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ORIENTAL PROSPECTS: HOW OPTION TRADING VOLUME AFFECT FIRM VALUE IN ASIA

Evidence from Financial and Technological Companies of the Hong Kong Exchange

Department of Accounting and Finance
Master's thesis in Economics
Finance

VAASA 2021

UNIVERSITY OF VAASA
Faculty of business studies
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Topic of the thesis: Oriental Prospects: How Option Trading Volumes Affect Firm Value in Asia.
Evidence from Financial and Technological Companies of the Hong Kong Exchange.
Degree: Master's degree in Economics
Department: Department of Accounting and Finance
Major subject: Finance
Line: Finance
Name of the supervisor: Jussi Nikkinen
Timo Rothovius
Year of completing the thesis: 2021 **Pages:** 46

ABSTRACT

Nousevat markkinat ovat aina olleet suuren kiinnostuksen kohteena. Nyt erityisesti Kauko-Idän markkinoiden merkitys kasvaa jatkuvasti. Tämän kehityksen taustalla on erityisesti Kiinan nouseva merkitys globaalissa taloudessa, ja kiinalaisten yritysten nousu kansainvälisille markkinoille yhä kiihtyvällä vauhdilla. Samaan aikaan optioista on tullut erottamaton osa taloutta, ja niistä on vuosien varrella tullut yksi tärkeimmistä instrumenteista rahoitusmarkkinoilla. Optioiden kaupankäyntivolyymit ovat nousseet niiden esittelyn jälkeen eksponentiaalisesti. Tämän vuoksi on tärkeää, että optioiden merkitystä tutkitaan nousevilla markkinoilla. Johtuen optioiden ominaisuuksista, ne ovat yksi parhaiten soveltuvista instrumenteista informaatiolla kaupankäyntiin. Näitä ominaisuuksia ovat muun muassa vipuvoima, hinta, sekä mahdollisuus naamioida omaa toimintaa markkinoilla. Näiden syiden vuoksi ne houkuttelevat sisäpiiritiedolla kauppaa tekeviä sekä muita toimijoita, joilla on ylimääräistä, ei markkinoilla olevaa tietoa. On myös osoitettu, että informaation määrällä on positiivinen vaikutus yrityksen arvoon. Mitä suurempi määrä informaatiota on tarjolla, sitä suurempi yrityksen arvo on verrattain. Tämä ylimääräinen informaatio voi syntyä muun muassa laajasta analyytikkojen seurannasta, jonkun markkinatoimijan tarpeella hankkia ylimääräistä informaatiota, tai sisäpiiritiedon käytöstä. Tämän tutkimuksen tarkoitus on selvittää, onko optioiden kaupankäynnillä, ja siinä liikkuvalla informaatiolla vaikutusta yrityksen arvoon. Tämän saavuttamiseen tähän tutkimukseen on valittu rahoitus- ja teknologiayrityksiä Hong Kongin pörssistä, ja näiden yrityksen arvoa verrataan niiden optioiden kaupankäyntivolyymeihin, yhdessä muiden selittävien muuttujien kanssa. Vuosittaiset vaihtelut on otettu huomioon tekemällä vuosi-dummy muuttujat. Tämän tutkimuksen tulos on, että optioiden kaupankäyntivolyymillä on positiivinen ja tilastollisesti merkittävä vaikutus yrityksen arvoon. Tämä yhteys on suurempi call-optioilla, mutta se on tilastollisesti merkittävä myös put-optioilla. Tämän tutkimuksen tarkoitus on tuottaa arvokasta informaatiota Kauko-Idässä toimivien yritysten johdoille.

Key words: Financial Derivatives, Option trading, Firm value, Emerging markets, Asia

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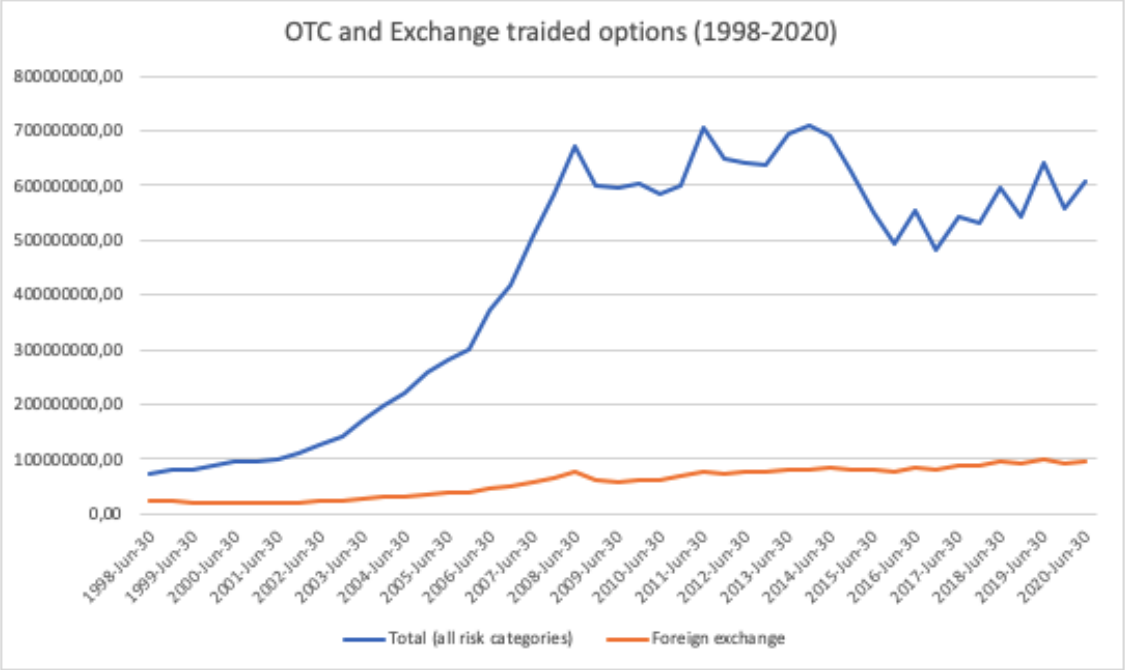
1 INTRODUCTION

Option markets, both exchanges traded and especially over-the-counter markets, have seen exponential and rapid growth over the past years. This is demonstrated in the figure 1, where quarterly option trading volumes have been gathered from the Bank of International Settlements (2020). The higher line represents over-the-counter volumes and lower line represents the exchange traded volumes. The growth has not only been limited to number of contracts but also to the number of underlying assets that options are available to. This rapid growth has made financial derivatives an inseparable part of the economy, and their economic significance has become undeniable. Options and other derivatives are used by all market participants to hedge, speculate, or to gain arbitrage.

***Figure 1**: Quarterly option trading volumes (1998-2020) (BIS, 2020).*



At the same time, the significance and economical influence of Asia, led by China, has grown to new heights. One of the well-known aspects of this expansion is known as “one belt, one road”-initiative, in which China strengthens its commercial network

(Sun & Hou 2019) and this has also led the way to influx of Chinese brands to globalize and to become household names in all parts of the world (Wang, Qiu, & Choi 2019). These include the likes of Xiaomi, Lenovo and Tencent to mention a few. When thinking about options, especially equity options, most of the attention is paid to American and European markets. Less attention is paid to Asian markets, which, although being less significant in volume, could still benefit from the properties that come along option trading.

One of these properties is the imbedded information that options carry. After the introduction of equity options, they were first treated as redundant, meaning that they nothing but price takers. But since the research conducted by Ross (1976) who showed that options can improve welfare, this started to change. Later on, Cao (1999) proved that options are not redundant indeed, but they have significant impact on the price of the underlying asset. This suggests that options can improve market efficiency, and agents with private or even additional information prefer to trade in options. At the same time multiple researches have shown that firm value and information have positive connection (see Fishman & Hagerty 1992, Khenna, Slezak, & Bradly 1994 etc.)

