The Impact of Single Stock Futures Block Trade transactions on underlying's volatility and return: Evidence from Stock Exchange of Thailand

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จุฬาลงกรณ์มหาวิทยาลัย
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An Independent Study Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Finance
Department of Banking and Finance
FACULTY OF COMMERCE AND ACCOUNTANCY
Chulalongkorn University
Academic Year 2019
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การศึกษาผลกระทบของสัญญาซื้อขายล่วงหน้าอ้างอิงหุ้นรายตัวต่อความผันผวนและผลตอบแทนของหุ้นอ้างอิง

นายโชติวิทย์ จิรธนานุวงศ์

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สารนิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
สาขาวิชาการเงิน ภาควิชาการธนาคารและการเงิน
คณะพาณิชยศาสตร์และการบัญชี จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2562
ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

Independent Study Title	The Impact of Single Stock Futures Block Trade transactions on underlying's volatility and return: Evidence from Stock Exchange of Thailand
By	Mr. Chotiwit Jiratananuwong
Field of Study	Finance
Thesis Advisor	Tanawit Sae-Sue, Ph.D.

Accepted by the FACULTY OF COMMERCE AND ACCOUNTANCY, Chulalongkorn University in Partial Fulfillment of the Requirement for the Master of Science

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โชติวิทย์ จิรธนานุวงศ์ : การศึกษาผลกระทบของสัญญาซื้อขายล่วงหน้าอ้างอิงหุ้นรายตัวต่อความผันผวนและผลตอบแทนของหุ้นอ้างอิง. (The Impact of Single Stock Futures Block Trade transactions on underlying's volatility and return: Evidence from Stock Exchange of Thailand) อ.ที่ปรึกษาหลัก : อ. ดร.ธนวิต แซ่ซือ

After the introduction of Single Stock Futures Block trade into the market, the concern of futures trading which is a high leverage product has been being in attention among investors. This paper examines the impact of Block trade trading volume on underlying's volatility and return by using linear regression model covering 86 stocks from year 2017-2019. For the impact on volatility, this paper use 2 different measurements of volatility to investigate the impact which is Parkinson variance estimator and 30 minutes price historical volatility. The results found a positive relation between Parkinson variance estimator and Block trade trading volume, and also found a positive relation between Parkinson variance estimator and underlying regular trading volume, but there is not enough evidence that Block trade trading volume has a higher impact on underlying's volatility. While in case of using the second measurement, 30 minutes price historical volatility, we found no relation from both types of trading volume. For the impact on underlying's daily return, the results found no relation between underlying's return and change in open interest. The conclusion from this study is that Block trade trading volume is one of the factors making market movement more volatile in a day, but it does not impact daily return implying that force closing position

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Chotiwit Jiratananuwong : The Impact of Single Stock Futures Block Trade transactions on underlying's volatility and return: Evidence from Stock Exchange of Thailand. Advisor: Tanawit Sae-Sue, Ph.D.

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Academic Year:	2019	Advisor's Signature .....

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to Chulalongkorn University for giving an opportunity and let me being a student here. I also would like to thank my advisor Tanawit Sae-Sue, Ph.D. for the continuous support and guidance along the period of studying here. Beside my advisor, I would like to thank to all my lecturer and committee Associate Professor SIRA SUCHINTABANDID, Ph.D. and Assistant Professor TANAKORN LIKITAPIWAT, Ph.D. for the suggestion and insightful comment. Lastly, I would like to thank to all my fellow school colleagues for all the works, class we have done together and supporting me throughout the master degree period.

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Abstract

After the introduction of Single Stock Futures Block trade into the market, the concern of futures trading which is a high leverage product has been being in attention among investors. This paper examines the impact of Block trade trading volume on underlying's volatility and return by using linear regression model covering 86 stocks from year 2017-2019. For the impact on volatility, this paper use 2 different measurements of volatility to investigate the impact which is Parkinson variance estimator and 30 minutes price historical volatility. The results found a positive relation between Parkinson variance estimator and Block trade trading volume, and also found a positive relation between Parkinson variance estimator and underlying regular trading volume, but there is not enough evidence that Block trade trading volume has a higher impact on underlying's volatility. While in case of using the second measurement, 30 minutes price historical volatility, we found no relation from both types of trading volume. For the impact on underlying's daily return, the results found no relation between underlying's return and change in open interest. The conclusion from this study is that Block trade trading volume is one of the factors making market movement more volatile in a day, but it does not impact daily return implying that force closing position process does not have a significant impact on stock's return. This paper provides additional information which might be helpful for both regulators, who are enhancing and improving market efficiency, and investors who manage portfolio in spot market.

