%	-24%	-33%	55%			-335%	

10.3.2. Put profit against underlying stock

10.3.2.1. Put weekly profit

Investor weekly put options total profit by stock from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
ABX	$ 23,403.92	$ (15,746.46)	$ 2,689.00	$ –	$ –	$ 5,400.00	$ –	$ –	$ (2,546.46)	$ (13,200.00)
AMZN	$ 575,376.23	$ (313,884.97)	$ 102,150.39	$ (24,972.40)	$ 48,572.71	$ (73,356.98)	$ –	$ –	$ (234,628.45)	$ (79,256.52)
BP	$ (294,571.79)	$ 4,163.67	$ 289,819.51	$ 18,467.24	$ 7,999.23	$ (44,716.54)	$ 14,675.00	$ –	$ 54,444.24	$ (50,280.57)
C	$ (58,511.35)	$ 68,622.53	$ (20,299.82)	$ (2,427.00)	$ (39,950.30)	$ 233.80	$ –	$ (16,290.39)	$ 69,305.53	$ (683.00)
DNDN	$ 54,185.45	$ (25,516.49)	$ (4,140.75)	$ (1,408.00)	$ –	$ 2,396.27	$ –	$ –	$ (28,512.49)	$ 2,996.00
F	$ 89,555.41	$ (64,188.52)	$ 59,899.34	$ 14,705.31	$ (27,685.73)	$ (8,651.91)	$ (3,587.37)	$ 4,142.00	$ (4,833.50)	$ (59,355.02)
GE	$ 98,682.83	$ (51,215.32)	$ 15,242.22	$ (3,259.50)	$ (22,317.00)	$ 10,478.08	$ (284.00)	$ 3,888.00	$ (44,317.76)	$ (6,897.56)
GS	$ 360,827.63	$ (192,399.85)	$ 53,627.82	$ 28,028.00	$ –	$ (57,683.74)	$ –	$ –	$ (13,519.02)	$ (178,880.83)
IBM	$ (7,418.38)	$ 5,161.90	$ 5,936.33	$ (10,528.80)	$ –	$ 1,687.05	$ –	$ –	$ 4,671.90	$ 490.00
INTC	$ (231.08)	$ 1,419.87	$ 2,484.98	$ (727.00)	$ 3,542.43	$ (3,047.06)	$ –	$ (4,862.00)	$ 791.87	$ 628.00
LVS	$ 100,267.71	$ (53,297.70)	$ (1,479.24)	$ –	$ –	$ 7,806.93	$ –	$ –	$ (52,651.03)	$ (646.67)
MSFT	$ 174,257.65	$ (113,434.87)	$ 100,699.96	$ 6,775.36	$ (69,735.85)	$ 15,635.11	$ (2,540.00)	$ 1,777.51	$ (106,704.85)	$ (6,730.02)
POT	$ 21,286.51	$ 6,605.23	$ (1,433.46)	$ –	$ (6,682.00)	$ (26,381.50)	$ –	$ –	$ 17,621.24	$ (11,016.02)
RIMM	$ (312,655.65)	$ 166,468.99	$ 27,433.48	$ –	$ –	$ (47,715.80)	$ –	$ –	$ 165,988.99	$ 480.00
Total Profit	$ 824,455.08	$ (577,241.99)	$ 632,629.75	$ 24,653.21	$ (106,256.51)	$ (217,916.29)	$ 8,263.63	$ (11,344.88)	$ (174,889.79)	$ (402,352.20)

10.3.2.2. Put weekly profit per option

Investor weekly put options profit per option by stock from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
ABX	$ 0.07	$ (0.59)	$ 0.68	$ –	$ –	$ 0.54	$ –	$ –	$ (0.56)	$ (0.66)
AMZN	$ 0.13	$ (0.26)	$ 0.02	$ (0.22)	$ 0.34	$ (0.10)	$ –	$ –	$ (0.21)	$ (0.70)
BP	$ (0.03)	$ 0.00	$ 0.08	$ 0.06	$ 0.03	$ (0.06)	$ 0.39	$ –	$ 0.07	$ (0.27)
C	$ 0.03	$ 0.03	$ (0.02)	$ (0.01)	$ (0.10)	$ 0.02	$ –	$ (0.12)	$ 0.03	$ (0.08)
DNDN	$ 0.15	$ (0.40)	$ 0.07	*	$ –	$ (0.15)	$ –	$ –	$ (0.40)	$ (0.35)
F	$ 0.02	$ (0.03)	$ 0.03	$ 0.04	$ (0.12)	$ (0.07)	$ (0.15)	$ 0.19	$ (0.01)	$ (0.04)
GE	$ 0.04	$ (0.10)	$ 0.01	$ (0.04)	$ (0.06)	$ 0.09	$ (0.02)	*	$ (0.10)	$ (0.09)
GS	$ (0.10)	$ (0.28)	$ 0.02	$ 2.70	$ –	$ (0.26)	$ –	$ –	$ (0.03)	$ (1.24)
IBM	$ (0.07)	$ 0.75	$ 0.13	$ (0.98)	$ –	$ (0.03)	$ –	$ –	$ 0.71	*
INTC	$ 0.01	$ 0.04	$ 0.00	$ (0.02)	$ 0.04	$ (0.08)	$ –	$ (0.17)	$ 0.04	$ 0.04
LVS	$ 0.08	$ (0.25)	$ (0.04)	$ –	$ –	$ 0.22	$ –	$ –	$ (0.25)	$ (0.44)
MSFT	$ 0.03	$ (0.09)	$ 0.05	$ 0.03	$ (0.12)	$ 0.09	$ (0.20)	$ 0.08	$ (0.10)	$ (0.03)
POT	$ (0.23)	$ 0.48	$ 0.02	$ –	$ (0.26)	$ (0.57)	$ –	$ –	$ 0.36	$ 2.07
RIMM	$ (0.14)	$ 0.63	$ 0.05	$ –	$ –	$ (0.55)	$ –	$ –	$ 0.63	$ 0.48
Average Profit	$ 0.04	$ (0.07)	$ 0.03	$ 0.02	$ (0.05)	$ (0.09)	$ 0.09	$ (0.05)	$ (0.03)	$ (0.18)

10.3.2.3. Put weekly return on investment per option

Investor weekly put options Return on investment by stock from june 2010 till Dec 2010 on the ISE	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
ABX		-40%	242%						-10%	-100%
AMZN		-31%	3%	-21%	136%	-12%			-26%	-72%
BP		1%	68%	85%	39%	-31%	645%		26%	-70%
C		94%	-90%	-44%	-872%	12%			95%	-574%
DNDN		-42%	-16%	*		31%			-49%	127%
F		-28%	38%	33%	-153%	-57%			-6%	-39%
GE		-160%	35%	-84%	-96%	117%	-100%	*	-178%	-95%
GS		-59%	7%			-28%			-5%	-229%
IBM		346%	12%	-100%		15%			313%	*
INTC		27%	5%	-44%	191%	-22%		-100%	17%	103%
LVS		-66%	-1%			160%			-66%	-46%
MSFT		-63%	52%	28%	-53%	30%	-100%	50%	-66%	-39%
POT		4003%	-9%		-100%	-129%			10680%	
RIMM		598%	9%			-73%			597%	

10.3.3. Call profit against moneyness

10.3.3.1. Call weekly profit

Investor weekly call options profit by moneyness from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary	Broker Dealer Profit
MONEYNESS										
1	$ (43,357.87)	$ (5,315.50)	$ (51,200.32)	$ 9,101.50	$ –	$ 96,087.69	$ –	$ –	$ (6,156.50)	$ 841.00
2	$ 262,497.58	$ (39,663.16)	$ (104,659.18)	$ (20,963.46)	$ (72,617.40)	$ 18,298.79	$ (3,230.00)	$ –	$ (36,131.16)	$ (3,532.00)
3	$ (414,616.25)	$ 1,149,067.68	$ (851,608.70)	$ (46,456.08)	$ (1,161,818.72)	$ 14,082.69	$ 133,457.86	$ 28,823.85	$ 17,132.54	$ 1,131,935.14
4	$ 322,115.72	$ 76,345.28	$ (100,078.43)	$ (83,198.82)	$ (375,597.29)	$ 81,623.26	$ 2,445.00	$ –	$ 85,172.88	$ (8,827.59)
5	$ (21,119.53)	$ (2,652.97)	$ (40,980.26)	$ 23,931.00	$ 35,150.25	$ 8,324.47	$ –	$ –	$ (5,918.97)	$ 3,266.00
Profit	$ 105,519.65	$ 1,177,781.33	$ (1,148,526.89)	$ (117,585.87)	$ (1,574,883.16)	$ 218,416.89	$ 132,672.86	$ 28,823.85	$ 54,098.79	$ 1,123,682.54

10.3.3.2. Call weekly profit per option

Investor weekly call options profit per option by moneyness from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary	Broker Dealer Profit
MONEYNESS										
1	$ 0.36	$ (0.40)	$ (0.42)	$ 0.84	$ –	$ 1.43	$ –	$ –	$ (4.74)	$ 0.07
2	$ 0.40	$ (0.60)	$ (0.14)	$ (0.34)	$ (0.80)	$ 0.16	$ (0.19)	$ –	$ (0.57)	$ (1.10)
3	$ (0.21)	$ 0.11	$ (0.04)	$ (0.03)	$ (0.18)	$ 0.01	$ 1.35	$ 0.36	$ 0.00	$ 0.27
4	$ 0.08	$ 0.07	$ (0.02)	$ (0.25)	$ (0.63)	$ 0.18	*	$ –	$ 0.08	$ (0.10)
5	$ (0.14)	$ (0.01)	$ (0.05)	$ 0.33	$ 0.52	$ 0.08	$ –	$ –	$ (0.03)	$ 0.39
Average Profit	$ (0.17)	$ 0.10	$ (0.04)	$ (0.05)	$ (0.22)	$ 0.07	$ 1.14	$ 0.24	$ 0.01	$ 0.26

10.3.3.3. Call weekly return on investment per option

Investor weekly call options return on investment by moneyness from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary	Broker Dealer Profit
MONEYNESS										
1		-49%	-10%			22%		0%	-147%	13%
2		0%	0%	0%	0%	0%			0%	0%
3		-1%	-1%	-5%	-43%	0%	-25%		-2%	0%
4		1082%	-101%	-106%	-209%	-6%	*		332%	15531%
5		214%	-61%	-5580%	-187799%	459%			236%	-7676%

10.3.4. Put profit against moneyness

10.3.4.1. Put weekly profit

Investor weekly put options total profit by moneyness from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary	Broker Dealer Profit
MONEYNESS										
1	$ 81,977.40	$ (10,829.99)	$ (11,922.41)	$ (3,920.00)	$ (13,199.99)	$ (31,275.02)	$ –	$ –	$ (10,829.99)	$ –
2	$ (11,734.36)	$ 9,105.87	$ 20,025.99	$ 228.50	$ 4,249.97	$ (30,981.85)	$ –	$ –	$ 7,422.87	$ 1,683.00
3	$ 576,082.56	$ (454,197.07)	$ 587,248.68	$ 35,988.32	$ (98,573.75)	$ (182,476.70)	$ 5,611.92	$ (15,486.88)	$ (90,601.47)	$ (363,595.60)
4	$ 160,744.56	$ (121,854.42)	$ 58,198.42	$ (6,359.62)	$ 1,267.27	$ 23,064.52	$ 2,651.70	$ 4,142.00	$ (81,040.82)	$ (40,813.61)
5	$ 17,384.93	$ 533.62	$ (20,920.93)	$ (1,284.00)	$ –	$ 3,752.76	$ –	$ –	$ 159.62	$ 374.00
Total Profit	$ 824,455.08	$ (577,241.99)	$ 632,629.75	$ 24,653.21	$ (106,256.51)	$ (217,916.29)	$ 8,263.63	$ (11,344.88)	$ (174,889.79)	$ (402,352.20)

10.3.4.2. Put weekly profit per option

Investor weekly put options profit per option by moneyness from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary	Broker Dealer Profit
MONEYNESS										
1	$ 0.32	$ (0.32)	$ (0.27)	$ (0.10)	*	$ (1.56)	$ –	$ –	$ (0.32)	$ –
2	$ (0.77)	$ 0.07	$ 0.06	*	*	$ (0.37)	$ –	$ –	$ 0.06	$ 5.61
3	$ 0.06	$ (0.06)	$ 0.04	$ 0.03	$ (0.06)	$ (0.11)	$ 0.14	$ (0.08)	$ (0.01)	$ (0.44)
4	$ (0.00)	$ (0.07)	$ 0.01	$ (0.03)	$ 0.00	$ 0.05	$ 0.06	$ 0.19	$ (0.17)	$ (0.03)
5	$ (0.02)	$ 0.00	$ (0.02)	$ (0.05)	$ –	$ 0.04	$ –	$ –	$ 0.00	$ 0.17
Average Profit	$ 0.04	$ (0.06)	$ 0.03	$ 0.02	$ (0.05)	$ (0.09)	$ 0.09	$ (0.05)	$ (0.02)	$ (0.18)

10.3.4.3. Put weekly return on investment per option

Investor weekly put options return on investment by moneyness from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary	Broker Dealer Profit
MONEYNESS										
1		−20%	−18%	−14%	*	−28%			−20%	
2		56%	4%	*	*	−18%			46%	
3		−23%	13%	18%	−43%	−22%	166%	−184%	−5%	−118%
4		−42%	8%	−65%	9%	53%	155%		−56%	−29%
5		5%	−22%	−510%		64%			1%	