These two ideas were first combined by Roll, Schwartz, and Subrahmanyam (2009) who showed that positive option trading volumes have significant effect on firm value, proxied by Tobin's Q. This relationship is due to combinations of market completion and the encouraged information trading. They make distinct differentiation between more active and less active markets. According to Roll et. al (2009), the positive relationship between option trading volumes and firm value is more profound in active market. Hong Kong Exchange is among the largest exchanges in the world, and Chinese market is one of the voluminous markets in the world. When observing active markets, the option trading volume remains positive even after accounting for the firm value. The research conducted by Roll et. al (2009) could have potential to ease every manager's work and can be considered as the starting point for future research on informational value of option trading and its effects on firm value. Blanco and

Wehrheim (2017) continue the research by showing that option trading volume has positive effect on firm's innovation, both in terms of increased patent applications as well as heightened return on research and development, further indicating that managers can utilize the information that is provided by options.

In this thesis the relationships between option trading volume, firm value and informational efficiencies in the Hong Kong Exchange with Chinese companies is examined. Other factors explaining the effect are the profitability and size of the company. After we have proven the relationship to be true, we can draw conclusions on how it is born, how it can be used, and what implementations it could possibly have based on previous research.

1.1 Motivation

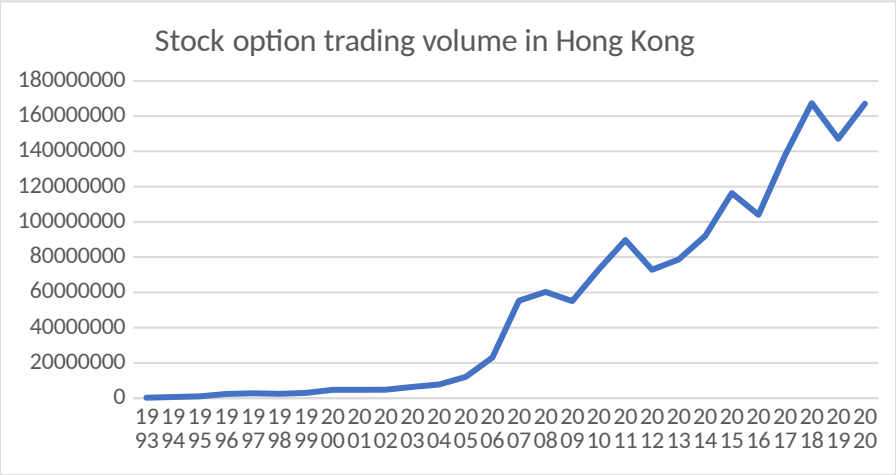
Previous studies have shown that option trading volume has a positive effect on firm value. These studies have all been centered around American markets, where the total volume is much greater than anywhere else. This empirical study continues from my bachelor's thesis: *How Option Trading Volumes Affect Firm Value: Deriving information from option volumes* (Leino, 2018) and aims to show whether these same links exists in less active markets. It should be noted that Hong Kong is a massive market by itself, and the characterization "less active" is only used to describe it when compared to the North American market. Hong Kong equity options are mostly on Chinese companies, and as the economical might of China rises, it is possible that more and more foreign personnel will be working in these Chinese companies as they set to globalize.

Emerging markets have always raised interest among finance professionals. They can be lucrative investment targets as the returns, along with risks, are significantly higher compared to developed markets. In addition, more companies see emerging markets as suitable to entry as regulations and rules have improved. However, emerging

markets have always been difficult to assess as standard financial models are unsuited for the different world of emerging markets (Bekaert & Harvey, 2003). When it comes to investments and fund-raising, Asia-Pacific (APAC) is on its own level among emerging markets, this being driven especially by China (Oberli, 2014) This means that foreign investments are coming in at increasing rate, and domestic companies use stock exchanges as their main fund-raising platform. According to Oberli (2014), between 50 to 65 percent of all funding in the APAC-area is raised through Hong Kong and China Mainland during 2007-2012, and the importance of both has increased ever since. In a survey, most institutional investors are preparing to grow their proportion of investments to emerging markets (Oberli, 2014).

While emerging markets have become more attractive for both foreign and domestic companies the significance of options have risen. They have become inseparable part of modern financial markets. Options have always had a less shiny reputation in the eyes of the general public, due to the many issues and large losses they have created, but as an investing instruments they are one of the most versatile and provide numerous benefits (Hull, 2015). It is only natural that portion of these newly invested founds mentioned by Oberli (2014) goes towards options for multiple reasons; leverage, hedging, higher returns etc. As it can be seen from Figure 2, the option trading volumes have started to truly grow after 2005 (Hong Kong Exchange, 2020). Even though there is more variation compered to more developed markets, the trend is clear. As emerging markets are defined by fast pace and competition is high, it is important to find new ways to receive and analyze information. In addition, the more current financial theory can be applied to emerging market, it becomes more easily predictable and integrated into the global economy. The most suitable place to start is large, international companies as they attract more capital and are more familiar. This is why this thesis focuses on technological and financial companies.

***Figure 2**: Annual stock option trading volume in Hong Kong Exchange (1993-2020) (HKEX,2020)*



The purpose of this thesis is to find out whether or not options benefit all parties, from investors to regular companies, how options can provide valuable information to support managers in their decision making, and to see if principles learned from developed markets can be applied to emerging markets

The results of these thesis, combined with the groundbreaking previous studies, could benefit all managers both in China and in Chinese companies working in global offices. As to the best of knowledge, no previous studies of option trading volume and firm value focusing on emerging or Asian markets have been conducted.

1.2 Research problem and hypotheses

The research problem can be stated as such: Previous studies (see e.g. Roll et. al, 2009, Blanco & Wehrheim, 2017 etc.) have shown that higher option trading activity has positive effect on firm value in highly sophisticated derivatives markets. Does this same relation exist in Asia? If it does, the goal is to draw conclusions as to why it exists and how can it be used to get an advantage.

This problem leads to the hypotheses, which is based on research by Roll et. al (2009):

H_1:There is a positive relation, and it is driven by call options

H_2: There is a positive relation, and it is driven by put options

The aim is not to dismiss both of the hypotheses, as depending on the results, both could apply as if there are not efficient amount of evidence to discredit the other. It would be preferable to confirm at least one of them, meaning that the null hypothesis that option trading volume does not have positive effect, or no statistical effect on the firm value can be rejected. If both hypotheses are accepted, it is a clear indicator that option trading volume itself is the main driver, despite of the market situation. If only one hypothesis is accepted, there will be a need to analyze why other type of option has significant effect when the other does not.

1.3 Structure of the thesis

This thesis is structured as follows; Section two provides the theoretical background of options and firm value. It is important to understand these two concepts fully, as it is tightly linked to the current research and market environment that will be presented in chapter three. Following this, in section four what type of data are used is presented, where it is collected and the descriptive statistics. Here the regression model along with variable descriptions and reasons on why the model was selected are presented. In chapter five, regression results are presented, analysis based on these results is conducted, and potential further directions to continue as well as some limitations this research might have are suggested and pointed out. This thesis concludes with chapter six where an overview of the entire research is performed. In the end there is an appendix where all the companies included in this research are stated as well as the divide between technological companies and financial companies.

2 THEORETICAL BACKGROUND

In this section one goes over the theoretical background of options, how information affects firm value, and how options and firm value are connected. Understanding why and how options are linked to firm value though information conveying is the cornerstone of this study, so understanding the mechanics behind it is paramount. It is important to understand how option prices are formed in order to see why private information is imbedded into them, how firm value is affected by information, and then how these are connected. The generic background is opened up and also different markets are compared in order to see if there are any deviations in the Asian markets.