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1. Introduction

Nowadays, futures contracts are one of the most popular instruments traded by investors around the world and also in Thailand. The concern of futures trading has been increasing and being in attention in recent years. For many investors, their trading behaviors have changed after the introduction of this instrument into the market because of its characteristics that allow aggressive speculation in the related underlying. This leads to the perception that the futures trading activities might have an impact on its underlying volatility and return which we will study in this paper.

Futures contracts are one of the derivatives instruments that the contract holder have an obligation to buy or sell an underlying which can be index, stock or commodity. Futures contracts can also do cash settlement in exchange at the maturity date. Its price changes one-to-one with respect to the change in price of the underlying securities. Futures contracts are highly leveraged products, investor only need to place the initial margin collateral, which less than the contract's value, in order to invest in these contracts. Call margin and force closing position processes are employed by the services Broker in order to protect them from a falling in value of contracts which the investor can no longer take the risk. The investor will be called to place more collateral when the portfolio equity balance is less than the maintenance margin in the amount that makes the portfolio value meet the level of initial margin again. But if the investor cannot place more collateral to meet the criteria in time, the position will be immediately forced to close. Moreover, trading in futures contract usually has lower cost compared to trading in the underlying securities.

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In this paper, we will mainly focus on the futures contract which its underlying is only Thai stock, or so-called Single Stock Futures or SSF. SSF were launched by

Thailand Futures Exchange (TFEX) in 2008. But because the SSF markets had low liquidity, by 2014 TFEX allowed brokers to be counterparty for investor by using Over The Counter (OTC) transaction as a channel to provide liquidity for investor called “SSF Block Trade” transactions.

SSF Block Trade is the OTC transaction that broker will be the counterparty for those investors who need leverage and want to invest in Single Stock Futures. Both counterparties will use put-through channel to match their OTC orders after making an agreement. By using the put-through channel, it also requires the minimum size of order at least 20, 100, 500 and 1000 contracts depending on the underlying (Table.A1 in appendix for more details), these large quantities per trade are classified as big lot orders. To deal with large broker exposure, broker eliminates their risk by immediately hedging with the underlying stocks in the spot market before confirming the futures contracts with the investors. The hedging process is perfectly executing with the equal value of the futures contracts and directly impact on the trading volume of those individual stocks. Moreover, broker gains profit by calculating the fees based on the open value, for example charging 6%/year of the open value and charging it in the OTC price when investor closes their position.

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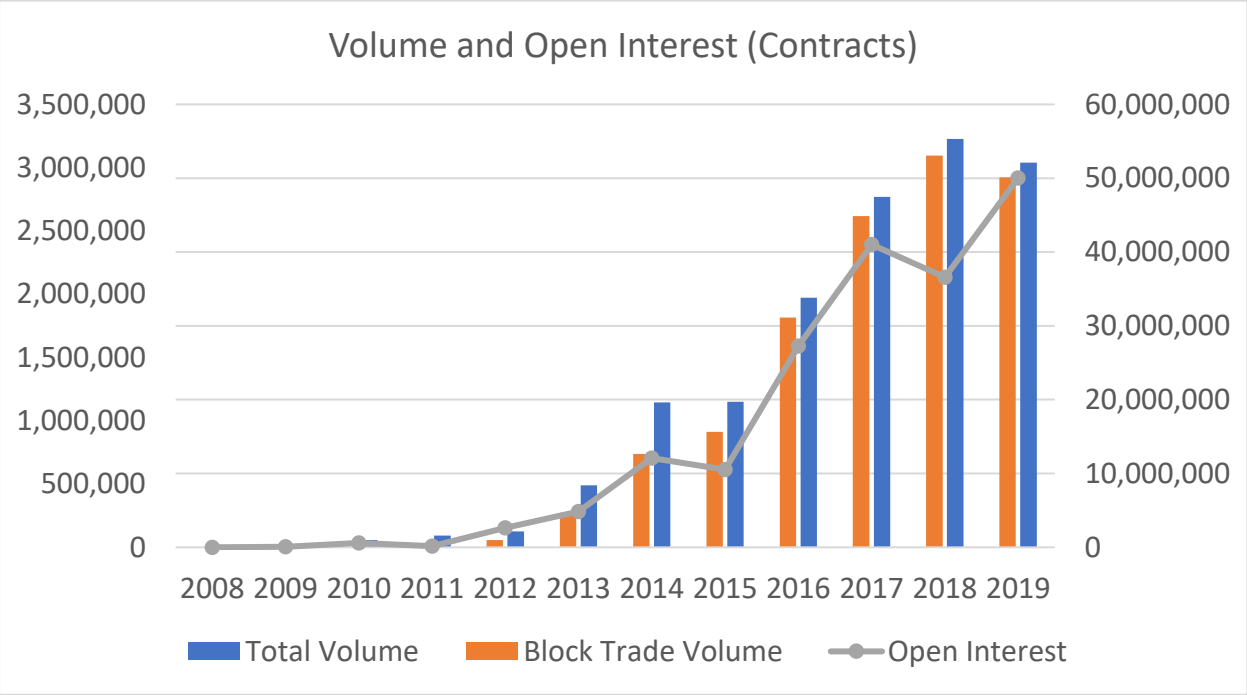
From the characteristics, mechanism and attractiveness of leverage of the transaction activities above, SSF Block Trade trading volume has been growing every year from only 1,000 contracts in 2010 to 31.12 million contracts in 2016 and recently

to 50.11 million contracts in 2019 or increase 61% over the past 4 years. The trading volume has also rapidly growth up to 90% of total trading volume in 2016.