10.3.5. Call profit against expiry date

10.3.5.1. Call weekly profit

Investor weekly call options profit for options traded from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional customer profit	Large Professional customer profit	Proprietary	Broker Dealer Profit
20100702	$ 57,662.15	$ 4,245.83	$ (65,638.03)	$ (271.00)	$ (332.75)	$ 87.98	$ –	$ –	$ 4,556.83	$ (311.00)
20100709	$ 55,509.87	$ (24,780.36)	$ (6,887.70)	$ (344.00)	$ (289.00)	$ 1,571.55	$ –	$ –	$ (24,780.36)	$ –
20100723	$ 116,993.76	$ 64,887.03	$ (14,028.87)	$ (15,357.23)	$ (233,899.36)	$ 31,793.20	$ (10,930.61)	$ (4,344.96)	$ 47,483.61	$ 17,403.42
20100730	$ (122,226.49)	$ (62,058.48)	$ 112,271.96	$ 13,502.22	$ 45,073.84	$ 75,495.43	$ –	$ –	$ (36,506.46)	$ (25,552.02)
20100806	$ (682,515.43)	$ 766,925.80	$ (177,400.15)	$ (15,813.87)	$ (810,363.92)	$ 152,241.76	$ –	$ –	$ (6,469.51)	$ 773,395.31
20100813	$ (204,213.23)	$ 16,724.59	$ 159,285.07	$ 25,749.00	$ 919.00	$ (16,189.02)	$ –	$ 1,000.00	$ (26,953.91)	$ 43,678.50
20100827	$ (39,537.56)	$ (4,993.32)	$ 101,445.86	$ (3,577.56)	$ (4,327.59)	$ (44,016.51)	$ –	$ –	$ (7,299.81)	$ 2,306.50
20100903	$ 495,594.57	$ 200,240.46	$ (945,402.83)	$ (138,078.91)	$ (84,916.55)	$ 153,994.54	$ 118,328.26	$ –	$ 203,632.12	$ (3,391.67)
20100910	$ 76,749.64	$ 3,259.99	$ (75,898.01)	$ 12,529.04	$ (4,470.43)	$ (15,430.22)	$ –	$ –	$ 7,608.95	$ (4,348.96)
20100924	$ 148,498.60	$ 189,786.94	$ (502,866.24)	$ (4,131.34)	$ 13,461.20	$ (35,292.08)	$ 756.00	$ –	$ 180,878.88	$ 8,908.06
20101001	$ (241,793.99)	$ 189,268.86	$ 93,646.20	$ (3,750.28)	$ (258,931.24)	$ 35,136.82	$ –	$ (2,845.23)	$ 1,135.80	$ 188,133.06
20101008	$ 189,799.18	$ (23,996.66)	$ (90,245.23)	$ (18,719.36)	$ (42,800.34)	$ 11,519.09	$ (1,560.00)	$ –	$ (30,731.26)	$ 6,734.59
20101022	$ (500,489.13)	$ 153,357.98	$ 296,821.45	$ (53,608.13)	$ (45,347.13)	$ (4,093.02)	$ –	$ –	$ 124,444.95	$ 28,913.03
20101029	$ (3,641.23)	$ (46,210.04)	$ 105,940.17	$ 76,742.91	$ (114,464.42)	$ (26,746.59)	$ 24,399.21	$ 30,190.04	$ (42,121.75)	$ (4,088.29)
20101105	$ (686,170.81)	$ 429,187.83	$ (167,110.47)	$ 18,921.28	$ 47,867.04	$ (75,722.70)	$ 3,840.00	$ –	$ 407,253.21	$ 21,934.62
20101112	$ 86,832.72	$ (66,048.76)	$ 21,331.48	$ 16,337.24	$ (34,693.04)	$ 42,289.11	$ –	$ –	$ (64,455.26)	$ (1,593.50)
20101126	$ 846,285.52	$ (342,585.14)	$ (100,550.92)	$ (16,890.30)	$ (11,999.97)	$ (31,674.04)	$ –	$ –	$ (400,875.49)	$ 58,290.34
20101203	$ 239,928.51	$ (121,106.19)	$ 20,387.51	$ (12,797.61)	$ (15,179.63)	$ 9,873.59	$ –	$ –	$ (134,038.06)	$ 12,931.87
20101210	$ 272,253.01	$ (148,325.02)	$ 86,371.88	$ 1,972.02	$ (20,188.89)	$ (46,421.99)	$ (2,160.00)	$ 4,824.00	$ (148,663.68)	$ 338.66
Profit	$ 105,519.65	$ 1,177,781.33	$ (1,148,526.89)	$ (117,585.87)	$ (1,574,883.16)	$ 218,416.89	$ 132,672.86	$ 28,823.85	$ 54,098.79	$ 1,123,682.54

10.3.5.2. Call weekly profit per option

Investor weekly call options profit per option traded from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional customer profit	Large Professional customer profit	Proprietary	Broker Dealer Profit
20100702	$ 0.05	$ 0.11	$ (0.16)	$ (0.00)	$ (0.01)	$ 0.01	$ –	$ –	$ 0.12	$ (0.52)
20100709	$ 0.10	$ (0.44)	$ (0.04)	$ (0.01)	*	$ 0.13	$ –	$ –	$ (0.44)	$ –
20100723	$ 0.06	$ 0.03	$ (0.01)	$ (0.10)	$ (0.17)	$ 0.16	$ (0.30)	$ (0.20)	$ 0.07	$ 0.01
20100730	$ (0.16)	$ (0.08)	$ 0.11	$ 1.19	$ 0.20	$ 0.34	$ –	$ –	$ (0.05)	$ (0.31)
20100806	$ (0.06)	$ 0.30	$ (0.12)	$ (0.11)	$ (0.43)	$ 0.52	$ –	$ –	$ (0.01)	$ 0.37
20100813	$ (0.07)	$ 0.03	$ 0.17	$ 0.19	$ 0.01	$ (0.10)	$ –	*	$ (0.08)	$ 0.32
20100827	$ 0.03	$ (0.04)	$ 0.09	$ (0.07)	$ (0.10)	$ (0.21)	$ –	$ –	$ (0.07)	$ 0.12
20100903	$ (0.28)	$ 0.47	$ (0.74)	$ (2.15)	*	$ 0.72	$ 4.35	$ –	$ 0.48	$ (0.92)
20100910	$ 0.04	$ 0.01	$ (0.07)	$ 0.15	$ (0.00)	$ (0.10)	$ –	$ –	$ 0.02	$ (0.33)
20100924	$ (0.17)	$ 0.81	$ (0.34)	$ (0.02)	$ 0.03	$ (0.29)	$ 0.06	$ –	$ 0.85	$ 0.41
20101001	$ (0.05)	$ 0.54	$ 0.08	$ (0.03)	$ (1.29)	$ 0.26	$ –	$ (0.05)	$ 0.01	$ 0.91
20101008	$ 0.11	$ (0.06)	$ (0.09)	$ (0.69)	$ (0.21)	$ 0.08	$ (0.13)	$ –	$ (0.08)	$ 0.17
20101022	$ (0.09)	$ 0.42	$ 0.12	$ (0.28)	$ (0.17)	$ (0.02)	$ –	$ –	$ 0.46	$ 0.29
20101029	$ 0.03	$ (0.07)	$ 0.04	$ 0.26	$ (0.18)	$ (0.16)	*	*	$ (0.08)	$ (0.04)
20101105	$ (0.22)	$ 0.60	$ (0.08)	$ 0.19	$ 0.12	$ (0.39)	*	$ –	$ 0.60	$ 0.72
20101112	$ 0.06	$ (0.31)	$ 0.01	$ 0.19	$ (0.50)	$ 0.48	$ –	$ –	$ (0.34)	$ (0.08)
20101126	$ 0.31	$ (0.85)	$ (0.05)	$ (0.14)	$ (0.60)	$ (0.30)	$ –	$ –	$ (1.35)	$ 0.55
20101203	$ 0.06	$ (0.29)	$ 0.01	$ (0.07)	$ (0.13)	$ 0.07	$ –	$ –	$ (0.36)	$ 0.26
20101210	$ 0.10	$ (0.15)	$ 0.03	$ 0.02	$ (0.11)	$ (0.40)	$ (0.08)	*	$ (0.16)	$ 0.01
Average Profit	$ (0.17)	$ 0.10	$ (0.04)	$ (0.05)	$ (0.22)	$ 0.07	$ 1.14	$ 0.24	$ 0.01	$ 0.26

10.3.5.3. Call weekly return on investment per option

Investor weekly call options return on investment per	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer	Medium Professional customer	Large Professional customer	Proprietary	Broker Dealer Profit
20100702		212%	−150%	−23%	−38%	2%			264%	−111%
20100709		−342%	−25%	−45%	*	81%			−342%	
20100723		16%	−4%	−51%	−42%	39%			17%	14%
20100730		−22%	21%	853%	38%	35%			−15%	−77%
20100806		71%	−27%	−44%	239%	112%			−4%	84%
20100813		18%	72%	120%		−10%			−35%	239%
20100827		−15%	95%	−111%		−54%			−29%	31%
20100903		112%	−272%	−76711%	*	126%	933%		114%	
20100910		3%	−16%	10%	−19%	−28%			8%	−75%
20100924		208%	−164%	−10%	353%	−60%			202%	581%
20101001		50%	24%	−10%	−39592%	29%			1%	69%
20101008		−41%	−21%	−186%	−1256%	25%			−63%	63%
20101022		31%	22%	−63%	−40%	−2%			32%	28%
20101029		−33%	16%	185%	−109%	−33%	*	*	−38%	−14%
20101105		175%	−21%	67%	78%	−43%	*	0%	178%	133%
20101112		−88%	3%	162%	−108%	54%			−90%	−52%
20101126		−162%	−15%	−28%	−33%	−50%			−240%	132%
20101203		−125%	2%	−196%	−50%	11%			−156%	119%
20101210		−71%	11%	23%	−35%	−47%		*	−74%	6%

10.3.6. Put profit against expiry date

10.3.6.1. Put weekly profit

Investor weekly put options total profit for options traded from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional customer profit	Large Professional customer profit	Proprietary	Broker Dealer Profit
20100702	$ 862.11	$ (35,214.83)	$ 25,979.85	$ (2,562.00)	$ 21,300.00	$ 7,899.71	$ 16,950.00	$ –	$ 26,089.83	$ (61,304.67)
20100709	$ 31,539.92	$ (9,396.00)	$ (11,008.92)	$ 206.00	$ 259.00	$ (2,204.00)	$ –	$ –	$ (9,396.00)	$ –
20100723	$ 36,948.56	$ (63,555.57)	$ 223,588.51	$ (47,323.35)	$ (73,886.87)	$ (18,181.42)	$ 1,823.70	$ 4,142.00	$ (28,091.05)	$ (35,464.52)
20100730	$ (99,111.53)	$ 59,732.62	$ (2,306.41)	$ 4,650.00	$ (6,682.00)	$ (16,015.30)	$ –	$ –	$ 76,626.62	$ (16,894.00)
20100806	$ (64,854.90)	$ 1,680.88	$ 82,901.81	$ 12,526.76	$ (807.57)	$ (33,127.86)	$ –	$ –	$ 1,680.88	$ –
20100813	$ 507,081.99	$ (179,762.82)	$ (150,365.84)	$ (7,050.01)	$ (6,889.33)	$ 16,748.82	$ –	$ –	$ (31,315.50)	$ (148,447.32)
20100827	$ 99,555.43	$ (34,835.08)	$ (41,516.31)	$ 8,153.01	$ (1,426.67)	$ 4,904.70	$ –	$ –	$ (54,975.08)	$ 20,140.00
20100903	$ 25,341.22	$ 3,254.08	$ 34,408.52	$ 3,520.00	$ (31,915.99)	$ (37,014.92)	$ (847.00)	$ –	$ 1,217.08	$ 2,037.00
20100910	$ 74,108.87	$ (26,385.93)	$ (8,629.65)	$ –	$ –	$ (12,707.36)	$ –	$ –	$ (34,694.97)	$ 8,309.04
20100924	$ (151,153.44)	$ 85,471.76	$ 40,013.01	$ (2,434.00)	$ (8,756.59)	$ (32,671.62)	$ (1,428.00)	$ (14,512.88)	$ 112,311.87	$ (26,840.11)
20101001	$ 166,335.52	$ (77,690.21)	$ (27,736.01)	$ (12,487.57)	$ 47,521.38	$ (18,252.90)	$ –	$ –	$ (77,679.30)	$ (10.90)
20101008	$ (50,512.54)	$ (6,776.49)	$ 66,945.63	$ 541.00	$ (2,328.00)	$ (1,093.11)	$ –	$ –	$ (7,958.62)	$ 1,182.13
20101022	$ 444,703.59	$ (291,481.25)	$ 79,947.73	$ 413.75	$ (26,519.20)	$ 84,416.62	$ –	$ –	$ (291,061.43)	$ (419.81)
20101029	$ (29,469.20)	$ (58,639.87)	$ 166,929.98	$ 53,852.92	$ 18,017.38	$ (84,100.27)	$ (7,951.08)	$ –	$ (26,835.79)	$ (31,804.09)
20101105	$ 112,003.25	$ (20,113.91)	$ (65,816.58)	$ (9,329.80)	$ (23,055.53)	$ 22,822.47	$ (284.00)	$ 3,888.00	$ (39,501.91)	$ 19,388.00
20101112	$ 174,121.56	$ (35,210.62)	$ (128,477.37)	$ 10,453.82	$ 11,406.56	$ 7,778.68	$ –	$ (4,862.00)	$ (588.54)	$ (34,622.09)
20101126	$ 44,591.39	$ (27,451.90)	$ 13,594.50	$ 559.00	$ (107.00)	$ (3,734.08)	$ –	$ –	$ 30,445.12	$ (57,897.02)
20101203	$ (487,391.91)	$ 162,679.53	$ 205,791.78	$ 43,759.67	$ (16,133.33)	$ (71,385.27)	$ –	$ –	$ 190,439.87	$ (27,760.34)
20101210	$ (10,244.82)	$ (23,546.38)	$ 128,385.49	$ (32,795.99)	$ (6,252.75)	$ (31,999.17)	$ –	$ –	$ (11,602.87)	$ (11,943.52)
Total Profit	$ 824,455.08	$ (577,241.99)	$ 632,629.75	$ 24,653.21	$ (106,256.51)	$ (217,916.29)	$ 8,263.63	$ (11,344.88)	$ (174,889.79)	$ (402,352.20)