2.1 Options and firm value

As stated in the introduction, both option trading volumes and the underlying assets to which options are available have increased drastically over the past decade or two. Options have many uses in modern finance; they can be used to speculate in order to profit from future movements, used as a hedge against unknown and undesired future movements, or used to profit from differences in prices, also known as arbitrage. Although the nature of all purposes is different, they are all needed.

Firm value, or market value, can be simply defined by multiplying the stock price with the number of outstanding shares. It is one of the main concerns of investors and managements, as one makes money based on the firm value, and another's responsibility is to maximize this value. In this paper, Tobin's Q is used as a proxy for firm value, as it takes more factors into consideration, and the Tobin's q is explained, and why approximate Tobin's q is selected in this chapter.

2.1.1 Options

Options have become important and inseparable part of financial markets. Options are divided into two groups; A *call option* is a right to sell the underlying asset at previously disclosed price, and a *put option* is the right to buy the underlying asset. On the other hand, the writer of option is obligated to sell or buy the underlying asset, if the holder chooses to exercise the option. This is the main difference compared to futures or forwards, where the price is agreed and both participants have to honor the agreement, either by closing out the position or trough actual delivery of the underlying assets. This also means that in order to acquire an option, one must pay premium. Options are then possible to divide into *European options* and *American options*, where the difference is the expiration date (Hull 2015: 8-9). As mentioned earlier the spectrum of underlying assets has grown from just stocks to include stock indices, foreign currency, future contracts, etc. The decision of exercise is made based on the price of the underlying asset at maturity in European options, or at the time of possible exercise in American options. If the price of the underlying asset is beneficial compared to the strike price of the option, the option will be exercised (Black & Scholes 1973).

Today options are traded around the world. Chicago Board Options Exchange is the largest option exchange in the world, and in Europe trading is done in Eurex. In Asia, only two large exchange offer equity options; The Hong Kong Exchange (HKEX) and the Japan Exchange Group (JEG). Most exchanges in Asia focus on Index options, like the Singapore Exchange and the Korean Exchange, or Options on ETFs, like the Shanghai Exchange. In addition, Over-the-counter markets (OTC) exist alongside exchanges, and these markets are responsible of most of the option trading volume. OTC markets are usually used by large institutional investors and trade sizes are much greater (Hull 2015: 1–6). The Hong Kong exchange operates similarly to other large derivatives

exchanges. Customer places an order in which the order type, option type, contract volume, maturity, strike price, and other specific details are instructed. Exchange then finds a partner to take the opposite side of the transaction (Cox & Rubenstein, 1985). The contract size in the Hong Kong Exchange varies from 500 to 10000 underlying shares, the most common contract size being 2000 shares. The maturity offered is next three calendar months or next three calendar quarter months, although it is possible that longer maturity is offered in some cases, and the contract is always a spot contract. The option premium is quoted in Hong Kong dollars, and strike prices are 0-500 Hong Kong dollars with rising internals. Trading is limited to two sets: 9:30am to 12am and from 13:00pm to 16:00pm local time. It should also be noted that Hong Kong Exchange has underlying companies divided into three tiers with different size trading tariffs (HKEX, 2020).

The difference between put and call options should be explained further, as in this thesis it is observed, if they have different kind of effect on the independent variable. Buyer of call option profits if the price of the underlying asset exceeds the strike price and loses the premium paid if the price of the asset is under the strike price. This is the opposite for put options, where buyer profits from prices under the strike price. Another way of looking at put and call options is that call options provide downside protection and put options provide upside protection. By themselves call option is then essentially a long position on the underlying asset with limited losses if the price of the underlying asset drops. Put option is the same as short position on the underlying asset, with limited losses if the price of the asset rises (Cox & Rubenstein, 1985). Although it is common to combine different options, different maturities, and underlying assets together in order to generate and customize strategies for specific scenarios (Hull, 2015), this thesis uses the basic idea of calls and puts when deducing the possible reason for the obtained results.

It is important to understand how options are priced, as that is connected to them being preferred by informed agents. In its most basic form, the equation for option

value can be seen as difference between strike price of the option and the price of the underlying asset (Bingham & Kiesel 1998: 2-3):

$$max\left[S(T)-K,0\right] \text{ for European Call,} \tag{1}$$

And

$$max\left[K-S(T),0\right] \text{ for European Put.} \tag{2}$$

However, for the price of the option, more precise formulas are needed. The Black-Merton-Scholes formula is the most well-known of these. Black and Scholes (1973) approached the problem by utilizing Capital asset pricing model, and Merton (1973) by setting a riskless portfolio. Many variations of the BMS formula exist, depending on the use, but the most basic formulas for European options are as follows (Hull 2015: 335-336):

$$c=S_0N\left(d_1\right)-Ke^{-rT}N\left(d_2\right), \tag{3}$$

and,

$$p=Ke^{-rT}N\left(-d_2\right)-S_0N\left(-d_1\right), \tag{4}$$

Where

$$d_1=\frac{\ln\left(\frac{S_0}{K}\right)+\left(r+\frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}, \tag{5}$$

and

$$d_2=\frac{\ln\left(\frac{S_0}{K}\right)+\left(r-\frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}=d_1-\sigma\sqrt{T}, \tag{6}$$

Where

$S_0 = Price\ of\ the\ underlying\ asset$

$K = Strike\ price$

$T = Time¿\ maturity$

$r = Risk-free\ interest\ rate$

$\sigma = Volatility$

$N(x) = Cumulative\ probability\ distribution\ function$

Options are exercised in almost all cases when it is beneficial. Otherwise their value is zero, and the paid premium is lost. As it can be seen from the BMS model this premium is much less than the price of the underlying asset, since the BMS model takes volatility into consideration as well. This attracts informed agents, since it enables larger leverage. There are also numerous different models but they all more or less derive their origin from the BMS-models, with added variables or equations so that it would be better applicable to different underlying assets or markets (Cox & Rubenstein, 1985).

2.1.2 Firm value

Firm value is of great importance to company management, and to current and possible investors. The responsibility that management has for investors means that without additional information management tends to focus more on short term profits, neglecting the benefits of long-term value. It is therefore evident that information is the key to long-term success and what factors could play into it, and this will be analyzed next.

One of the most obvious way to see how additional information affects firm value, is to look how company's valuation is affected by analyst coverage. Financial analysts are responsible for producing information alongside setting expectations on how well the company is expected to perform. The true movement of stock prices is not based on the actual profit or losses the company makes. More crucial is how did the company perform against expectations set to it. These expectations are often set by analysts. He and Tian (2013) find that management feels pressured by these expectations. As the management tries to match the benchmarks set to the company, the focus turns from long term value to short term profits (He & Tian 2013). When analyst coverage

intensifies, the market price becomes to be closer and closer to the fundamental value of the company. Therefore, lower levels of analyst coverage are correlated with higher returns. This meaning that added public information reduces the chance of positive, or negative, surprise (Doukas, Kim and Pantzalis 2005). The self-interest of analysts also plays a large role, as they often work for institutions that benefit from increased trading. Analysts also tend to protect their reputation. This results in more than necessary amount of recommendation changes and it especially it shows in buy recommendations, as mistakes there are not as costly (Womack 1996, Doukas et. al 2005)

Information affects companies' value through ownership as well, especially if the owner is an institutional investor, which is regarded as more knowledgeable compared to other market participants. When the institutional owner is committed to long term goals, the company is able to generate above average returns with lower volatility, and higher dividend (Borochin & Yang 2017). The role of Institutional owners is to function as blockholders. They tend to acquire more information about the firm and are more dedicated. Blockholders enable management to invest more when there is no fear of short-term performance and if the blockholders stay as owners it shows positive signals to other market participants and has a positive effect on the stock price (Edmans 2009). After the 2008 financial crises, some short-sale constraints were introduced. Nagel (2005) finds that companies with institutional ownership are less likely to encounter short-sale constraints. Not being able to short sale means that countering over-pricing becomes more difficult. This means that returns become more predictable as levels of institutional ownership increase (Nagel 2005).