10.3.6.2. Put weekly profit per option

Investor weekly put options profit per option traded from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional customer profit	Large Professional customer profit	Proprietary	Broker Dealer Profit
20100702	$ (0.14)	$ (0.26)	$ 0.12	$ (0.06)	$ 0.75	$ 0.22	$ 1.13	$ -	$ 0.36	$ (0.98)
20100709	$ 0.13	$ (0.25)	$ (0.09)	$ 0.02	$ 0.01	$ (0.63)	$ -	$ -	$ (0.25)	$ -
20100723	$ 0.09	$ (0.03)	$ 0.20	$ (0.89)	$ (0.20)	$ (0.08)	$ 0.05	$ 0.19	$ (0.03)	$ (0.03)
20100730	$ 0.04	$ 0.18	$ (0.00)	$ 0.16	$ (0.26)	$ (0.11)	$ -	$ -	$ 0.25	$ (0.55)
20100806	$ 0.01	$ 0.00	$ 0.06	$ 0.05	$ (0.00)	$ (0.22)	$ -	$ -	$ 0.00	$ -
20100813	$ 0.25	$ (0.28)	$ (0.20)	$ (0.46)	$ (0.05)	$ 0.06	$ -	$ -	$ (0.06)	$ (1.28)
20100827	$ (0.41)	$ (0.16)	$ (0.05)	$ 0.19	$ (0.06)	$ 0.04	$ -	$ -	$ (0.26)	$ 4.03
20100903	$ (0.08)	$ 0.05	$ 0.05	$ 0.04	$ (0.11)	$ (0.21)	$ (0.07)	$ -	$ 0.02	$ 0.97
20100910	$ 0.02	$ (0.09)	$ (0.01)	$ -	$ -	$ (0.10)	$ -	$ -	$ (0.13)	$ 0.20
20100924	$ 0.08	$ 0.06	$ 0.03	$ (0.05)	$ (0.18)	$ (0.24)	$ (0.14)	$ (0.09)	$ 0.08	$ (0.15)
20101001	$ 0.12	$ (0.49)	$ (0.03)	$ (0.22)	$ 0.40	$ (0.19)	$ -	$ -	$ (0.55)	$ (0.00)
20101008	$ 0.00	$ (0.02)	$ 0.07	$ 0.01	$ (0.12)	$ (0.02)	$ -	$ -	$ (0.03)	$ 0.07
20101022	$ 0.16	$ (0.89)	$ 0.05	$ 0.01	$ (0.28)	$ 0.77	$ -	$ -	$ (1.05)	$ (0.01)
20101029	$ 0.09	$ (0.10)	$ 0.10	$ 0.27	$ 0.12	$ (0.82)	*	$ -	$ (0.06)	$ (0.22)
20101105	$ (0.02)	$ (0.08)	$ (0.04)	$ (0.08)	$ (0.17)	$ 0.25	$ (0.02)	*	$ (0.20)	$ 0.50
20101112	$ 0.10	$ (0.14)	$ (0.07)	$ 0.10	$ 0.14	$ 0.06	$ -	$ (0.17)	$ (0.00)	$ (0.83)
20101126	$ 0.22	$ (0.05)	$ 0.01	$ 0.01	$ (0.00)	$ (0.04)	$ -	$ -	$ 0.06	$ (1.96)
20101203	$ 0.02	$ 0.18	$ 0.09	$ 0.46	$ (0.40)	$ (0.44)	$ -	$ -	$ 0.23	$ (0.33)
20101210	$ 0.17	$ (0.11)	$ 0.07	$ (0.46)	$ (0.06)	$ (0.65)	$ -	$ -	$ (0.06)	$ (0.29)
Average Profit	$ 0.04	$ (0.06)	$ 0.03	$ 0.02	$ (0.05)	$ (0.09)	$ 0.09	$ (0.05)	$ (0.02)	$ (0.18)

10.3.6.3. Put weekly return on investment per option

Investor weekly put options return on investment per option traded from june 2010 till Dec 2010 on the ISE Exchange	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional customer profit	Large Professional customer profit	Proprietary	Broker Dealer Profit
20100702		-61%	81%	-1017%		95%			1121%	-111%
20100709		-69%	-66%			-97%			-69%	
20100723		-17%	51%	-92%	-72%	-17%	72%		-12%	-24%
20100730		62%	-1%		-100%	-23%			109%	-64%
20100806		2%	36%	66%	-4%	-73%			2%	
20100813		-108%	-131%		-145%	19%			-23%	-526%
20100827		-51%	-37%	422%	-25%	9%			-120%	88%
20100903		17%	16%	11%	-171%	-53%	-100%		6%	
20100910		-30%	-5%			-34%			-39%	
20100924		97%	20%	-34%	-774%	-48%	-100%	-408%	191%	-91%
20101001		-97%	-9%	-311%	2378%	-30%			-102%	0%
20101008		-10%	35%	14%	-194%	-4%			-13%	35%
20101022		-73%	11%	18%	-4196%	88%			-74%	-5%
20101029		-45%	47%	379%	128%	-169%	*		-40%	-51%
20101105		-14%	-15%	-63%	-339%	25%	-100%	*	-29%	375%
20101112		-43%	-23%	299%	68%	11%		-100%	-1%	-254%
20101126		-13%	4%	100%	-8%	-8%			18%	-172%
20101203		115%	45%	7417%	-59%	-62%			146%	-261%
20101210		-53%	23%	-43%	-46%	-102%			-28%	-486%

10.3.7. Call profit against days to expire

Days to Expiration Call Profit	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
0	$ 160,078.44	$ (16,719.38)	$ (43,295.63)	$ (20,899.63)	$ (105,339.47)	$ 41,008.26	$ 3,732.00	$ (1,845.23)	$ (25,517.41)	$ 8,798.04
1	$(1,136,489.36)	$ 915,799.23	$ 509,985.75	$ (60,446.08)	$(1,139,077.23)	$ (8,118.17)	$ 4,233.16	$ (1,686.54)	$ 61,482.28	$ 854,316.96
2	$ (259.80)	$ (68,264.85)	$ 38,964.04	$ (92,796.60)	$ (97,360.71)	$132,878.88	$134,940.80	$ 20,163.09	$ (32,830.46)	$ (35,434.40)
3	$ 493,455.22	$ (79,982.98)	$ (389,872.17)	$ 319.50	$ (52,893.11)	$ 79,900.47	$ 4,655.51	$ 24,400.54	$(123,691.14)	$ 43,708.16
4	$ 252,642.69	$ 243,397.76	$ (615,182.64)	$ (4,169.95)	$ (46,134.29)	$ (70,126.32)	$ (3,825.00)	$ -	$ 231,034.94	$ 12,362.82
7	$ 336,092.46	$ 183,551.55	$ (649,126.24)	$ 60,406.91	$ (134,078.35)	$ 42,873.76	$ (11,063.61)	$(12,208.01)	$ (56,379.42)	$ 239,930.97
Total Profit	$ 105,519.65	$1,177,781.33	$(1,148,526.89)	$(117,585.87)	$(1,574,883.16)	$218,416.89	$132,672.86	$ 28,823.85	$ 54,098.79	$1,123,682.54

10.3.8. Put profit against days to expire

Days to Expiration Put Profit	Market maker profit	Firm Profit	Small Customer Profit	Medium Customer Profit	Large Customer Profit	Small Professional Customer Profit	Medium Professional Customer Profit	Large Professional Customer Profit	Proprietary Profit	Broker Dealer Profit
0	$ 30,956.13	$ (32,993.05)	$ 10,107.33	$ (6,594.51)	$ 52,203.64	$ (19,839.48)	$ (847.00)	$ -	$ (23,221.82)	$ (9,771.23)
1	$ 142,419.66	$(114,240.74)	$125,788.42	$(31,140.59)	$ (15,141.56)	$ 9,095.55	$ (2,540.00)	$ -	$(104,611.90)	$ (9,628.84)
2	$ 498,815.67	$(223,880.82)	$ 16,769.59	$ (6,975.73)	$ (72,224.68)	$ 11,376.80	$ -	$ -	$(236,214.44)	$ 12,333.61
3	$ 245,941.40	$(173,125.37)	$183,471.85	$ (1,767.60)	$ 3,022.77	$ (66,337.37)	$ (3,567.43)	$ (14,512.88)	$ 38,829.66	$(211,955.04)
4	$ 12,725.68	$ 17,913.68	$ (20,101.71)	$ 30,820.96	$ (43,397.26)	$ (28,157.38)	$ 12,282.35	$ -	$ 117,375.76	$ (99,462.07)
7	$(106,403.47)	$ (50,915.69)	$316,594.27	$ 40,310.68	$ (30,719.40)	$(124,054.40)	$ 2,935.70	$ 3,168.00	$ 32,952.95	$ (83,868.64)
Total Profit	$ 824,455.08	$(577,241.99)	$632,629.75	$ 24,653.21	$(106,256.51)	$(217,916.29)	$ 8,263.63	$ (11,344.88)	$(174,889.79)	$(402,352.20)

11. Code

11.1. Cleaning Open Close Dataset

11.1.1. Importing open close data

```
/*importing openclose data*/
data openclose;
     set a.justweekly2010;
run;
```

11.1.2. Eliminating outliers

```
/*Removing abnormal expiration and after hour trades */
data openclose1;
     set openclose;
     exdate = input(put(expr_dt, $8.),yymmdd8.);
     Weekday= weekday(exdate);
     if weekday~=6 then delete;
     if blocktime= 2100 then delete;
     if blocktime= 1840 then delete;
     if blocktime= 2044 then delete;
     if blocktime= 1610 then delete;
     if blocktime= 1620 then delete;
     if blocktime= 1630 then delete;
     if blocktime= 2259 then delete;
     trade_dt1=input(strip(trade_dt),anydtdte10.);
     expr_dt1=input(strip(expr_dt),anydtdte10.);
RUN;
/*Renaming openclose1*/
data openclose2;
     set openclose1;
run;
/*sorting the data before running the code*/
proc sort;
     by  undly pc expr_dt strk_prc trade_dt blocktime;
run;
```

11.1.3. Calculating Volume

```
/*calculating volume*/
data a.openclose3;
     set openclose2;
     BY undly pc Expr_dt strk_prc trade_dt blocktime;
     array x {73}     ISE_vol FOB_TRD FOB_VOL FCB_TRD FCB_VOL FOS_TRD FOS_VOL FCS_TRD FCS_VOL COB_SM_TRD
                      COB_SM_VOL CCB_SM_TRD CCB_SM_VOL COS_SM_TRD COS_SM_VOL CCS_SM_TRD CCS_SM_VOL COB_MD_TRD
                      COB_MD_VOL CCB_MD_TRD CCB_MD_VOL COS_MD_TRD COS_MD_VOL CCS_MD_TRD CCS_MD_VOL COB_LG_TRD
                      COB_LG_VOL CCB_LG_TRD CCB_LG_VOL COS_LG_TRD COS_LG_VOL CCS_LG_TRD CCS_LG_VOL
                      BDOB_TRD BDOB_VOL BDCB_TRD BDCB_VOL BDOS_TRD BDOS_VOL BDCS_TRD BDCS_VOL POB_TRD POB_VOL PCB_TRD
                      PCB_VOL POS_TRD POS_VOL PCS_TRD PCS_VOL PCOB_SM_TRD PCOB_SM_VOL PCCB_SM_TRD PCCB_SM_VOL
                      PCOS_SM_TRD PCOS_SM_VOL PCCS_SM_TRD PCCS_SM_VOL PCOB_MD_TRD PCOB_MD_VOL PCCB_MD_TRD
                      PCCB_MD_VOL PCOS_MD_TRD PCOS_MD_VOL PCCS_MD_TRD PCCS_MD_VOL PCOB_LG_TRD PCOB_LG_VOL
                      PCCB_LG_TRD PCCB_LG_VOL PCOS_LG_TRD PCOS_LG_VOL PCCS_LG_TRD PCCS_LG_VOL;

     array xlag {73} ISE_vol1 FOB_TRD1 FOB_VOL1 FCB_TRD1 FCB_VOL1 FOS_TRD1 FOS_VOL1 FCS_TRD1 FCS_VOL1 COB_SM_TRD1
                      COB_SM_VOL1 CCB_SM_TRD1 CCB_SM_VOL1 COS_SM_TRD1 COS_SM_VOL1 CCS_SM_TRD1 CCS_SM_VOL1 COB_MD_TRD1
                      COB_MD_VOL1 CCB_MD_TRD1 CCB_MD_VOL1 COS_MD_TRD1 COS_MD_VOL1 CCS_MD_TRD1 CCS_MD_VOL1 COB_LG_TRD1
                      COB_LG_VOL1 CCB_LG_TRD1 CCB_LG_VOL1 COS_LG_TRD1 COS_LG_VOL1 CCS_LG_TRD1 CCS_LG_VOL1
                      BDOB_TRD1 BDOB_VOL1 BDCB_TRD1 BDCB_VOL1 BDOS_TRD1 BDOS_VOL1 BDCS_TRD1 BDCS_VOL1 POB_TRD1 POB_VOL1
                      PCB_TRD1 PCB_VOL1 POS_TRD1 POS_VOL1 PCS_TRD1 PCS_VOL1 PCOB_SM_TRD1 PCOB_SM_VOL1 PCCB_SM_TRD1
                      PCCB_SM_VOL1 PCOS_SM_TRD1 PCOS_SM_VOL1 PCCS_SM_TRD1 PCCS_SM_VOL1 PCOB_MD_TRD1 PCOB_MD_VOL1
                      PCCB_MD_TRD1 PCCB_MD_VOL1 PCOS_MD_TRD1 PCOS_MD_VOL1 PCCS_MD_TRD1 PCCS_MD_VOL1 PCOB_LG_TRD1
                      PCOB_LG_VOL1 PCCB_LG_TRD1 PCCB_LG_VOL1 PCOS_LG_TRD1 PCOS_LG_VOL1 PCCS_LG_TRD1 PCCS_LG_VOL1;


    array xdiff {73}ISE_vol2 FOB_TRD2 FOB_VOL2 FCB_TRD2 FCB_VOL2 FOS_TRD2 FOS_VOL2 FCS_TRD2 FCS_VOL2 COB_SM_TRD2
                    COB_SM_VOL2 CCB_SM_TRD2 CCB_SM_VOL2 COS_SM_TRD2 COS_SM_VOL2 CCS_SM_TRD2 CCS_SM_VOL2 COB_MD_TRD2
                    COB_MD_VOL2 CCB_MD_TRD2 CCB_MD_VOL2 COS_MD_TRD2 COS_MD_VOL2 CCS_MD_TRD2 CCS_MD_VOL2 COB_LG_TRD2
                    COB_LG_VOL2 CCB_LG_TRD2 CCB_LG_VOL2 COS_LG_TRD2 COS_LG_VOL2 CCS_LG_TRD2 CCS_LG_VOL2
                    BDOB_TRD2 BDOB_VOL2 BDCB_TRD2 BDCB_VOL2 BDOS_TRD2 BDOS_VOL2 BDCS_TRD2 BDCS_VOL2 POB_TRD2
                    POB_VOL2 PCB_TRD2 PCB_VOL2 POS_TRD2 POS_VOL2 PCS_TRD2 PCS_VOL2 PCOB_SM_TRD2 PCOB_SM_VOL2 PCCB_SM_TRD2
                    PCCB_SM_VOL2 PCOS_SM_TRD2 PCOS_SM_VOL2 PCCS_SM_TRD2 PCCS_SM_VOL2 PCOB_MD_TRD2
                    PCOB_MD_VOL2 PCCB_MD_TRD2 PCCB_MD_VOL2 PCOS_MD_TRD2 PCOS_MD_VOL2 PCCS_MD_TRD2 PCCS_MD_VOL2
                    PCOB_LG_TRD2 PCOB_LG_VOL2 PCCB_LG_TRD2 PCCB_LG_VOL2 PCOS_LG_TRD2 PCOS_LG_VOL2
                    PCCS_LG_TRD2 PCCS_LG_VOL2;

    DO i=1 to 73;
        xlag{i}=Lag(x{i});
    IF FIRST.TRADE_DT THEN xlag(i)=0;
        xdiff{i}=x{i}-xlag{i};
END;
        days_exp1=-days_exp;
run;
```

```
 /*Summation of the small, medium and large trades to have a single total sales*/
data openclose4;
         set a.openclose3;
         BY undly pc Expr_dt strk_prc Trade_DT blocktime ;

           COB_tot_trd = COB_SM_TRD2 + COB_MD_TRD2 + COB_LG_TRD2;
           COB_tot_vol = COB_SM_VOL2 + COB_MD_VOL2 + COB_LG_VOL2;
           CCB_tot_trd = CCB_SM_TRD2 + CCB_MD_TRD2 + CCB_LG_TRD2;
           CCB_tot_vol = CCB_SM_VOL2 + CCB_MD_VOL2 + CCB_LG_VOL2;
           COS_tot_trd = COS_SM_TRD2 + COS_MD_TRD2 + COS_LG_TRD2;
           COS_tot_vol = COS_SM_VOL2 + COS_MD_VOL2 + COS_LG_VOL2;
           CCS_tot_trd = CCS_SM_TRD2 + CCS_MD_TRD2 + CCS_LG_TRD2;
           CCS_tot_vol = CCS_SM_VOL2 + CCS_MD_VOL2 + CCS_LG_VOL2;

           PCOB_tot_trd =PCOB_SM_TRD2 + PCOB_MD_TRD2 + PCOB_LG_TRD2;
           PCOB_tot_vol =PCOB_SM_VOL2 + PCOB_MD_VOL2 + PCOB_LG_VOL2;
           PCCB_tot_trd =PCCB_SM_TRD2 + PCCB_MD_TRD2 + PCCB_LG_TRD2;
           PCCB_tot_vol =PCCB_SM_VOL2 + PCCB_MD_VOL2 + PCCB_LG_VOL2;
           PCOS_tot_trd =PCOS_SM_TRD2 + PCOS_MD_TRD2 + PCOS_LG_TRD2;
           PCOS_tot_vol =PCOS_SM_VOL2 + PCOS_MD_VOL2 + PCOS_LG_VOL2;
           PCCS_tot_trd =PCCS_SM_TRD2 + PCCS_MD_TRD2 + PCCS_LG_TRD2;
           PCCS_tot_vol =PCCS_SM_VOL2 + PCCS_MD_VOL2 + PCCS_LG_VOL2;
     run;
```

11.1.4. Creating 10 minute intervals

```
/*converting time_num to create a time variable*/
data openclose5;
    set openclose4;
        time_num=input(blocktimen, time12.);
        format time_num time.;
run;

/*creating time intervals for ani data*/
data openclose6;
    set openclose5;
        if blocktime="0910" then interval=1;
        if blocktime="0920" then interval=2;
        if blocktime="0930" then interval=3;
        if blocktime="0940" then interval=4;
        if blocktime="0950" then interval=5;
        if blocktime="1000" then interval=6;
        if blocktime="1010" then interval=7;
        if blocktime="1020" then interval=8;
        if blocktime="1030" then interval=9;
        if blocktime="1040" then interval=10;
        if blocktime="1050" then interval=11;
        if blocktime="1100" then interval=12;
        if blocktime="1110" then interval=13;
        if blocktime="1120" then interval=14;
        if blocktime="1120" then interval=14;
        if blocktime="1130" then interval=15;
        if blocktime="1140" then interval=16;
        if blocktime="1150" then interval=17;
        if blocktime="1200" then interval=18;
        if blocktime="1210" then interval=19;
        if blocktime="1220" then interval=20;
        if blocktime="1230" then interval=21;
        if blocktime="1240" then interval=22;
        if blocktime="1250" then interval=23;
        if blocktime="1300" then interval=24;
        if blocktime="1310" then interval=25;
        if blocktime="1320" then interval=26;
        if blocktime="1330" then interval=27;
        if blocktime="1340" then interval=28;
        if blocktime="1350" then interval=29;
        if blocktime="1400" then interval=30;
        if blocktime="1410" then interval=31;
        if blocktime="1420" then interval=32;
        if blocktime="1430" then interval=33;
        if blocktime="1440" then interval=34;
        if blocktime="1450" then interval=35;
        if blocktime="1500" then interval=36;
        if blocktime="1510" then interval=37;
        if blocktime="1520" then interval=38;
        if blocktime="1530" then interval=39;
        if blocktime="1540" then interval=40;
        if blocktime="1550" then interval=41;
        if blocktime="1600" then interval=42;
RUN;
```

11.1.5. Editing data

```
/*Eliminating remaing tickers to have only 14 tickers*/
DATA openclose7;
    SET openclose6;

        if undly="AAPL" THEN DELETE;
        IF undly="AIG" THEN DELETE;
        IF undly="AXP" THEN DELETE;
        IF undly="BAC" THEN DELETE;
        IF undly="BIDU" THEN DELETE;
        IF undly="CSCO" THEN DELETE;
        IF undly="DIA" THEN DELETE;
        IF undly="EEM" THEN DELETE;
        IF undly="FAS" THEN DELETE;
        IF undly="FAZ" THEN DELETE;
        IF undly="GDX" THEN DELETE;
        IF undly="GLD" THEN DELETE;
        IF undly="GM" THEN DELETE;
        IF undly="GOOG" THEN DELETE;
        IF undly="IWM" THEN DELETE;
        IF undly="JPM" THEN DELETE;
        IF undly="MEE" THEN DELETE;
        IF undly="NDX" THEN DELETE;
        IF undly="NFLX" THEN DELETE;
        IF undly="PCLN" THEN DELETE;
        IF undly="PFE"  THEN DELETE;
        IF undly="QQQQ" THEN DELETE;
        IF undly="RIG" THEN DELETE;
        IF undly="SLV" THEN DELETE;
       IF undly="SPY" THEN DELETE;
       IF undly="TBT" THEN DELETE;
       IF undly="TLT" THEN DELETE;
       IF undly="USO" THEN DELETE;
       IF undly="VXX" THEN DELETE;
       IF undly="VXX1" THEN DELETE;
       IF undly="XLF" THEN DELETE;
       IF undly="XOM" THEN DELETE;
       strk_prc=round(strk_prc,1);
run;
/*Sorting the dataset*/
proc sort data=openclose7;/*sorting ani data*/
    by undly pc Expr_dt strk_prc trade_dt interval ise_vol2;
run;

/*creating primaryid for the openclose data*/
data openclose8;
    set openclose7;
      primaryid= strip(pc)!!strip(expr_dt1)!!strip(trade_dt1)!!strip(undly)!!strip(strk_prc)!!strip(interval);
run;

/*sorting by primary id ani */
proc sort data=openclose8;
    by primaryid;
run;
/*deleting rows where there is no one-to-one match*/
data a.openclose9;
    set openclose8;
    if ise_vol2='0' then delete;
run;
```

11.2. Cleaning Trade and Quote Dataset

11.2.1. Importing trade and quote data

```
/*Creating a library named "a"*/
libname a "C:\data";

/*Importing trade and quote data*/
DATA tradequote;
    INFILE 'C:\tradedata\*.sas' LRECL=5000
    TRUNCOVER FILENAME = MyInFile
        input column 2. @ ;
        INPUT tradeDate ddmmyy10. $ time timew. $ indic $ OPRAno $ Exchange
              $ price   $ sumvol $ undlyexchcode $ symbol $ pc1  $ expr_dt2
              $ strk_prc1 $ OPRAcode $ Undly &time $;
        EndFile = REVERSE(MyInFile);
        File = REVERSE(SUBSTR(EndFile,1,INDEX(EndFile,'\') - 1));
    KEEP tradedate tradetime indic OPRAno Exchange Price sumvol undlyexchcode symbol
         pc1 expr_dt2 strk_prc1 OPRAcode undly dateandtime file;
RUN;
```

11.2.2. Renaming Variables

```
/*Renaming variables*/
data tradequote1;
    LENGTH NAME $15.;
    INFILE 'C:\tradedata\*.sas' DSD;
        input  trade_dt2 mmddyy10. tm $ tradetime$ indic$ OpraNo$ Exch $ Price $ ise_vol2 $ undlyexch $ undly1
               $ pc1 $ expr_dt2 mmddyy10. atk $ strk_prc1 $ Opracode $ dtm $ undly $ datetime $;
run;
/*Permanantly saving the imported file*/
data a.tradequote2;
    set tradequote1;
run;
```

11.2.3. Eliminating Outlier

```
/*Eliminating abnormal expiries*/
data tradequote3;
     set a.tradequote2(drop=name tm);
     if
         expr_dt2 = 18432
         or expr_dt2=18460
         or expr_dt2=18495
         or expr_dt2=18523
         or expr_dt2=18551
         or expr_dt2=18586
         or expr_dt2=18614
         or expr_dt2=18649
         or expr_dt2=18677
         or expr_dt2=18705
         or expr_dt2=18733
         or expr_dt2=18768
         or expr_dt2=18796
         or expr_dt2=18824
         or expr_dt2=18859
         or expr_dt2=18887
         or expr_dt2=18922
         or expr_dt2=19011
         or expr_dt2=19013
         or expr_dt2=19377
         or expr_dt2=18634
    then delete;
run;
```

```
/*Converting expiry date format*/
data tradequote4;
     set tradequote3;
         expr_dt1=put(expr_dt2,mmddyy8.);
run;
/*Creating an extra saved file*/
data a.tradequote5;
     set tradequote4;
run;
/*Eliminating optons traded on other exchanges*/
data tradequote6(Rename=( tradetime=blocktime1 ));
     set a.tradequote5;
         if exch^='I' then delete;
run;
/*Converting the formating for time*/
data tradequote7;
     set tradequote6;
         time_num=input(blocktime1, time12.);
         format time_num time.;
run;
```

11.2.4. Creating 10 minute intervals

```
/*Assigning time intervals a number in order to aggregate trade into 10 min buckets*/
data tradequote8(rename=(strk_prc1=strk_prc2));
     set tradequote7;
         if time_num>'09:00't and time_num<'09:10't then interval=1;
         if time_num>'09:10't and time_num<'09:20't then interval=2;
         if time_num>'09:20't and time_num<'09:30't then interval=3;
         if time_num>'09:30't and time_num<'09:40't then interval=4;
         if time_num>'09:40't and time_num<'09:50't then interval=5;
         if time_num>'09:50't and time_num<'10:00't then interval=6;
         if time_num>'10:00't and time_num<'10:10't then interval=7;
         if time_num>'10:10't and time_num<'10:20't then interval=8;
         if time_num>'10:20't and time_num<'10:30't then interval=9;
         if time_num>'10:30't and time_num<'10:40't then interval=10;
         if time_num>'10:40't and time_num<'10:50't then interval=11;
         if time_num>'10:50't and time_num<'11:00't then interval=12;
         if time_num>'11:00't and time_num<'11:10't then interval=13;
         if time_num>'11:10't and time_num<'11:20't then interval=14;
         if time_num>'11:20't and time_num<'11:30't then interval=15;
         if time_num>'11:30't and time_num<'11:40't then interval=16;
         if time_num>'11:40't and time_num<'11:50't then interval=17;
         if time_num>'11:50't and time_num<'12:00't then interval=18;
         if time_num>'12:00't and time_num<'12:10't then interval=19;
         if time_num>'12:10't and time_num<'12:20't then interval=20;
         if time_num>'12:20't and time_num<'12:30't then interval=21;
         if time_num>'12:30't and time_num<'12:40't then interval=22;
         if time_num>'12:40't and time_num<'12:50't then interval=23;
         if time_num>'12:50't and time_num<'13:00't then interval=24;
         if time_num>'13:00't and time_num<'13:10't then interval=25;
         if time_num>'13:10't and time_num<'13:20't then interval=26;
```

```
        if time_num>'13:10't and time_num<'13:20't then interval=26;
        if time_num>'13:20't and time_num<'13:30't then interval=27;
        if time_num>'13:30't and time_num<'13:40't then interval=28;
        if time_num>'13:40't and time_num<'13:50't then interval=29;
        if time_num>'13:50't and time_num<'14:00't then interval=30;
        if time_num>'14:00't and time_num<'14:10't then interval=31;
        if time_num>'14:10't and time_num<'14:20't then interval=32;
        if time_num>'14:20't and time_num<'14:30't then interval=33;
        if time_num>'14:30't and time_num<'14:40't then interval=34;
        if time_num>'14:40't and time_num<'14:50't then interval=35;
        if time_num>'14:50't and time_num<'15:00't then interval=36;
        if time_num>'15:00't and time_num<'15:10't then interval=37;
        if time_num>'15:10't and time_num<'15:20't then interval=38;
        if time_num>'15:20't and time_num<'15:30't then interval=39;
        if time_num>'15:30't and time_num<'15:40't then interval=40;
        if time_num>'15:40't and time_num<'15:50't then interval=41;
        if time_num>'15:50't and time_num<'16:00't then interval=42;
run;
```

11.2.5. Creating a primary key

```
/*creating a primary id for the data*/
data tradequote9;
    set tradequote8;
        strk_prc1=round(strk_prc2,1);
        primaryid= strip(pc1)!!strip(expr_dt2)!!strip(trade_dt2)!!strip(undly1)!!strip(strk_prc1)!!strip(interval);
run;
/*Sorting data by variables*/
proc sort data=tradequote9;
    by undly1 pc1 Expr_dt2 strk_prc1 trade_dt2 primaryid;
```