The information affects firm value also in the case of going public and stock liquidity. Stock liquidity is important for two reasons. The first one is simple: The higher the stock liquidity, the better the performance of the stock. This is even more so with firms that have high quality research and development departments or whose stock prices experience high volatility (Fang, Noe & Tice 2009). Liquidity traders and informed

agents prefer active markets, as it enables the masking of informed trades under the noise. In these markets the information has more value, which is translated to stock prices (Kyle 1985, Holmström & Triole 1993). Second reason is that higher liquidity means that trading costs are lower. Although this attracts investors driven by short term profits (Porter 1992), which in itself increases the need for the company to focus on these short-term profits (Fang et. al 2014). This can lower the threshold for blockholder to acquire part of a company, increasing the amount of information (Edmans 2009). Initial public offerings affect both stock liquidity and analyst coverage. Bajo, Chemmanur, Simonyan and Tehranian (2016) show that centrally lead IPOs increase both analyst coverage and stock liquidity, therefore reducing the possibility of under-valuing the company when listing, as more information is gathered by the underwriters (Bajo et. al 2016).

One can see that information is the key for enhancing long-term firm value. Having long-term goals means that investors are willing to acquire more information about the firm, in order to decide whether to keep their investment or not. Decision to continue with the selected firm sends signals to other market participants, increasing the value. Stock liquidity increases the informational content in the prices, but it may also put emphasis on short-term profits.

2.1.3 Tobin's q

Considering the importance of Tobin's q to this and previous research, it is paramount that it is clear to everyone. Tobin's q is one of the key figures in firm valuation, developed by James Tobin, and since it is a simple way of calculating firm value, it has become highly popular among researchers. The basic idea is not complicated:

$$Q\,ratio = \frac{Total\,market\,value\,of\,firm}{Total\,value\,of\,assets}. \tag{7}$$

In this research, the approximation off Tobin's q will be used, created by Chung and Pruitt (1994), as other versions, such as Linderber and Ross (1981), Lang and Litzenberger (1989) are deemed too time consuming with little added benefit to the end result. Lang and Litzenbergs (1989) model is the most accurate one and it is as follows:

$$q = \frac{PREFST + VCOMS + LTDEBT + STDEBT - ADJ}{TOTASST - BKCAP + NETCAP},$$

(8)

Where

PREFST= Liquidating value of firm´s preferred stock

VCOMS= Price of the firm´s common stock multiplied by the number of shares outstanding at the close of the year

LTDEBT= Value of firm´s long-term debt, adjusted for its age structure

STDEBT= Book value of the firm´s current liabilities

ADJ= Value of the firm´s net short-term assets

TOTASST= Book value of firm´s total assets

BKCAP= Book value of the firm´s net capital stock

NETCAP= Firm´s inflation-adjusted net capital stock

However, Chung and Pruitt's (1994) model captures 96,6% of the variability obtained from the previous model, and is significantly faster and easier to use, which is why it is chosen for this research. Also, the numbers for the approximate q can be derived from basic financial statements, as the more detailed data are near impossible to find for companies at Hong Kong Exchange. The approximate q is calculated as follows (Chung and Pruitt (1994):

$$Approximate\, q = \frac{MVE + PS + DEBT}{TA}, \qquad (9)$$

Where

MVE= Product of Firm´s share price and the number of outstanding common stock
PS= Liquidating value of the firm´s outstanding preferred stock
DEBT= Value of short-term liabilities + short-term assets + book value of long-term debt
TA=Book value of firm´s total assets

2.2 How information ties options and firm value

It is known that information has a significant effect on firm value, and by taking a look at how options carry information and why informed traders prefer to use options compare to other forms of investment. If options carry significant amounts of information, it is expected that it has prefund effect on stock prices, and therefore effecting the firm value. This section aims to provide evidence tying options and the information imbedded in them to firm value.

2.2.1 Information trading

As proved by Cao (1999), if the hypothesis of completely efficient markets is relaxed, as it is often the case, options have significant impact on the price of the underlying assets. The existence of options makes it easier and more efficient for agents with private information to benefit from this additional information (Cao 1999). Two most important variables in options pricing are volatility and stock price, and if there is information that is not incorporated in the stock price, options become attractive (Easly, O'hara, Sirinvas 1998) and the risk of holding an option is reduced (Cao 1999).

One of the main reasons why informed traders prefer to use options is the added leverage that options provide. If the information is positive by nature, the existence of options enables trading to be profitable in all possible situations, as the trade can masquerade the inside information the trader has (Biais & Hillion 1994). This is

confirmed by Back (1993) who states that options enable going around short sale constraints as well as add leverage (Back 1993). Options are widely used in risk management and possess great downside protection. Chakravarty, Gulen, and Mayhew (2004) state this downside protection along with leverage is what attracts informed trading. The leverage depends on the moneyness of the option. Out-of-the-money (OTM) options possess the largest leverage, due to the large Bid-Ask spread. However, most informed traders use At-the-money (ATM) or In-the-money (ITM) options, as it is important to camouflage the informed trading (Hu 2014, Chakravarty et. al 2004).

Informed traders are selective in more than just the moneyness of options. Admati and Pfleiderer (1998) suggest that informed traders tend to trade in more active markets, and inside the market when it is at its busiest. By doing this, informed traders make sure that their trades have as little price effect as possible (Admati and Pfleiderer 1998). This is supported by the findings of Pagano (1989) and Kyle (1985) who state that if there is no difference in costs between two markets, the trading will concentrate in one of them (Pagano 1989). This is because the noise generated by liquidity traders makes it easier to mask informed trading (Kyle 1985).

Option markets make it highly profitable for market participants to collect additional information. This information affect market prices, making it an important factor in long-term investments. Previous studies (Manaster & Koehler 1982, Hull 2017, etc.) explain that in BMS formula, all other variables are known except volatility, and therefore the implied volatility obtained by reversing the formula gives a reasonable accurate description about market participants expectations about the future prices. This is confirmed by Hu (2014), who discovered that also the order flow of options contains information effecting future prices. Although option trading flow in volume sense is an insignificant part of stock order imbalance, it is significant in a sense of information content, and that this is caused by constant information flow (Hu 2014). It should also be noted, that similar kind of information content is missing from index

options, driving home the point that informed traders use options specifically due to the information they have about specific company (Pan & Poteshman 2006).

Information content of options is born out of many different factors. Options provide immense leverage, which in of itself is enough to attract informed investors. Then informed investors have the ability to choose the option moneyness, time and place for trading, and to design trades that match the information they have. It has been shown (Chakravarty et. al 2004) that private information in options is conveyed to stock prices, having a significant effect on them.

2.2.2 Firm value effected by informational efficiency

Both the source of the information and the quality of information matters in the stock markets. There is a difference between informed agents and traders with inside information. It is possible that insider information may have a negative impact effect in the stock market. It affects liquidity and in worst cases changes the managerial incentives, and it deteriorates the trust in capital markets. Although it can also be argued that all kinds of insider information makes the markets more efficient, no matter what the original source or purpose of the information is, and it is shown that in markets with relatively more insider trading, the informational efficiency is indeed higher (Fishman & Hagerty 1992). Firm might even condone insider trading as then the insiders are usually battling with informed outsiders. Through this it might have positive effect on initial offer prices (Khanna, Slezak & Bradley 1994). This suggests that companies can find equilibrium where the information efficiency benefits the company the most.