11.2.6. Aggregating volume and price in 10 minute intervals

```
/*Averaging price and summing the volume into a ten minute bucket*/
DATA tradequote10;
    SET tradequote9;
    by undly1 pc1 Expr_dt2 strk_prc1 trade_dt2 primaryid interval;

    IF first.interval THEN
    DO;
        sumvol = 0;
        cnt   = 0;
        sumprice=0;
END;
        sumvol + ise_vol2;
        sumprice + price;
        cnt + 1;
        meanprice = sumprice / cnt;

    IF last.interval THEN
    DO;
    OUTPUT;
    END;

    KEEP primaryid blocktime1 undly1 pc1 strk_prc1  trade_dt2 expr_dt1 expr_dt2 dtm expr_dt1
         interval sumvol cnt meanprice;

RUN;
```

11.3. Merging Open Close and Trade Dataset

11.3.1. Merging dataset

```
/*Eliminating data that is out of the lower and upper bound*/
DATA tradequote11;
    SET tradequote10;
        IF EXPR_DT1>'12/31/10' THEN DELETE;
        IF EXPR_DT1<'06/01/10' THEN DELETE;
        IF TRADE_DT2='18438' THEN DELETE;
        IF EXPR_DT2>'18606' THEN DELETE;
RUN;

/*sorting trade data*/
proc sort data=tradequote10;
    by primaryid;
run;

/*sorting the openclose data*/
proc sort data=openclose10;
    by primaryid;
run;

/*merging the datasets by primary id*/
data merged_file;
merge  openclose10 tradequote10;
    by  primaryid;
    run;
```

11.3.2. Merging error rate

```
/*Creating column for the difference in volume of merged dataset*/
data error;
    set merged_file;
        volumedifference=sumvol-ise_vol2;
run;

/*Frequency tabulated to observe the number of times difference is 0*/
proc freq data=error;
    table volumedifference ;
run;

/*histogram created to plot the distribution of the differences*/
ODS GRAPHICS ON;
PROC UNIVARIATE DATA = error;
    VAR volumedifference;
    HISTOGRAM volumedifference/NORMAL;
    TITLE;
RUN;

/*deleting the data that does not merge*/
data merged_file1 (Rename=(expr_dt2=date));
    set error;
    if volumedifference^=0 then delete;
Run;
```

11.4. Summary Statistics

11.4.1. Volume against contracts purchased and written

```
/*Creating Variables for total purchased and written contracts*/
data a;
set openclose6;
writtenposition=fcs_vol2 + fos_vol2 + ccs_sm_vol2 + cos_sm_vol2 + pcos_sm_vol2 + pccs_sm_vol2 + bdos_vol2
+ bdcs_vol2 + ccs_md_vol2 + cos_md_vol2 + ccs_lg_vol2 + cos_lg_vol2+ pcos_md_vol2 + pccs_md_vol2
+ pcos_lg_vol2 + pccs_lg_vol2 + pcs_vol2 + pos_vol2;

BoughtPosition=fob_vol2 + fcb_vol2 + ccb_sm_vol2 + cob_sm_vol2 + bdob_vol2 + bdcb_vol2
                + pcob_sm_vol2 + pccb_sm_vol2 + ccb_md_vol2 + cob_md_vol2 + ccb_lg_vol2 + cob_lg_vol2 +pcob_md_vol2
               + pccb_md_vol2 + pcob_lg_vol2 + pccb_lg_vol2 + pob_vol2 + pcb_vol2;

boughtpositionfirm= fob_vol2 + fcb_vol2;
soldpositionfirm = fcs_vol2 + fos_vol2 ;
boughtpositioncus =  ccb_sm_vol2 + cob_sm_vol2 + ccb_md_vol2 + cob_md_vol2 + ccb_lg_vol2 + cob_lg_vol2;
soldpositioncus= ccs_sm_vol2 + cos_sm_vol2 + ccs_md_vol2 + cos_md_vol2 + ccs_lg_vol2 + cos_lg_vol2;
boughtpositionbd=bdob_vol2 + bdcb_vol2;
soldpositionbd = bdos_vol2+ bdcs_vol2;
boughtpositionpc= pcob_sm_vol2 + pccb_sm_vol2 +pcob_md_vol2 + pccb_md_vol2 + pcob_lg_vol2 + pccb_lg_vol2 ;
soldpositionpc= pcos_md_vol2 + pccs_md_vol2 + pcos_lg_vol2 + pccs_lg_vol2 + pcos_sm_vol2 + pccs_sm_vol2 ;
boughtpositionp= pob_vol2 + pcb_vol2;
soldpositionp=pcs_vol2 + pos_vol2;
run;
```

```
/*Tabulating open and sold contracts by moneyness, call and put*/
PROC TABULATE DATA = a S=[foreground=watchit.] ;
    CLASS pc moneyness;
    VAR   boughtpositionfirm soldpositionfirm boughtpositioncus soldpositioncus boughtpositionbd soldpositionbd
          boughtpositionpc soldpositionpc boughtpositionp soldpositionp;
    TABLE pc all, moneyness all,boughtpositionfirm soldpositionfirm boughtpositioncus soldpositioncus boughtpositionbd
          soldpositionbd
          boughtpositionpc soldpositionpc boughtpositionp soldpositionp
    /BOX='Investor weekly call options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly call options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
```

11.4.2. Trades against contracts purchased and written

```
/*Tabulating open and sold trades by call and put*/
PROC TABULATE DATA = b S=[foreground=watchit.] ;
    CLASS pc;
    VAR   boughtpositionfirm soldpositionfirm boughtpositioncus soldpositioncus boughtpositionbd soldpositionbd
          boughtpositionpc soldpositionpc boughtpositionp soldpositionp;
    TABLE pc all, boughtpositionfirm soldpositionfirm boughtpositioncus soldpositioncus boughtpositionbd
          soldpositionbd
          boughtpositionpc soldpositionpc boughtpositionp soldpositionp
    /BOX='Investor weekly call options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly call options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
```

```
/*Creating Variables for total purchased and written trade*/
data b;
set openclose6;
writtenposition=fcs_trd2 + fos_trd2 + ccs_sm_trd2 + cos_sm_trd2 + pcos_sm_trd2 + pccs_sm_trd2 + bdos_trd2
+ bdcs_trd2 + ccs_md_trd2 + cos_md_trd2 + ccs_lg_trd2 + cos_lg_trd2+ pcos_md_trd2 + pccs_md_trd2
+ pcos_lg_trd2 + pccs_lg_trd2 + pcs_trd2 + pos_trd2;

BoughtPosition=fob_trd2 + fcb_trd2 + ccb_sm_trd2 + cob_sm_trd2 + bdob_trd2 + bdcb_trd2
                + pcob_sm_trd2 + pccb_sm_trd2 + ccb_md_trd2 + cob_md_trd2 + ccb_lg_trd2 + cob_lg_trd2 +pcob_md_trd2
               + pccb_md_trd2 + pcob_lg_trd2 + pccb_lg_trd2 + pob_trd2 + pcb_trd2;

boughtpositionfirm= fob_trd2 + fcb_trd2;
soldpositionfirm = fcs_trd2 + fos_trd2 ;
boughtpositioncus =  ccb_sm_trd2 + cob_sm_trd2+ ccb_md_trd2 + cob_md_trd2+ ccb_lg_trd2 + cob_lg_trd2;
soldpositioncus= ccs_sm_trd2 + cos_sm_trd2 + ccs_md_trd2 + cos_md_trd2 + ccs_lg_trd2 + cos_lg_trd2;
boughtpositionbd=bdob_trd2 + bdcb_trd2;
soldpositionbd = bdos_trd2+ bdcs_trd2;
boughtpositionpc= pcob_sm_trd2 + pccb_sm_trd2 +pcob_md_trd2 + pccb_md_trd2 + pcob_lg_trd2 + pccb_lg_trd2 ;
soldpositionpc= pcos_md_trd2 + pccs_md_trd2+ pcos_lg_trd2 + pccs_lg_trd2 + pcos_sm_trd2 + pccs_sm_trd2 ;
boughtpositionp= pob_trd2 + pcb_trd2;
soldpositionp=pcs_trd2 + pos_trd2;
run;
```

11.4.3. Volume against days to expiry

```
/*Tabulating open and sold trades by call and put*/
PROC TABULATE DATA = a S=[foreground=watchit.] ;
    CLASS days_exp;
    VAR   boughtpositionfirm soldpositionfirm boughtpositioncus soldpositioncus boughtpositionbd soldpositionbd
          boughtpositionpc soldpositionpc boughtpositionp soldpositionp;
    TABLE  days_exp, boughtpositionfirm soldpositionfirm boughtpositioncus soldpositioncus boughtpositionbd
         soldpositionbd
          boughtpositionpc soldpositionpc boughtpositionp soldpositionp
    /BOX='Investor weekly call options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly call options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
```

11.5. Intraday Trading Pattern

11.5.1. Creating graphs

```
/*creating new columns for all the percentage of each column*/

data graph1;
    set openclose4;
    BY undly pc Expr_dt strk_prc Trade_DT blocktime ; /*add ticker symbol sorting when using big data*/

array x {20}        FOB_VOL2 FCB_VOL2  FOS_VOL2  FCS_VOL
                    COB_tot_VOL  CCB_tot_VOL  COS_tot_VOL  CCS_tot_VOL
                    BDOB_VOL2  BDCB_VOL2  BDOS_VOL2 BDCS_VOL2
                    POB_VOL2 PCB_VOL2  POS_VOL2  PCS_VOL2
                    PCOB_tot_VOL  PCCB_tot_VOL  PCOS_tot_VOL PCCS_tot_VOL ;

array xperc {20}    FOB_VOL3 FCB_VOL3  FOS_VOL3  FCS_VOL3
                    COB_tot_VOL3  CCB_tot_VOL3  COS_tot_VOL3  CCS_tot_VOL3
                    BDOB_VOL3  BDCB_VO13  BDOS_VOL3 BDCS_VOL3
                    POB_VOL3 PCB_VOL3  POS_VOL3  PCS_VOL3
                    PCOB_tot_VOL3  PCCB_tot_VOL3  PCOS_tot_VOL3 PCCS_tot_VOL3 ;
    DO i=1 to 20;
    xperc{i}=(x{i}/17718594.00)*100;
    end;
run;
```

```
data graph2;
    set graph1;

if ise_vol2<'0' then delete;
if FOB_VOL3<'0' then delete;
if FCB_VOL3<'0' then delete;
if FOS_VOL3<'0' then delete;
```

```
if FCS_VOL3<'0' then delete;
if COB_tot_VOL3<'0' then delete;
if ccb_tot_VOL3<'0' then delete;
if cos_tot_VOL3<'0' then delete;
if ccs_tot_VOL3<'0' then delete;
if BDOB_VOL3<'0' then delete;
if BDCB_VOL3<'0' then delete;
if BDOS_VOL3<'0' then delete;
if BDCS_VOL3<'0' then delete;
if PCOB_tot_VOL3<'0' then delete;
if PCCB_tot_VOL3<'0' then delete;
if PCOS_tot_VOL3<'0' then delete;
if PCCS_tot_VOL3<'0' then delete;
if POB_VOL3<'0' then delete;
if PCB_VOL3<'0' then delete;
if POS_VOL3<'0' then delete;
if PCS_VOL3<'0' then delete;

run;

/*checking the summary stats to get an idea and trim removes the end and gives the average*/

proc univariate data=graph2 trim=0.2 winsor=1;   var ISE_VOL2;
ods select BasicMeasures TrimmedMeans WinsorizedMeans;
run;


 /*check if ise_vol2 is normally distrbuted*/

proc univariate data = graph2 plots;
     var ISE_vol2;
 run;

 /*creating a histogram to test for normality*/

PROC SGPLOT DATA = graph2;
     HISTOGRAM ise_vol2 ;
  RUN;


  /*method to remove non negative numbers and abnormally large values*/

data graph3;
     set graph2;

 if ISE_VOL2<0 then delete;
 if ISE_VOL2>=15000 then delete;

 run;

 /*trying the stadandard deviation*/

PROC MEANS NOPRINT DATA=graph3;
    MEAN=ISEMEAN STDDEV=ISESD;
RUN;
```

```
DATA graph4;/*trting the standarddev method. */
     SET graph3;
     DIFF=ISE_vol2-ISEMEAN;
     Z=DIFF/ISESD; * CREATES STANDARDIZED SCORE (Z-SCORE);
 RUN;

 /*The firm*/
proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=perc group=blocktime groupdisplay=cluster;
     title in the money and Firm open buy;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=Fcs_vol3 group=blocktime groupdisplay=cluster;
     title In the money and Firm close buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=FOS_vol3 group=blocktime groupdisplay=cluster;
     title In the money and Firm open sell;
     run;


proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=FCS_vol2 group=blocktime groupdisplay=cluster;
     title In the money and Firm close sell;
     run;


proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=FOB_vol2 group=blocktime groupdisplay=cluster;
     title At the money and Firm open buy;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=FCB_vol2 group=blocktime groupdisplay=cluster;
     title At the money and Firm close buy;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=FOS_vol2 group=blocktime groupdisplay=cluster;
     title At the money and Firm open sell;
     run;
```

```
proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=FCS_vol2 group=blocktime groupdisplay=cluster;
     title At the money and Firm close sell;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=FOB_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Firm open buy;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=FCB_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Firm close buy;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=FOS_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Firm open sell;
     run;


proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=FCS_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Firm close sell;
     run;

     /*The customer*/

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=COB_tot_vol3 group=blocktime groupdisplay=cluster;
     title In the money and Customer open buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=CCB_tot_vol group=blocktime groupdisplay=cluster;
     title In the money and Customer close buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=COS_tot_vol3 group=blocktime groupdisplay=cluster;
     title In the money and Customer open sell;
     run;
```

```
proc sgplot data=graph4;
    where moneyness=2;
    vbar days_exp1 /response=CCS_tot_vol group=blocktime groupdisplay=cluster;
    title In the money and Customer close sell;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=COB_tot_vol group=blocktime groupdisplay=cluster;
    title At the money and Customer open buy;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=CCB_tot_vol group=blocktime groupdisplay=cluster;
    title At the money and Customer close buy;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=COS_tot_vol3 group=blocktime groupdisplay=cluster;
    title At the money and Customer open sell;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=CCS_tot_vol group=blocktime groupdisplay=cluster;
    title At the money and Customer close sell;
    run;

proc sgplot data=graph4;
    where moneyness=4;
    vbar days_exp1 /response=COB_tot_vol3 group=blocktime groupdisplay=cluster;
    title Out of the money and Customer open buy;
    run;

proc sgplot data=graph4;
    where moneyness=4;
    vbar days_exp1 /response=CCB_tot_vol group=blocktime groupdisplay=cluster;
    title Out of the money and Customer close buy;
    run;

proc sgplot data=graph4;
    where moneyness=4;
    vbar days_exp1 /response=COS_tot_vol group=blocktime groupdisplay=cluster;
    title Out of the money and Customer open sell;
    run;
```

```
proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=CCS_tot_vol3 group=blocktime groupdisplay=cluster;
     title Out of the money and Customer close sell;
     run;

     /*Professional customer*/

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=PCOB_tot_vol group=blocktime groupdisplay=cluster;
     title In the money and Professional Customer open buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=PCCB_tot_vol group=blocktime groupdisplay=cluster;
     title In the money and Professional Customer close buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=PCOS_tot_vol group=blocktime groupdisplay=cluster;
     title In the money and Professional Customer open sell;
     run;


proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=PCCS_tot_vol group=blocktime groupdisplay=cluster;
     title In the money and Professional Customer close sell;
     run;


proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=PCOB_tot_vol group=blocktime groupdisplay=cluster;
     title At the money and Professional Customer open buy;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=PCCB_tot_vol group=blocktime groupdisplay=cluster;
     title At the money and Professional Customer close buy;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=PCOS_tot_vol3 group=blocktime groupdisplay=cluster;
     title At the money and Professional Customer open sell;
     run;
```

```
proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=PCCS_tot_vol group=blocktime groupdisplay=cluster;
     title At the money and Professional Customer close sell;
     run;


proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=PCOB_tot_vol group=blocktime groupdisplay=cluster;
     title Out of the money and Professional Customer open buy;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=PCCB_tot_vol group=blocktime groupdisplay=cluster;
     title Out of the money and Professional Customer close buy;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=PCOS_tot_vol group=blocktime groupdisplay=cluster;
     title Out of the money and Professional Customer open sell;
     run;


proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=PCCS_tot_vol group=blocktime groupdisplay=cluster;
     title Out of the money and Professional  Customer close sell;
     run;

     /*Broker Dealer */

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=BDOB_vol2 group=blocktime groupdisplay=cluster;
     title In the money and Broker dealer open buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=BDCB_vol2 group=blocktime groupdisplay=cluster;
     title In the money and Broker dealer close buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=BDOS_vol2 group=blocktime groupdisplay=cluster;
     title In the money and Broker dealer open sell;
     run;
```

```
proc sgplot data=graph4;
    where moneyness=2;
    vbar days_exp1 /response=BDCS_vol2 group=blocktime groupdisplay=cluster;
    title In the money and Broker dealer close sell;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=BDOB_vol3 group=blocktime groupdisplay=cluster;
    title At the money and Broker dealer open buy;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=BDCB_vol3 group=blocktime groupdisplay=cluster;
    title At the money and Broker dealer close buy;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=BDOS_vol3 group=blocktime groupdisplay=cluster;
    title At the money and Broker dealer open sell;
    run;

proc sgplot data=graph4;
    where moneyness=3;
    vbar days_exp1 /response=BDCS_vol2 group=blocktime groupdisplay=cluster;
    title At the money and Broker dealer close sell;
    run;


proc sgplot data=graph4;
    where moneyness=4;
    vbar days_exp1 /response=BDOB_vol3 group=blocktime groupdisplay=cluster;
    title Out of the money and Broker dealer open buy;
    run;

proc sgplot data=graph4;
    where moneyness=4;
    vbar days_exp1 /response=BDCB_vol2 group=blocktime groupdisplay=cluster;
    title Out of the money and Broker dealer close buy;
    run;

proc sgplot data=graph4;
    where moneyness=4;
    vbar days_exp1 /response=BDOS_vol2 group=blocktime groupdisplay=cluster;
    title Out of the money and Broker dealer open sell;
    run;

proc sgplot data=graph4;
    where moneyness=4;
    vbar days_exp1 /response=BDCS_vol2 group=blocktime groupdisplay=cluster;
    title Out of the money and Broker dealer close sell;
    run;
```

```
     /*PROPRITARY*/

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=POB_vol3 group=blocktime groupdisplay=cluster;
     title In the money and Proprietary open buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=PCB_vol2 group=blocktime groupdisplay=cluster;
     title In the money and Proprietary close buy;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=POS_vol2 group=blocktime groupdisplay=cluster;
     title In the money and Proprietary open sell;
     run;

proc sgplot data=graph4;
     where moneyness=2;
     vbar days_exp1 /response=PCS_vol2 group=blocktime groupdisplay=cluster;
     title In the money and Proprietary close sell;
     run;


proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=POB_vol2 group=blocktime groupdisplay=cluster;
     title At the money and Proprietary open buy;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=PCB_vol2 group=blocktime groupdisplay=cluster;
     title At the money and Proprietary close buy;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=POS_vol2 group=blocktime groupdisplay=cluster;
     title At the money and Proprietary open sell;
     run;

proc sgplot data=graph4;
     where moneyness=3;
     vbar days_exp1 /response=PCS_vol3 group=blocktime groupdisplay=cluster;
     title At the money and Proprietary close sell;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=POB_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Proprietary open buy;
     run;
```

```
proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=PCB_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Proprietary close buy;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=POS_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Proprietary open sell;
     run;

proc sgplot data=graph4;
     where moneyness=4;
     vbar days_exp1 /response=PCS_vol2 group=blocktime groupdisplay=cluster;
     title Out of the money and Proprietary close sell;
     run;
```

11.6. Investor Profitability

11.6.1. Importing and merging weekly closing stock price

```
 /*Importing closing stockprice dataset*/
data stockprice (Rename=(ticker=undly prc=stockprice1));
     set a.stockprice2411;
 run;

 /*sorting the merged_file*/
proc sort data=merged_file1;
     by undly date;
 run;

 /*sorting the stock price*/
proc sort data=stockprice;
     by undly date;
 run;

 /*merging the stockprice and merged_file*/
data merged_file3;
     merge stockprice(in=aa) merged_file1(in=bb);
     by undly date;
 run;

 /*Renaming variables*/
data a.merged_file4 (Rename=(PCCB_tot_vol=pccb_tot_vol2));
     set merged_file3;
 run;
```

11.6.2. Calculating profit for call options

```
/*calculate call profit*/
data merged_file5;
set a.merged_file4;

if pc1^='C' then delete;
run;

/*Profit Calculation FOR CALL OPTION for firms*/
data profitcall;
set merged_file5;


Fbuyincost=(Fob_vol2+fcb_vol2)*meanprice;
Fsellingcost= (Fos_vol2+fcs_vol2)*meanprice;
a =  stockprice1-strk_prc ;
b = fob_vol2-fcs_vol2;
c = max(a,0);
Firmbuyintrin = c*b;
e = fos_vol2-fcb_vol2;
Firmsellintrin= c*e;
Firmprofit=(Fsellingcost-Fbuyincost+Firmbuyintrin-Firmsellintrin)*100;
Firmopen=(Fos_vol2 + fob_vol2)*100;
Firmopencost=(fob_vol2)*100*meanprice;

smallCbuyincost=(Cob_sm_vol2+ccb_sm_vol2)*meanprice;
smallsellingcost= (cos_sm_vol2+ccs_sm_vol2)*meanprice;
i = cob_sm_vol2-ccs_sm_vol2;
smallcirmbuyintrin = c*i;
l = cos_sm_vol2-ccb_sm_vol2;
smallcirmsellintrin= c*l;
smallcirmprofit=(smallsellingcost-smallcbuyincost+smallcirmbuyintrin-smallcirmsellintrin)*100;
smallcirmopen=(cos_sm_vol2 + cob_sm_vol2)*100;
smallcirmopencost=(cob_sm_vol2)*100*meanprice;

medCbuyincost=(Cob_md_vol2+ccb_md_vol2)*meanprice;
medcsellingcost= (cos_md_vol2+ccs_md_vol2)*meanprice;
z = cob_md_vol2-ccs_md_vol2;
medcirmbuyintrin = c*z;
za = cos_md_vol2-ccb_md_vol2;
medcirmsellintrin= c*za;
medcirmprofit=(medcsellingcost-medcbuyincost+medcirmbuyintrin-medcirmsellintrin)*100;
medcirmopen=(cos_md_vol2 + cob_md_vol2)*100;
medcirmopencost=(cob_md_vol2)*100*meanprice;

lgCbuyincost=(Cob_lg_vol2+ccb_lg_vol2)*meanprice;
lgcsellingcost= (cos_lg_vol2+ccs_lg_vol2)*meanprice;
zaa = cob_lg_vol2-ccs_lg_vol2;
lgcirmbuyintrin = c*zaa;
zaf = cos_lg_vol2-ccb_lg_vol2;
lgcirmsellintrin= c*zaf;
lgcirmprofit=(lgcsellingcost-lgcbuyincost+lgcirmbuyintrin-lgcirmsellintrin)*100;
lgcirmopen=(cob_lg_vol2 + cos_lg_vol2)*100;
lgcirmopencost=(cob_lg_vol2)*100*meanprice;
```

```
smpcbuyincost= (pcob_sm_vol2+pccb_sm_vol2) *meanprice ;
smpcsellingcost= (pcos_sm_vol2 + pccs_sm_vol2) * meanprice;
p=pcob_sm_vol2-pccs_sm_vol2;
smpcbuyintrin = c*p;
s =pcos_sm_vol2-pccb_sm_vol2;
smpcsellintrin= c*s;
smpcprofit=(smpcsellingcost-smpcbuyincost+smpcbuyintrin-smpcsellintrin)*100;
smpcopen=(pcos_sm_vol2 +pcob_sm_vol2)*100;
smpcopencost=(pcob_sm_vol2)*100*meanprice;


mdpcbuyincost= (pcob_md_vol2+pccb_md_vol2) *meanprice ;
mdpcsellingcost= (pcos_md_vol2 + pccs_md_vol2) * meanprice;
pa=pcob_md_vol2-pccs_md_vol2;
mdpcbuyintrin = c*pa;
sa =pcos_md_vol2-pccb_md_vol2;
mdpcsellintrin= c*sa;
mdpcprofit=(mdpcsellingcost-mdpcbuyincost+mdpcbuyintrin-mdpcsellintrin)*100;
mdpcopen=(pcos_md_vol2+pcob_md_vol2)*100;
mdpcopencost=(pcob_md_vol2)*100*meanprice;

lgpcbuyincost= (pcob_lg_vol2+pccb_lg_vol2) *meanprice ;
lgpcsellingcost= (pcos_lg_vol2 + pccs_lg_vol2) * meanprice;
paa=pcob_lg_vol2-pccs_lg_vol2;
lgpcbuyintrin = c*paa;
saa =pcos_lg_vol2-pccb_lg_vol2;
lgpcsellintrin= c*saa;
lgpcprofit=(lgpcsellingcost-lgpcbuyincost+lgpcbuyintrin-lgpcsellintrin)*100;
lgpcopen=(pcob_lg_vol2+pcos_lg_vol2)*100;
lgpcopencost=(pcob_lg_vol2)*100*meanprice;


bdbuyincost=(bdob_vol2+bdcb_vol2)*meanprice;
bdsellingcost= (bdos_vol2+bdcs_vol2)*meanprice;
v = bdob_vol2-bdcs_vol2;
bdbuyintrin = c*v;
y = bdos_vol2-bdcb_vol2;
bdsellintrin= c*y;
bdprofit=(bdsellingcost-bdbuyincost+bdbuyintrin-bdsellintrin)*100;
bdopen=(bdob_vol2+bdos_vol2)*100;
bdopencost=(bdob_vol2)*100*meanprice;


pbuyincost=(pob_vol2+pcb_vol2)*meanprice;
psellingcost= (pos_vol2+pcs_vol2)*meanprice;
ba = pob_vol2-pcs_vol2;
pbuyintrin = c*ba;
ea = pos_vol2-pcb_vol2;
psellintrin= c*ea;
pprofit=(psellingcost-pbuyincost+pbuyintrin-psellintrin)*100;
popen=(pos_vol2+pob_vol2)*100;
popencost=(pob_vol2)*100*meanprice;

marketmaker=0-pprofit-bdprofit-lgpcprofit-mdpcprofit-smpcprofit-lgcirmprofit-medcirmprofit-smallcirmprofit-firmprofit;

run;
```