Informational efficiency also translates into price efficiency. In the markets, one can find direct and undirect signals. For example, price is a direct signal. An indirect signal might be when someone has private information about the product, which changes

the perception about the price. (Dow & Gorton 1997). Stock prices in secondary market are widely regarded to have the largest information content. However, secondary stock market and managerial decisions are heavily linked, which in turn means that investors need incentives to collect additional information in order to preserve the link and profit from it. It is important, since if the connection is broken, that managerial decisions are not affected by the price signals, which could lead to managerial agency problem (Dow & Gorton 1997).

One possible part of an agency problem can be the allocation of resources. If the agency problem is mitigated by informational efficiency which is improved by informational agents trading in option markets, it leads to improved quality of investments. This in turn has a positive effect on firm value (Fishman & Hagarty 1992, Subrahmanyam & Titman 1999). Better informational efficiency, despite the origin or intended purpose of the information, equals greater economic efficiency. This is due to the mitigation of agency problem and better allocation of resources in terms of investments. (Fishman & Hagarty 1992, Khennan et. al 1994, Dow & Gorton 1997, Subrahmanyam & Titman 1999). Therefore, a presumption can be made that because options are preferred by informed agents, this leads into informational efficiency balancing informational efficiency, increasing firm value. In other words, higher option trading volume should mean improved firm value.

2.3 How information affects firm value in Asia

It has become clear that information has different ways of effecting firm value, but the general census is that accurate and neutral information tends to have positive impact on firm value. In order to find out if the information has similar way of being translated into value previous research on the subject is presented. Due to the the specific subject of this theses, one would tend to focus on research done on Hong Kong

Exchange, but as Hong Kong trading is closely tied numerous countries in East-Asia, looking at the entire APAC area is important.

One of the main reasons that make this study interesting is that according to previous studies (Morck, Yeung, & Yu 2000, Kalok Chan & Allaudeen Hameed 2006), nor the need or desire to collect firm-specific private information should exist. According to Morack et. al (2000) the Asian stock market is so highly correlated with worldwide markets, especially the US market, that this on itself is enough to discourage private information accumulation. They also state that weak property laws, which has been the case in the past, especially with China, prevent more detailed information from developing into the stock prices. Secondly, Far-Asian companies have traditionally been in general highly family-centric or otherwise owned by small group, such as major government ownership. This is connected to the blockholder theory discussed earlier. The close circle of owners and managers is highly incented to collect private information regarding their own company and would also be equally reluctant to share this information. As is the case with blockholders, these owners and managers would highly benefit by using options in order to mask their traders and acquire more leverage.

The third and fourth reasons are lack of willingness on corporate side to publicize information and the overall level of corporate governance. As an extension, corporate transparency is low and that the level of surveillance to monitor the corporate governance by the regulators has been missing. When the regulatory body is weak or missing entirely, insider trading is more rampant and obvious then it would be otherwise. It should be noted that the study by Morac et al. (2000) has been conducted pre 2000, right after major financial crises in Asia. After this, both the companies and the stock exchanges have improved greatly on both issues. First and foremost, this development attracts new investors and prevents the market from falling into similar crises. Both this and the fast development of derivatives trading in

the Hong Kong exchange might have driven more insider trading into the option market. This is, however, just speculation and subject for another study.

Chan and Hameed (2006) continue the research by turning their attention to analyst coverage. If the case is that Asian markets are highly correlated with worldwide markets as proposed by Morack et. al (2000), then the question is what would be the effect of analyst coverage. As discussed in earlier chapters of this research, analyst may have alternative motives to produce and make public information. Chan and Hameed (2006) find that as the analyst coverage increases, it incorporates more and more market-wide information, and the impact of firm-specific, detailed information is diminished. This would suggest that there is another way for utilizing private information. They also note that the corporate governance and regulatory aspects mentioned by Morack et. al (2000) mean that it is more expensive to collect private information. With the high cost taken into account, the information would then need to be leveraged and options could be ideal for this purpose. Analyst information can also be considered public information, and when this information is impacted by marked-wide details instead of more specific ones, analyst cannot compete with insider traders or blockholders in producing private, detailed, and firm specific information. Both Morack et. al (2000) and Chan and Hameed (2006) show that institutional investors are considered as informed agents in emerging markets.

Although the overall number of detailed studies regarding how information by different collectors effects the firm values in Asia, and more specifically in Hong Kong, it is clear that the mechanisms in the information contribution work similarly to more developed economy. During the past decade one have seen rapid market development in all aspects, so there is reason to believe that these mechanisms in Hong Kong and The United States work even more similarly now. Based on this one can expect similar results in our analysis. In the next chapter focus shifts to previous studies that answer the question; “How option trading value effect firm value?”. These studies performed

in The United States work as the inspiration, when performing the empirical analysis in this research.

3 Current research and market environment

Although some studies (see: Choy & Wei, 2012) suggest that there might be little connection between information and options since it is unclear how much information is in options as the effect on earnings announcements is minor. However, this is directly contradicted by Truong and Corrado (2014) and related to this, a large portion of existing literature seem to confirm the existence of link between information and options (Biais & Hillion 1994, Easly et. al 1998, Cao 1999, Chakravarty et al 2004)

Due to the novelty of the subject, not many studies focus on the link between option trading volume and firm value. Most importantly, Roll, Schwartz, and Subrahmanyam (2009), approach the subject similarly as this this research does. However, the focus of this research is in the emerging markets, especially in Asia, which is far behind the most known markets in option trading volume and overall turnover. There are many aspects of Hong Kong Exchange which makes it unique in world, including large foreign

cash-flows and possibility to enter Chinese stock markets. To the best knowledge, similar studies from emerging markets do not exist. Roll et. al (2009) use Tobin's q as a proxy for firm value and they calculate option volume by multiplying the end of the day mid-point in bid-ask spreads to come up with option trading volume and use financial statement data for other variables.

The magnitude of the research conducted by Roll et. al (2009) is massive, including on average 6500 companies per year. Being a market wide study, the result should give comprehensive picture and understanding about how option trading volumes affect firm value. This thesis uses the research by Roll et. al (2009) as guideline, as one has seen that the same motivations and reasons drive insider information in the Asian markets. There is some variation in the overall firm count and in number of firms with positive option trading volume. Roll et. al (2009) explain this with the bursting of tech bubble in the late nineteens, which resulted in numerous bankruptcies.

Their main conclusion is that for companies with positive option trading volume, the Tobin's q is around 17,49% larger, compared to the entire sample. This is in line with the hypotheses of this thesis as well. It comes as a little surprise that Roll et. al (2009) also find that the firm size is significantly larger for companies with positive option volume. This in itself would indicate that maybe it is the firm size that drives the option trading volume, and not the other way around. CapX has positive impact when considering full sample and ROA has negative impact. Both of these are measures for growth opportunities. In align with the notion that growth opportunities are more emphasized when valuing smaller firms, both variables are statistically insignificant for firms with positive option trading volumes, which mostly consist of larger companies. This could mean that these variables also drive higher option volumes instead being resulted from them. However, after doing robustness checks by using moneyness of options and open interest, it is clear that option volumes still have positive and significant effect on Tobin's q (Roll et. al 2009). As the size is important driver, in this

thesis, financial companies are selected as one industry as they are among the largest companies in China.