11.6.3. Calculating profit for put options

```
/*Extracting the pull option trades*/
data merged_file6 ;
set a.merged_file4 ;

if pc1^='P' then delete;
run;

/*Profit Calculation FOR PUT OPTION for firms*/
data profitput;
set merged_file6;

Fbuyincost=(Fob_vol2+fcb_vol2)*meanprice;
Fsellingcost= (Fos_vol2+fcs_vol2)*meanprice;
a =  strk_prc-stockprice1 ;
b = fob_vol2-fcs_vol2;
c = max(a,0);
Firmbuyintrin = c*b;
e = fos_vol2-fcb_vol2;
Firmsellintrin= c*e;
Firmprofit=(Fsellingcost-Fbuyincost+Firmbuyintrin-Firmsellintrin)*100;
Firmopen=(Fos_vol2 + fob_vol2)*100;
Firmopencost=(fob_vol2)*100*meanprice;



smpcbuyincost= (pcob_sm_vol2+pccb_sm_vol2) *meanprice ;
smpcsellingcost= (pcos_sm_vol2 + pccs_sm_vol2) * meanprice;
p=pcob_sm_vol2-pccs_sm_vol2;
smpcbuyintrin = c*p;
s =pcos_sm_vol2-pccb_sm_vol2;
smpcsellintrin= c*s;
smpcprofit=(smpcsellingcost-smpcbuyincost+smpcbuyintrin-smpcsellintrin)*100;
smpcopen=(pcos_sm_vol2 +pcob_sm_vol2)*100;
smpcopencost=(pcob_sm_vol2)*100*meanprice;


mdpcbuyincost= (pcob_md_vol2+pccb_md_vol2) *meanprice ;
mdpcsellingcost= (pcos_md_vol2 + pccs_md_vol2) * meanprice;
pa=pcob_md_vol2-pccs_md_vol2;
mdpcbuyintrin = c*pa;
sa =pcos_md_vol2-pccb_md_vol2;
mdpcsellintrin= c*sa;
mdpcprofit=(mdpcsellingcost-mdpcbuyincost+mdpcbuyintrin-mdpcsellintrin)*100;
mdpcopen=(pcos_md_vol2+pcob_md_vol2)*100;
mdpcopencost=(pcob_md_vol2)*100*meanprice;
```

```
smallCbuyincost=(Cob_sm_vol2+ccb_sm_vol2)*meanprice;
smallsellingcost= (cos_sm_vol2+ccs_sm_vol2)*meanprice;
i = cob_sm_vol2-ccs_sm_vol2;
smallcirmbuyintrin = c*i;
l = cos_sm_vol2-ccb_sm_vol2;
smallcirmsellintrin= c*l;
smallcirmprofit=(smallsellingcost-smallcbuyincost+smallcirmbuyintrin-smallcirmsellintrin)*100;
smallcirmopen=(cos_sm_vol2 + cob_sm_vol2)*100;
smallcirmopencost=(cob_sm_vol2)*100*meanprice;

medCbuyincost=(Cob_md_vol2+ccb_md_vol2)*meanprice;
medcsellingcost= (cos_md_vol2+ccs_md_vol2)*meanprice;
z = cob_md_vol2-ccs_md_vol2;
medcirmbuyintrin = c*z;
za = cos_md_vol2-ccb_md_vol2;
medcirmsellintrin= c*za;
medcirmprofit=(medcsellingcost-medcbuyincost+medcirmbuyintrin-medcirmsellintrin)*100;
medcirmopen=(cos_md_vol2 + cob_md_vol2)*100;
medcirmopencost=(cob_md_vol2)*100*meanprice;

lgCbuyincost=(Cob_lg_vol2+ccb_lg_vol2)*meanprice;
lgcsellingcost= (cos_lg_vol2+ccs_lg_vol2)*meanprice;
zaa = cob_lg_vol2-ccs_lg_vol2;
lgcirmbuyintrin = c*zaa;
zaf = cos_lg_vol2-ccb_lg_vol2;
lgcirmsellintrin= c*zaf;
lgcirmprofit=(lgcsellingcost-lgcbuyincost+lgcirmbuyintrin-lgcirmsellintrin)*100;
lgcirmopen=(cob_lg_vol2 + cos_lg_vol2)*100;
lgcirmopencost=(cob_lg_vol2)*100*meanprice;



lgpcbuyincost= (pcob_lg_vol2+pccb_lg_vol2) *meanprice ;
lgpcsellingcost= (pcos_lg_vol2 + pccs_lg_vol2) * meanprice;
paa=pcob_lg_vol2-pccs_lg_vol2;
lgpcbuyintrin = c*paa;
saa =pcos_lg_vol2-pccb_lg_vol2;
lgpcsellintrin= c*saa;
lgpcprofit=(lgpcsellingcost-lgpcbuyincost+lgpcbuyintrin-lgpcsellintrin)*100;
lgpcopen=(pcob_lg_vol2+pcos_lg_vol2)*100;
lgpcopencost=(pcob_lg_vol2)*100*meanprice;


bdbuyincost=(bdob_vol2+bdcb_vol2)*meanprice;
bdsellingcost= (bdos_vol2+bdcs_vol2)*meanprice;
v = bdob_vol2-bdcs_vol2;
bdbuyintrin = c*v;
y = bdos_vol2-bdcb_vol2;
bdsellintrin= c*y;
bdprofit=(bdsellingcost-bdbuyincost+bdbuyintrin-bdsellintrin)*100;
bdopen=(bdob_vol2+bdos_vol2)*100;
bdopencost=(bdob_vol2)*100*meanprice;


pbuyincost=(pob_vol2+pcb_vol2)*meanprice;
psellingcost= (pos_vol2+pcs_vol2)*meanprice;
ba = pob_vol2-pcs_vol2;
pbuyintrin = c*ba;
ea = pos_vol2-pcb_vol2;
psellintrin= c*ea;
pprofit=(psellingcost-pbuyincost+pbuyintrin-psellintrin)*100;
popen=(pos_vol2+pob_vol2)*100;
popencost=(pob_vol2)*100*meanprice;

marketmaker=0-pprofit-bdprofit-lgpcprofit-mdpcprofit-smpcprofit-lgcirmprofit-medcirmprofit-smallcirmprofit-firmprofit;

run;
```

11.6.4. Tabulating Profit against variable

11.6.4.1. Call profit against underlying stock

```
/*Tabulation of total call profit*/
title profitbyexpr_dtp;
ODS PDF FILE='C:\data\putundly.pdf';
PROC FORMAT;
     VALUE watchit
      0.1 - 200000000 = 'Green'
      low - 0 = 'Red' ;
RUN;
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS undly;
     VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit
         mdpcprofit lgpcprofit pprofit bdprofit;
     TABLE undly all='Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
           smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
           lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
           mdpcprofit='Medium Professional Customer Profit'
           lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary'
           bdprofit='Broker Dealer Profit'
     /BOX='Investor weekly call options profit from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options profit from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
ODS PDF CLOSE;
```

```
/*Tabulation of call profit per contract*/
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS undly;
     VAR firmopen smallcirmopen medcirmopen lgcirmopen smpcopen mdpcopen lgpcopen popen bdopen;
     TABLE undly all='Total Contracts', firmopen='Firm contract' smallcirmopen='Small Customer contracts'
           medcirmopen='Medium Customer contracts'
           lgcirmopen='Large Customer Contracts' smpcopen='Small Professional Customer contracts'
           mdpcopen='Medium Professional Customer Contracts'
           lgpcopen='Large Professional Customer contracts' popen='Proprietary contracts' bdopen='Broker Dealer contracts'
     /BOX='Investor weekly call options opened contracts from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options opened contracts from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
```

```
/*Tabulation ROI for call options*/
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS undly;
     VAR   firmopencost smallcirmopencost medcirmopencost lgcirmopencost smpcopencost
           mdpcopencost lgpcopencost popencost bdopencost;
     TABLE undly all='Total Cost', firmopencost='Firm contract cost' smallcirmopencost='Small Customer contracts cost'
           medcirmopencost='Medium Customer contracts cost'
           lgcirmopencost='Large Customer Contracts cost' smpcopencost='Small Professional Customer contracts cost'
           mdpcopencost='Medium Professional Customer Contracts cost'
           lgpcopencost='Large Professional Customer contracts cost' popencost='Proprietary contracts cost'
           bdopencost='Broker Dealer contracts cost'
     /BOX='Investor weekly call options opened contracts cost from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options opened contracts cost from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
```

11.6.4.2. Put profit against underlying stock

```
/*Tabulation of total put profit*/
title profitbyexpr_dtp;
ODS PDF FILE='C:\data\putundly.pdf';
PROC FORMAT;
    VALUE watchit
    0.1 - 200000000 = 'Green'
    low - 0 = 'Red' ;
RUN;
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
    CLASS undly;
    VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit mdpcprofit
        lgpcprofit pprofit bdprofit;
    TABLE undly all='Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
          smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
          lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
          mdpcprofit='Medium Professional Customer Profit'
          lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary' bdprofit='Broker Dealer Profit'
    /BOX='Investor weekly put options profit from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly put options profit from july 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
ODS PDF CLOSE;


/*Tabulation of put profit per contract*/
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
    CLASS undly;
    VAR firmopen smallcirmopen medcirmopen lgcirmopen smpcopen mdpcopen lgpcopen popen bdopen;
    TABLE undly all='Total Contracts', firmopen='Firm contract' smallcirmopen='Small Customer contracts'
          medcirmopen='Medium Customer contracts'
          lgcirmopen='Large Customer Contracts' smpcopen='Small Professional Customer contracts'
          mdpcopen='Medium Professional Customer Contracts'lgpcopen='Large Professional Customer contracts'
          popen='Proprietary contracts' bdopen='Broker Dealer contracts'
    /BOX='Investor weekly put options opened contracts from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly put options opened contracts from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;

/*Tabulation ROI for Put options*/
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
    CLASS undly;
    VAR firmopencost smallcirmopencost medcirmopencost lgcirmopencost smpcopencost mdpcopencost
        lgpcopencost popencost bdopencost;
    TABLE undly all='Total Cost', firmopencost='Firm contract cost' smallcirmopencost='Small Customer contracts cost'
          medcirmopencost='Medium Customer contracts cost'
          lgcirmopencost='Large Customer Contracts cost' smpcopencost='Small Professional Customer contracts cost'
          mdpcopencost='Medium Professional Customer Contracts cost'
          lgpcopencost='Large Professional Customer contracts cost' popencost='Proprietary contracts cost'
          bdopencost='Broker Dealer contracts cost'
    /BOX='Investor weekly put options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly put options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
```

11.6.4.3. Call profit against moneyness

```
/*Tabulation of total call profit*/
title profitbyexpr_dtp;
ODS PDF FILE='C:\data\putmoneyness.pdf';
PROC FORMAT;
     VALUE watchit
      0.1 - 200000000 = 'Green'
      low - 0 = 'Red' ;
RUN;
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS moneyness;
     VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit
         mdpcprofit lgpcprofit pprofit bdprofit;
     TABLE moneyness all='Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
           smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
           lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
           mdpcprofit='Medium Professional Customer Profit'
           lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary'
           bdprofit='Broker Dealer Profit'
     /BOX='Investor weekly call options profit from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options profit from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
ODS PDF CLOSE;


 /*Tabulation of call profit per contract*/
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS moneyness;
     VAR firmopen smallcirmopen medcirmopen lgcirmopen smpcopen mdpcopen lgpcopen popen bdopen;
     TABLE moneyness all='Total Contracts', firmopen='Firm contract' smallcirmopen='Small Customer contracts'
           medcirmopen='Medium Customer contracts'
           lgcirmopen='Large Customer Contracts' smpcopen='Small Professional Customer contracts'
           mdpcopen='Medium Professional Customer Contracts'
           lgpcopen='Large Professional Customer contracts' popen='Proprietary contracts' bdopen='Broker Dealer contracts'
     /BOX='Investor weekly call options opened contracts from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options opened contracts from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;


 /*Tabulation ROI for call options*/
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS moneyness;
     VAR firmopencost smallcirmopencost medcirmopencost lgcirmopencost smpcopencost
         mdpcopencost lgpcopencost popencost bdopencost;
     TABLE moneyness all='Total Cost', firmopencost='Firm contract cost' smallcirmopencost='Small Customer contracts cost'
           medcirmopencost='Medium Customer contracts cost'
           lgcirmopencost='Large Customer Contracts cost' smpcopencost='Small Professional Customer contracts cost'
           mdpcopencost='Medium Professional Customer Contracts cost'
           lgpcopencost='Large Professional Customer contracts cost' popencost='Proprietary contracts cost'
           bdopencost='Broker Dealer contracts cost'
     /BOX='Investor weekly call options opened contracts cost from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options opened contracts cost from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
```

11.6.4.4. Put profit against moneyness

```
/*Tabulation of total put profit*/
title profitbyexpr_dtp;
ODS PDF FILE='C:\data\putmoneyness.pdf';
PROC FORMAT;
    VALUE watchit
    0.1 - 200000000 = 'Green'
    low - 0 = 'Red' ;
RUN;
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
    CLASS moneyness;
    VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit mdpcprofit
        lgpcprofit pprofit bdprofit;
    TABLE moneyness='Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
          smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
          lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
          mdpcprofit='Medium Professional Customer Profit'
          lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary' bdprofit='Broker Dealer Profit'
    /BOX='Investor weekly put options profit from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly put options profit from july 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
ODS PDF CLOSE;


 /*Tabulation of put profit per contract*/
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
    CLASS moneyness;
    VAR firmopen smallcirmopen medcirmopen lgcirmopen smpcopen mdpcopen lgpcopen popen bdopen;
    TABLE moneyness all='Total Contracts', firmopen='Firm contract' smallcirmopen='Small Customer contracts'
          medcirmopen='Medium Customer contracts'
          lgcirmopen='Large Customer Contracts' smpcopen='Small Professional Customer contracts'
          mdpcopen='Medium Professional Customer Contracts'lgpcopen='Large Professional Customer contracts'
          popen='Proprietary contracts' bdopen='Broker Dealer contracts'
    /BOX='Investor weekly put options opened contracts from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly put options opened contracts from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;


 /*Tabulation ROI for Put options*/
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
    CLASS undly;
    VAR firmopencost smallcirmopencost medcirmopencost lgcirmopencost smpcopencost mdpcopencost
        lgpcopencost popencost bdopencost;
    TABLE undly all='Total Cost', firmopencost='Firm contract cost' smallcirmopencost='Small Customer contracts cost'
          medcirmopencost='Medium Customer contracts cost'
          lgcirmopencost='Large Customer Contracts cost' smpcopencost='Small Professional Customer contracts cost'
          mdpcopencost='Medium Professional Customer Contracts cost'
          lgpcopencost='Large Professional Customer contracts cost' popencost='Proprietary contracts cost'
          bdopencost='Broker Dealer contracts cost'
    /BOX='Investor weekly put options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly put options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
```

11.6.4.5. Call profit against expiry date

```
/*Tabulation of total call profit*/
title profitbyexpr_dtp;
ODS PDF FILE='C:\data\putexpr_dt.pdf';
PROC FORMAT;
     VALUE watchit
      0.1 - 200000000 = 'Green'
      low - 0 = 'Red' ;
RUN;
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS expr_dt;
     VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit
         mdpcprofit lgpcprofit pprofit bdprofit;
     TABLE expr_dt all='Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
           smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
           lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
           mdpcprofit='Medium Professional Customer Profit'
           lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary'
           bdprofit='Broker Dealer Profit'
     /BOX='Investor weekly call options profit from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options profit from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
ODS PDF CLOSE;


 /*Tabulation of call profit per contract*/
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS expr_dt;
     VAR firmopen smallcirmopen medcirmopen lgcirmopen smpcopen mdpcopen lgpcopen popen bdopen;
     TABLE expr_dt all='Total Contracts', firmopen='Firm contract' smallcirmopen='Small Customer contracts'
           medcirmopen='Medium Customer contracts'
           lgcirmopen='Large Customer Contracts' smpcopen='Small Professional Customer contracts'
           mdpcopen='Medium Professional Customer Contracts'
           lgpcopen='Large Professional Customer contracts' popen='Proprietary contracts' bdopen='Broker Dealer contracts'
     /BOX='Investor weekly call options opened contracts from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options opened contracts from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;


 /*Tabulation ROI for call options*/
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS expr_dt;
     VAR   firmopencost smallcirmopencost medcirmopencost lgcirmopencost smpcopencost
           mdpcopencost lgpcopencost popencost bdopencost;
     TABLE expr_dt all='Total Cost', firmopencost='Firm contract cost' smallcirmopencost='Small Customer contracts cost'
           medcirmopencost='Medium Customer contracts cost'
           lgcirmopencost='Large Customer Contracts cost' smpcopencost='Small Professional Customer contracts cost'
           mdpcopencost='Medium Professional Customer Contracts cost'
           lgpcopencost='Large Professional Customer contracts cost' popencost='Proprietary contracts cost'
           bdopencost='Broker Dealer contracts cost'
     /BOX='Investor weekly call options opened contracts cost from july 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options opened contracts cost from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
```

11.6.4.6. Put profit against expiry date

```
/*Tabulation of total put profit*/
title profitbyexpr_dtp;
ODS PDF FILE='C:\data\putexpiry.pdf';
PROC FORMAT;
     VALUE watchit
     0.1 - 200000000 = 'Green'
     low - 0 = 'Red' ;
RUN;
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
     CLASS expr_dt;
     VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit mdpcprofit
         lgpcprofit pprofit bdprofit;
     TABLE expr_dt all='Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
           smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
           lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
           mdpcprofit='Medium Professional Customer Profit'
           lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary' bdprofit='Broker Dealer Profit'
     /BOX='Investor weekly put options profit from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly put options profit from july 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
ODS PDF CLOSE;


/*Tabulation of put profit per contract*/
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
     CLASS expr_dt;
     VAR firmopen smallcirmopen medcirmopen lgcirmopen smpcopen mdpcopen lgpcopen popen bdopen;
     TABLE expr_dt all='Total Contracts', firmopen='Firm contract' smallcirmopen='Small Customer contracts'
           medcirmopen='Medium Customer contracts'
           lgcirmopen='Large Customer Contracts' smpcopen='Small Professional Customer contracts'
           mdpcopen='Medium Professional Customer Contracts'lgpcopen='Large Professional Customer contracts'
           popen='Proprietary contracts' bdopen='Broker Dealer contracts'
     /BOX='Investor weekly put options opened contracts from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly put options opened contracts from june 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;


/*Tabulation ROI for Put options*/
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
     CLASS expr_dt;
     VAR firmopencost smallcirmopencost medcirmopencost lgcirmopencost smpcopencost mdpcopencost
         lgpcopencost popencost bdopencost;
     TABLE expr_dt all='Total Cost', firmopencost='Firm contract cost' smallcirmopencost='Small Customer contracts cost'
           medcirmopencost='Medium Customer contracts cost'
           lgcirmopencost='Large Customer Contracts cost' smpcopencost='Small Professional Customer contracts cost'
           mdpcopencost='Medium Professional Customer Contracts cost'
           lgpcopencost='Large Professional Customer contracts cost' popencost='Proprietary contracts cost'
           bdopencost='Broker Dealer contracts cost'
     /BOX='Investor weekly put options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly put options opened contracts cost from june 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
```

11.6.4.7. Call profit against days to expire

```
PROC TABULATE DATA = profitcall S=[foreground=watchit.] ;
     CLASS days_exp;
     VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit
         mdpcprofit lgpcprofit pprofit bdprofit;
     TABLE days_exp all='Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
           smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
           lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
           mdpcprofit='Medium Professional Customer Profit'
           lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary'
           bdprofit='Broker Dealer Profit'
     /BOX='Investor weekly call options profit from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
     TITLE 'Investor weekly call options profit from june 2010 till Dec 2010 on the ISE Exchange';
     KEYLABEL sum='$';
RUN;
```

11.6.4.8. Put profit against days to expire

```
PROC TABULATE DATA = profitput S=[foreground=watchit.] ;
    CLASS days_exp;
    VAR marketmaker firmprofit smallcirmprofit medcirmprofit lgcirmprofit smpcprofit mdpcprofit
        lgpcprofit pprofit bdprofit;
    TABLE days_exp all='Total Profit', marketmaker='Market maker profit' firmprofit='Firm Profit'
          smallcirmprofit='Small Customer Profit' medcirmprofit='Medium Customer Profit'
          lgcirmprofit='Large Customer Profit' smpcprofit='Small Professional Customer Profit'
          mdpcprofit='Medium Professional Customer Profit'
          lgpcprofit='Large Professional Customer Profit' pprofit='Proprietary' bdprofit='Broker Dealer Profit'
    /BOX='Investor weekly put options profit from june 2010 till Dec 2010 on the ISE Exchange' ROW=FLOAT;
    TITLE 'Investor weekly put options profit from june 2010 till Dec 2010 on the ISE Exchange';
    KEYLABEL sum='$';
RUN;
```

12. Work Cited

Aggarwal, Raj, and Edward Gruca. "Intraday Trading Patterns In The Equity Options Markets." *Journal of Financial Research* 16.4 (1993): 285-97. Web.

Admati, Anat R., and Paul Pfleiderer. "A Theory of Intraday Patterns: Volume and Price Variability." *Rev. Financ. Stud. Review of Financial Studies* 1.1 (1988): 3-40. Web.

Anderson, A. "Is Online Trading Gambling with Peanuts?" *Technical Report, Swedish Institute for Financial Research* (2008): n. pag. Web.

Avellaneda, Marco, and Michael D. Lipkin. "A Market-Induced Mechanism for Stock Pinning." *SSRN Electronic Journal SSRN Journal* (2003): n. pag. Web. 25 Oct. 2015.

Bamber, Linda Smith, Orie E. Barron, and Thomas L. Stober. "Differential Interpretations and Trading Volume." *SSRN Electronic Journal SSRN Journal* (n.d.): n. pag. Web.

Barber, Brad M., and Odean, Terrance. "All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors." *SSRN Electronic Journal SSRN Journal* (n.d.): n. pag. Web. 18 Oct. 2015.

Bauer, Rob, Mathijs Cosemans, and Piet M. A. Eichholtz. "Option Trading and Individual Investor Performance." *SSRN Electronic Journal SSRN Journal* (n.d.): n. pag. Web.

Bessembinder, Hendrik, Kalok Chan, and Paul J. Seguin. "An Empirical Examination of Information, Differences of Opinion, and Trading Activity." *Journal of Financial Economics* 40.1 (1996): 105-34. Web.

Brock, William A., and Allan W. Kleidon. "Periodic Market Closure and Trading Volume." *Journal of Economic Dynamics and Control* 16.3-4 (1992): 451-89. Web.

Brunnermeier, Markus, Christian Gollier, and Jonathan Parker. "Optimal Beliefs, Asset Prices, and the Preference for Skewed Returns." (2007): n. pag. Web.

Chakravarty, Sugato, Huseyin Gulen, and Stewart Mayhew. "Informed Trading in Stock and Option Markets." *The Journal of Finance* 59.3 (2004): 1235-257. Web.

Chan, Kalok, Y. Peter Chung, and Herb Johnson. "The Intraday Behavior of Bid-Ask Spreads for NYSE Stocks and CBOE Options." *The Journal of Financial and Quantitative Analysis* 30.3 (1995): 329. Web.

Chang, Chuang-Chang, Pei-Fang Hsieh, and Hung-Neng Lai. "Do Informed Option Investors Predict Stock Returns? Evidence from the Taiwan Stock Exchange." *Journal of Banking & Finance* 33.4 (2009): 757-64. Web. 7 Nov. 2015.

Chatrath, Arjun, Rohan A. Christie-David, Hong Miao, and Sanjay Ramchander. "Short-term Options: Clienteles, Market Segmentation, and Event Trading." *Journal of Banking & Finance* 61 (2015): 237-50. Web.

Chiang, Min-Hsien, Tsai-yin Lin, Ching-Mann Huang, and Yun Lin. "Intraday Trading Patterns and Day-of-week in Stock Index Options Markets: Evidence from Emerging Markets." *Journal of Financial Management & Analysis* 19.2 (2006): n. pag. Web.

Chordia, Tarun, and Avanidhar Subrahmanyam. "Order Imbalance and Individual Stock Returns: Theory and Evidence." *Journal of Financial Economics* 72.3 (2004): 485-518. Web.

Choy, Siu Kai, and Jason Zhanshun Wei. "Option Trading: Information or Differences of Opinion?" *SSRN Electronic Journal SSRN Journal* (n.d.): n. pag. Web.

Diether, Karl B., Christopher J. Malloy, and Anna Scherbina. "Differences of Opinion and the Cross Section of Stock Returns." *The Journal of Finance* 57.5 (2002): 2113-141. Web.

Doran, J. S., D. Jiang, and D. R. Peterson. "Gambling Preference and the New Year Effect of Assets with Lottery Features." *Review of Finance* 16.3 (2011): 685-731. Web.

Dorn, Daniel, and Paul Sengmueller. "Trading as Entertainment?" *Management Science* 55.4 (2009): 591-603. Web.

Foster, F. Douglas, and S. Viswanathan. "A Theory of the Interday Variations in Volume, Variance, and Trading Costs in Securities Markets." *Rev. Financ. Stud. Review of Financial Studies* 3.4 (1990): 593-624. Web.

Gao, Xiaohui, and Tse-Chun Lin. "Do Individual Investors Trade Stocks as Gambling? Evidence from Repeated Natural Experiments." *SSRN Electronic Journal SSRN Journal* (n.d.): n. pag. Web.

Garrett, Thomas A., and Russell S. Sobel. "Gamblers Favor Skewness, Not Risk: Further Evidence from United States' Lottery Games." *Economics Letters* 63.1 (1999): 85-90. Web.

Glosten, Lawrence R., and Paul R. Milgrom. "Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders." *Journal of Financial Economics* 14.1 (1985): 71-100. Web.

Goldberg, Bruce. "International Securities Exchange." *ISE to Change Market Trading Hours* (9 Feb. 2006): n. pag. Print.

Grinblatt, Mark. "The Investment Behavior and Performance of Various Investor Types: A Study of Finland's Unique Data Set." *Journal of Financial Economics* 55.1 (2000): 43-67. Web. 6 Nov. 2015.

Grinblatt, Mark, and Matti Keloharju. "Sensation Seeking, Overconfidence, and Trading Activity." *SSRN Electronic Journal SSRN Journal* (2009): n. pag. Web.

Han, Bing, and Alok Kumar. "Speculative Retail Trading and Asset Prices." *Journal of Financial and Quantitative Analysis J. Financ. Quant. Anal.* 48.02 (2013): 377-404. Web.

Hellwig, Martin F. "On the Aggregation of Information in Competitive Markets." *Journal of Economic Theory* 22.3 (1980): 477-98. Web.

Hong, Harrison, and Jeremy C. Stein. "Disagreement and the Stock Market." *Journal of Economic Perspectives* 21.2 (2007): 109-28. Web.

"International Securities Exchange." *Home | International Securities Exchange, LLC.* N.p., n.d. Web. 29 Apr. 2016. <http://www.ise.com/>.

Jain, Prem C., and Gun-Ho Joh. "The Dependence between Hourly Prices and Trading Volume." *The Journal of Financial and Quantitative Analysis* 23.3 (1988): 269. Web.

Kandel, Eugene, and Neil D. Pearson. "Differential Interpretation of Public Signals and Trade in Speculative Markets." *Journal of Political Economy* 103.4 (1995): 831-72. Web.

Lakonishok, Josef, Inmoo Lee, Neil D. Pearson, and Allen M. Poteshman. "Option Market Activity." *Rev. Financ. Stud. Review of Financial Studies* 20.3 (2006): 813-57. Web.

"Market Data." *HOT Data | International Securities Exchange, LLC*. N.p., n.d. Web. 03 Dec. 2016.

McGregor, Molly H. "International Securities Exchange." *ISE Extends Trading Hours for Its ISE FX Options Products* (26 Apr. 2010): n. pag. Print.

Meyer, Stephan, Sebastian Schroff, and Christof Weinhardt. "(Un)skilled Leveraged Trading of Retail Investors." *SSRN Electronic Journal SSRN Journal* (n.d.): n. pag. Web. 23 Mar. 2016.

Schwartz, Robert A., and Asani Sarkar. "Market Sidedness: Insights into Motives for Trade Initiation." *SSRN Electronic Journal SSRN Journal* (n.d.): n. pag. Web.

Services, Wharton Research Data. "Wharton Research Data Services." *Wharton Research Data Services*. N.p., n.d. Web. 03 Dec. 2016.

Sheikh, Aamir M., and Ronn, Ehud I. "A Characterization of the Daily and Intraday Behavior of Returns on Options." *The Journal of Finance* 49.2 (1994): 557-80. Web. 18 Oct. 2015.

Stephan, Jens A., and Robert E. Whaley. "Intraday Price Change and Trading Volume Relations in the Stock and Stock Option Markets." *The Journal of Finance* 45.1 (1990): 191. Web. 18 Oct. 2015.

Vijh, Anand M. "Liquidity of the CBOE Equity Options." The Journal of Finance 45.4 (1990): 1157-179. Web.

13. Acknowledgement

- I would like to acknowledge Professor Davies who supported me throughout the whole journey. He sparked my interest in options and taught me a lot of new skills.
- I would also like to thank Professor Gai to teach me SAS. He assisted me a lot throughout the project.
- I would like to thank Babson College for the software support provided.
- I would like to thank Monique for organizing writing days where we could sit and focus on writing our papers.
- I would like to give a shout out to tick data LLC for providing me data for free. This data cost was in the thousands and without their assistance this project would never be completed.
- I would also like to thank Professor Soybel and Professor Bliss for guiding me in the first semester. They were a great resource.
- My main shout out goes to my sister, Kripa Shroff. She supported me a lot and helped me sort my timings for the project. She helped me to avoid procrastinating and always guided me on the right path.
- I would also take this opportunity to thank Dad and Mom for assisting me to get a great education. Furthermore, I really appreciate the hard work ethics they taught me when I was young.
- Finally, I would like to thank my late Grand Mother for teaching and nurturing me. I believe she is still placing her hands on my head and she will always be there to bless me. I love you Dadi.