In unison with the results of the previous study, Blanco and Wehrheim (2017) continue the research by Roll et. al (2009). They approach the subject from innovation standpoint. If higher option trading volume means higher firm value, and this is because additional information, then this additional information should also give managers incentives and trust to expand the company's innovation output. Tech companies have always been early adapters of new technologies and they also continually produce new technologies by definition. As the other industry included in this thesis is tech companies in Hong Kong exchange, this idea is also relevant to us. If there is a connection between higher levels of innovation and patents and option trading volume as well as a connection between option trading volumes and firm value, tech companies would be where the manifestation of this relationship is at its largest.

They found that not only does higher option volume improve firm value, it also has positive effect on firm innovation. According to Blanco and Wehrheim (2017) the productivity of investments in research and development is significantly better when the firm has higher option trading volumes, and that option listing means a large (37%) increase in patent citations. These are largely due to the same reasons as the improvement in firm value. As option volumes are higher, the managerial agency problem is mitigated, and managers have better understanding of the impact of their decisions and are more willing to invest in long-term, same as the investors (Blanco & Wehrheim 2017).

3.1 Market Environment

As mentioned before, China has become one of the most important emerging markets in the world. During the past 50 years China has moved from highly restricted markets

to normal, regulated markets. This has been done gradually over the years. During this time the average economic growth has been around 9% annually. Previously known mostly from manufacturing, this economic growth has increased internal demand and demand for higher quality as people have become wealthier. (Managi & Kaneko, 2010). There are still numerous issues and characteristics that separate Chinese markets from developed markets such as high government influence and regulation. It has been a challenging market for foreign companies to enter (Cao, 2011). In the same time, Chinese companies, led by technological and financial firms, have started to grow and foreign companies pay increasing amount of attention to the Chinese markets, along with foreign capital. Therefore, Chinese markets have become distinct, known for large scale exportation and capital inflows (Liu, Buck & Shu 2005).

Hong Kong on the other hand, has had free markets for most of its existence as a British domain. As a major trading hub since the 1900s, Hong Kong economy developed to a high-income economy early. Since Hong Kong was ceded back to China in 1997, it still kept economic independence under the “One country, two systems” policy, and was listed as the most economically free country in the world in 2018 by the Fraser Institute (2020). Recent times have been turbulent in Hong Kong, starting with new stricter legislation followed up by mass protest, up to the Covid-19 virus. The financial center of the Chinese region is slowly moving up as Shanghai Exchange has grown rapidly. In terms of market capitalization, the Shanghai Exchange has already surpassed the Hong Kong Exchange. However, Shanghai is still lacking in some respects. Most importantly for this thesis, Shanghai does not offer options where the underlying asset is shares, only to indexes (SSE, 2020).

It is certain that Hong Kong will be extremely important financial center in the future. One of the main reasons for the economic growth in China are Foreign Direct Investments, or FDI. China is second only to the US in FDI amounts. Hong Kong has become the hub trough which these capital flows are routed. in terms of regions, Hong Kong counts for more than 60 percent of all capital inflows to Mainland China, and

over 50 percent of all capital outflows from Mainland China (Fung & Yau, 2012). The overall market situation is stable, and Hong Kong plays an important part in internationalizing Chinese currency, the Renminbi. In the future, it is possible that some of the stocks will be listen in RMB rather than in Honk Kong Dollars. This would mean that some of the option and other financial derivatives quotations might switch to RMB as well (Fung & Yau, 2012).

4 Data and methodology

This chapter explains and opens up Data and methodology used in this thesis. First, this thesis introduces where the data are collected, what it consists of, and how extensive it is. Then the descriptive statistics of first option data are presented, followed by firm variable data. This chapter concludes with the presentation of methodology and introduction of the regression model used to calculate the results.

4.1 Data

Extensive option data and firm variable data are used in this research. Option data for both call and put options will be used as out main independent variable and will be presented separately first. Then our firm valuable data is presented, from which one set will be used as dependable variable, and other sets as the control variables. The list of the companies and industry divide can be found in the appendix.

4.1.1 Option trading volumes

Option data are collected from DataStream with the help of University of Vaasa. Data are collected daily for the full year, starting from 01.01.2016 and ending at 31.12.2018. The number of banking days each year is almost the same, with 2016 having 261 banking days and 2017 as well as 2018 having 260 banking days. Full data consists of Market price (MP) which is the settlement price issued by the exchange. If the option has not been traded, the price is the average of latest bid and ask prices. The data are collected for all traded option series with reasonable expiry dates. Volume of contracts traded (VM) is the total cumulative total volume for all individual option series. Option trading volume is then calculated as follows:

$$OTV_{t=1} = MP * VM\,, \tag{10}$$

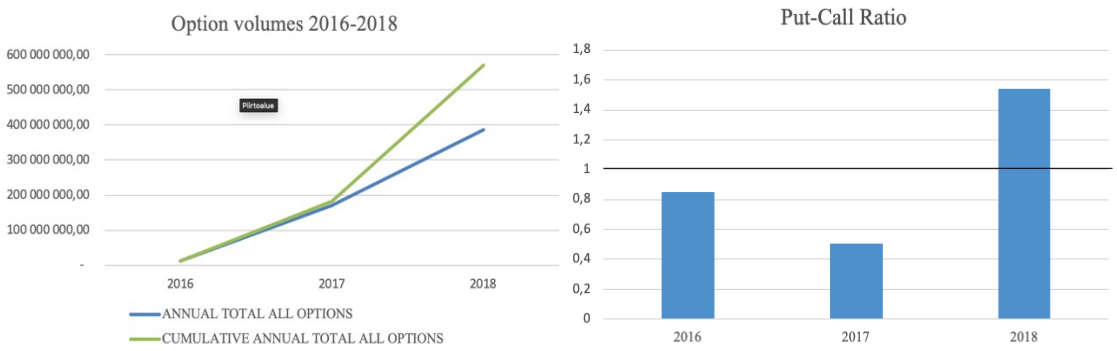
Where $OTV_{t=1}$ is the Option trading volume for specific year. The data are collected for 27 companies total. Years 2016 and 2017 have 26 companies, as Xiaomi listed in Hong Kong change in 2018, so there could have not been option volumes before that. These companies come from two specific industries; technology and finance. The technology companies consist of both software and hardware manufacturers. The finance companies include commercial banks, investment banks, and insurance companies. These two industries include some of the largest Chinese companies like Tencent and Industrial and Commercial Bank of China. In addition, among these companies are the most worldwide recognized firms from Hong Kong exchange.

***Table 1**: Scope of the research*

Scope of the research		
Year	All Firms	Firms with positive option volume
2016	26	25
2017	26	25
2018	27	25

The company has positive Option trading volume, when the Market Price times Trading volume gives a positive number. Therefore, when the option trading volume is zero, it is not counted. The number of companies with positive option trading volume also varies as one company did not start option trading before 2017, and another stopped option trading for 2018. Therefore, there are no years when all the companies included had positive option trading volume. This should bring more effectiveness into our regressions. The date collected for options is also separated into put and calls, therefore a test regarding the differences in put and call options can be performed. Figure 4 shows the development of option trading volume and the put-call ratio from the time range considered.

***Figure 3**: Development of option trading in selected companies and Put-Call ratio*



From this figure it can be seen that following the worldwide trend on option trading, the volumes are steadily rising as expected. The rise is much steeper than on more mature markets, but if compared to equity option trading volume between 2005 and 2010, the steepness of the clime is around the same (BIS 2018) .What should be noted is the sudden a fast rise of Put options from 2017 to 2018, indicated by the sudden jump in put-call ratio. Before the jump the number of puts traded was roughly half of the option trading of calls, with a downward trend, and then jumped to be one and half times larger.

4.1.2 Tobin's Q and control variables

The variable data are collected from Thomas Reuters, once again with the help of University of Vaasa. The data are collected for the same companies and consists of yearly figures for corresponding years. Data includes the following variables: Return on Assets (RoA) representing the firm profitability, and Book Value out Shares Fiscal (BVSF). BVSF is used instead of market value because with such a small-time interval, changes in firm size are more likely to manifest in share value then the total market value of the company. Tobin's Q (TQ) is the dependent variable and the proxy for firm value. By taking the calculations showed earlier for Tobin's Q, and modify them to

better fill the purpose of this research. Despite this, the purpose of the Q remains the same. The Tobin's Q is calculated by:

$$TQ = \frac{(EMV + LMV)}{(EBV + LBV)}, \quad (11)$$

Where

TQ = *Tobin's Q*

EMV = *Market value of Equity*

LMV = *Market value of Liabilities*

EBV = Book value of Equity

LMV = *Book value of Liabilities*

Streamlining the calculations gives us more easily usable and comparable numbers, as the gap between software and hardware -technology companies, as well as with and within financial institutions becomes more clearly visible.

The descriptive statistics are as expected with minimal surprises. The mean of Tobin's Q is over one, ranging from the low of 0.7 up to 6.6. It is skewed to the right and has large tails. Option trading volumes in all three categories (Total, call and put) have naturally high values in all the different descriptive statistics and this is as expected. All of them are skewed to the right and the tails of the standard deviations are substantially large. Mean of Put-volume options is higher than the mean for Call-volume options, but their median is around the same. This would indicate larger single numbers for Put-option volume. The maximum value (20.41%) for Return on Assets naturally comes from a software-developing company, with little assets and high returns. In BVSF it should be noted that no company did stock splits or similar actions that would have high impact on the value of the variable. Again, the results are as they would be expected.

***Table 2**: Descriptive Statistics*

Descriptive Statistics						
	Tobin's Q	OVT	OVC	OVP	ROA	BVSF
Mean	1.402	7902682.	3797536.	4105146.	3.496	16.011
Median	1.019	179713.7	87907.51	88663.59	1.410	9.984
Maximum	6.643	3.77E+08	1.44E+08	2.33E+08	20.410	84.687
Minimum	0.714	0.0000	0.0000	0.0000	- 9.430	2.045
Std. Dev.	1.049	459575595	20266622	26825056	5.325	17.199
Skewness	3.146	7.179	6.136	8.141	1.501	2.371
Kurtosis	12.909	55.66	39.522	69.531	5.491	8.550
Jarque-Bera	453.533	9806.761	4886.505	15442.51	50.093	175.435
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	110.767	6.24E+08	3.00E+08	3.24E+08	276.210	1264.884
Sum sq.Dev.	85.808	1.65E+17	3.20E+16	5.61E+16	2211.360	23076.60
Observations	79	79	79	79	79	79

The correlation matrix is also as it would be expected to be. Naturally all the different option measurements are highly correlated with each other. They will not be used in the same regressions and much emphases should not be put on these correlations. BVSF has little correlation with Tobin's Q, otherwise the variables have a correlation of over 0.5 with the dependent variable. Out of the different option volume variables, put volumes have the lowest correlations with other variables as well as with Tobin's Q. One possible explanation would be that as Put option buyers benefit from downwards trends in profitability and decrease of the share price, it is natural that they move in different directions.

***Table 3**: Correlation Matrix*

Correlation Matrix						
	Tobin's Q	OVT	OVC	OVP	ROA	BVSF
Tobin's Q	1.000					
Option volume (Total)	0.538	1.000				
Option volume (Call)	0.622	0.969	1.000			
Option volume (Put)	0.452	0.982	0.904	1.000		
Return on Assets	0.782	0.304	0.336	0.267	1.000	
Book Value out Shares Fiscal	0.054	0.151	0.153	0.143	0.195	1.000

4.2 Methodology

The methodology in this thesis is a multivariate regression model. This model will be run three times; Model 1 is run with call-option volume as main independent variable, Model 2 is run with put-option volume and finally Model 3 will be run as a robustness check with the total option trading volume to confirm that the results are similar. The regression model is run with Heteroskedasticity-consistent standard errors and covariance (Bartlet kernel, Newey-West fixed), in order to make sure heteroskedasticity and autocorrelation is already taken into account. The basic regression model is as follows:

$$TQ = \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 OV + \beta_5 ROA + \beta_6 BVSF + \varepsilon, \quad (12)$$

Where

TQ = Tobin’s Q

D_t = Year Dummy. 1 for the year of the observation; 0 otherwise

OV = Option trading volume

RoA = Return on Assets

BVSF = Book value out of shares fiscal

The three dummies will make it possible to analyze the effect of option volumes each year with high confidence. However, this means that when running the regressions, the intercept alpha needs to be dropped, as otherwise the regression model will be near singular matrix and cannot be run. The other variables return on assets and book value out shares fiscal can be seen as proxies for profitability and size respectively. Both of these aspects are expected to effect Tobin's Q so it is important to include them in the regression so the true effect of option trading volume to Tobin's Q can be observed more accurately.

Data and methodology are collected and selected to best fit the purpose of this research. Option trading data are massive in size and modifying is difficult. When all the data are put together, one end up with panel data and therefore multivariable OLS regression is selected. As the size differences between the different variables are massive, HAC correction is needed as the regression is ran. In the next section, the results of the regression analyses are presented, and the implications derived from these results are explained.

5 Empirical evidence

In this chapter the results of the test are shown, and analysis of the results is performed. Starting with the Model 1, followed by Model 2, and concluding in double check of combined option volume with Model 3. For running the regressions, Eviews is used, and then double check is performed with SPSS by IBM. The results are collected to a table for each model, variables will be on the right, followed by coefficient which have the standard deviations in brackets under it, except for dummies. Last two colons will be t-value and p-value respectively. Under each table the R-squared and adjusted R-squared are presented. These provide information on how well the model explains the changes in the dependent variable.

5.1 Regression results

Model 1 shows the relationship between Call-option trading volume and Tobin's Q. As it can be seen, the proxies for profitability and size are highly statistically significant. Call option trading volume is significant on 99 percent level. The coefficient is small and positive. This is not a surprise as the Option trading volumes are measured in hundreds of millions and Tobin's Q in single digits.

***Table 4**: Model 1 regression results*

Model 1			
In model 1 the dependent variable is Tobin's Q . Model is linear regression model with HAC standard errors and covariance (Bartlett kernel, Newey-West fixed.) The standard errors are reported under the coefficient in brakets, except for Dummy variables.			
Variable	Coefficient	t-statistic	p-value
D_{2016}	1.067940	9.533875	0.0000
D_{2017}	1.056304	13.24788	0.0000
D_{2018}	0.865424	9.630730	0.0000
Option Volume (Call)	2.22E-08 (7.01E-09)	3.159721	0.0023
Return on Assets	0.130733 (0.022114)	5.911884	0.0000
Book value (Shares Fiscal)	- 0.008372 (0.001688)	- 4.958172	0.0000

Return on assets has a positive relationship, but book value of shares has a negative, which is a surprise. However, the coefficient is small, and the values of share prices are close to the values of Tobin's Q.

Next are the results from Model 2. In the Model 2 the regression has all the other variables are as they were previously, except for the option volume, which now consistis of put options.

***Table 5**: Model 2 Regression results*

Model 2			
In model 2 the dependent variable is Tobin's Q . Model is linear regression model with HAC standard errors and covariance (Bartlett kernel, Newey-West fixed.) The standard errors are reported under the coefficient in brakets, except for Dummy variables.			
Variable	Coefficient	t-statistic	p-value
D_{2016}	1.024076	8.417334	0.0000
D_{2017}	1.074859	11.34549	0.0000
D_{2018}	0.841268	7.666373	0.0000
Option Volume (Put)	1.13E-08 (3.82E-09)	2.950440	0.0043
Return on Assets	0.143066 (0.024819)	5.764278	0.0000
Book value (Shares Fiscal)	- 0.007663 (0.002072)	- 3.698464	0.0000

Here one can see similar results to the Model 1. However, put-option trading volume is less significant compared to call-option trading volume, but it is still statistically significant on a 99 per cent confidence level. The coefficient measuring the effect is substantially smaller compared to Model 1. Again, return on assets and book value of shares are highly significant. The effect of return on assets is little larger in this model, and the negative effect of book value of shares is smaller, indicating that they have more positive effect in Model 2 compared to our first model. Despite the differences in the results, the two main models show clear connection between option trading volume, in both call options and put options, and the firm value measured by Tobin's Q. Next the results from Model 3 are presented, showing how the entire option trading volume is linked to the value of the firm.

Table 6: *Model 3 Regression results*

Model 3			
In model 3 the dependent variable is Tobin's Q . Model is linear regression model with HAC standard errors and covariance (Bartlett kernel, Newey-West fixed.) The standard errors are reported under the coefficient in brakets, except for Dummy variables.			
Variable	Coefficient	t-statistic	p-value
D_{2016}	1.045863	9.11403	0.0000
D_{2017}	1.072968	12.10736	0.0000
D_{2018}	0.847323	8.271064	0.0000
Option Volume (Total)	8.14E-09 (3.34E-09)	2.438640	0.0172
Return on Assets	0.137247 (0.022719)	6.041012	0.0000
Book value (Shares Fiscal)	- 0.008058 (0.001843)	- 4.372698	0.0000

In the Model 3, the results are similar as in the primary models. Although the p-value rises significantly from call and put option trading volumes, it is still significant at 95 per cent confidence interval, almost at 99 per cent confidence level. Also, the coefficient is substantially larger. This on the other hand can be explained by the sheer difference in the values. In total, put options compound a little over half of the total option volume, so the total option trading volume is nearly double compared to the other option metrics. Therefore, change of one in total option trading volume means almost half smaller change in Tobin's q. Other variables are highly significant, and the coefficients follow what have been seen in the first two models. Return on assets has a lower coefficient and book value of shares have a higher, but negative coefficient compared to the other models. Also, both of the explanatory variables have higher t-statistic compared to the other models.

5.2 Analysis of the results

The results of the regression analysis show clear indication of option trading volume affecting firm value. It would seem, that this effect is driven by the call option volumes, rather than put-option volumes. One possible explanation could be that as a buyer of put benefits from lower stock prices (Hill 2017), more put options are being purchased when the value of the company is in a downwards trend. Our results are then confirmed by the third model, proving that option trading volume is significant in Hong Kong exchange, confirming the ideas of previous researches (Roll et. al 2017). As the effects are now clear, attention can be turned to looking at the implications of this singularity.

According to the previous research (Fishman & Hagerty 1992, Khenna et. al 1994, Dow & Gorton 1997, etc.), it is clear that information is one of the main drivers of firm value. It has also been shown that information works similarly in Asia and has an effect on the firm value (Morack et. al 2000, Chan & Hameed 2006). In short this means that greater informational efficiency can been seen as greater firm value. It is also shown that options and option trading involve large amounts of firm-specific information and informed agents prefer to trade in options (Biais & Hillion 1998, Easly et. al 1998, Cao 1999, Chakravarty et. al 2004). These assumptions are also made by Roll et. al (2009), from which this thesis expands on. Roll et. al (2009) show that there is a clear connection between option trading volumes and firm value in large, well-developed markets, and it is driven by the informational content on the options, deductions based on the results can be made.

It can be seen that Option trading volumes drive higher firm values in the Hong Kong exchange for finance and technology companies. These companies naturally have higher impact on the economy and operate in more global environment then their contemporaries, but it can be still assumed that this effect is not limited to this companies only. It can also be deducted that this connection is created as information transmitted through option trading, and it is this inside information that effects firm

value. These results could help operators in Asia to better benefit better from the added information and to mitigate managerial agency problem. These results could also be stretched to implicate that managers could make investment decisions based on the option trading volume, as Blanco and Wehrheim (2017) show that companies with higher option trading volume have higher levels of innovation. This implies that managers do take information from option trading volume when deciding investment targets. Therefore, with high confidence the null hypothesis H_0:There is no positive relation between option trading volume and firm value can be rejected and accept both alternative hypotheses. It seems evident that H_1 is what drives the relationship, but there is no evidence that would lead to the rejection of H_2. Both of the hypotheses are accepted, with slight favor to the effect call options have on the firm value.

5.3 Further research and limitations

As this is the first research regarding option trading volume and firm value in developing markets, Asia in general, the first step would be to broaden the scope of the research, either by including more companies, larger timeframe, or more developed markets e.g. Japanese option market. This research could also be expanded to see how companies themselves or outside investors utilize the fact that option trading volume effects firm value in Hong Kong Exchange. This research is neither without any limitations. As daily option data are absolutely massive in size, this limits this scope in both the number of companies as well as in number of years that are included. These restrictions affect other aspects of the research as well. With a larger scope, more explanatory variables could be added to produce more comprehensive results. If the number of years is expanded, using pure market value as a proxy for firm size would be recommended and better suited, instead of share price. Over longer period of time, market value should show the effects of changes in size more accurately, and this eliminates the possible effects of stock splits or similar maneuvers that have large effect on stock price, and which are more likely over longer time horizon.

This concludes the presentation of the results and our analysis of them. In the next and final chapter, the background, results and analysis are combined into one comprehensive conclusion.

6 Conclusions

Since the creation of options, they have intrigued financial experts due to their versatility, hedging abilities, and the massive leverage that is possible to achieve by using them. The use and trading of options reaches new high every year, apart from the 2008 financial crisis. Even then, there was no significant drop. In later years the significance of Asian markets, especially China's influence in global economy has risen exponentially. It is therefore important to understand how developing markets work in order to maximize the benefit globally.

As informational efficiency is clearly linked to increased firm value and it is shown that options carry huge amounts of hidden information. This imbedded information in options is born from the aspects and usefulness of options. As agents who have motivation and are invested in collecting additional information want to reach maximal profits from it, they often prefer options due to the immense leverage options provide. Also, the actual information and trades are harder to trace, this also encourages traders and agents with inside information to use options to hide their activates. Previous research (Roll et. al 2009) prove that this link between option trading volumes and firm value exists in developed markets.

By trying to solve whether the same connection exists in emerging markets, focusing especially in Chinese companies from Financial and Technological industries that are traded in the Hong Kong Exchange this research continues from the previous studies by Rol et. al (2009) and Blanco and Wehrheim (2017). These companies include both soft- and hardware manufactures as well as banks and insurance companies. These kinds of companies are on the frontline of the Chinese global economic expansion. Tobin's Q is used as a proxy for firm value and build a multivariate regression model, including three dummies for the years, Option trading volume variable, and two control variables; Return on Assets and Book value of Shares, that are believed to have explanatory powers related to Tobin's Q. The research shows that there is a clear

connection between option trading volume and firm value. It also seems to be more driven by call option trading volumes then put option volumes, but both are statistically significant in explaining the Tobin's Q. It can be deduced that this relationship is born from similar causes as it is in more developed markets.

The results in this research can be utilized by foreign and local managers in Far-Asian companies, or in companies wishing to invest to these Far-Asian companies. When knowing that information is transferred through option trading it can be used for more decisive and accurate investing. Knowing now that both agents with additional information and insider traders use options to benefit from the information in Hong Kong Exchange, everyone can be encouraged to maximize the benefit of these oriental prospects.

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