Figure 1: Single Stock Futures Transaction in Thailand Futures Exchange (TFEX)



From TFEX Statistics 2020. (www.tfex.co.th)

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Table 1: Single Stock Futures Transaction in Thailand Futures Exchange (TFEX)

Period	Total Volume		Volume (Block Trade)		Volume Block Trade / Total	Open Interest
	Total	Daily Average	Total	Daily Average		
2019	52,098,173	213,517	50,112,018	205,377	96.19%	2,917,490
2018	55,332,444	225,847	53,075,592	216,635	95.92%	2,134,802
2017	47,480,762	194,593	44,869,077	183,890	94.50%	2,393,257

2016	33,826,624	138,634	31,128,183	127,575	92.02%	1,589,464
2015	19,708,113	81,103	15,644,871	64,382	79.38%	615,012
2014	19,624,561	80,100	12,643,746	51,607	64.43%	704,176
2013	8,415,967	34,351	4,668,968	19,057	55.48%	282,282
2012	2,168,037	8,849	988,422	4,034	45.59%	154,366
2011	1,578,092	6,468	184,510	756	11.69%	9,514
2010	969,353	4,006	1,000	4	0.10%	35,356
2009	145,758	600	-	-	-	3,337
2008	3,838	154	-	-	-	178

From TFEX Statistics 2020. (www.tfex.co.th)

With high leverage, fast growing in trading volume and the hedging process, there is a concern of the impact of SSF Block Trade transactions on the underlying stocks. Therefore, this paper will study the spot price volatility and return after the introduction of SSF Block Trade in order to indicate the impact and efficiency of the market. This paper also intends to provide additional information of the impact for both investors and the regulator whether the attractiveness of SSF Block Trade is just another instrument to manage portfolio and enhance the market liquidity in the regulator's perspective or it can lead to destroy the market efficiency due to the over trading using as a high leverage vehicle for investors.

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2.Literature review

There are many of various empirical studies has been documented on how futures trading has an impact on the stability of underlying. In this part, we will separate the empirical studies into 2 part which is the impact on underlying's volatility and underlying's return.

Literature review of the impact on underlying's volatility

The empirical studied on this topic has indicated the mixed conclusion. Start with the improvement on spot stabilization, Antonios Antoniou, Phil Holmes and Richard Priestley (1998) documented that the introduction of futures has not had a detrimental effect on the underlying market and the volatility asymmetric are significantly lower after the introduction of futures because futures trading attracts the noise from spot market by transmitting the news from spot market to futures market. He designs his empirical studies by using GARCH (1,1) model combining with news asymmetric response of conditional volatility to information. Align with Bessembinder and Seguin (1992). They hypothesized the impact on S&P 500 index volatility with 3 components including spot volume, futures volume and open interest of the S&P 500 index futures. For the futures volume, he found that unexpected futures trading volume has a positive relation with spot volatility while the expected futures trading volume (which is roughly equal to the prior day activities level) is negative. Consequently, he also found that the spot volatility declines as a function of open interest. A possible explanation is that the low cost of futures trading attracts the investor and causes them to move from equity market to futures market.

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While Galloway & Miller (1997) found no relation. They observed the S&P MidCap 400 stock index volatility and compared its value between before and after the introduction of index futures. To examine index volatility, the researcher used OLS regression model with the cross-sectional analysis data of underlying trading volume, pre index volatility and firm value. He found a decreasing trend in volatility with a significantly increase in underlying trading volume and also found the similar result in the other control sample stocks, but he found no evidence of a relation

between futures trading volume and spot volatility. Align with Kawaller, D. Koch and W. Koch (1990). They examine the relation of volatility of S&P 500 index and S&P 500 futures by using Granger tests, which includes both of the past movement volatility of spot and futures in the model, for more accurately. The researcher measured the volatility by using 1-minute price changes to calculate variance and compared on a daily basis. The result of this study indicates that there is no systematic pattern of futures volatility leading index volatility, or index volatility leading futures volatility.

Although many of the empirical studied on the volatility impact has align in the way of no-detrimental effect or no-relation, but most of the studied are on the U.S market while the derivatives instrument has been used in many countries with the different market dynamics. Therefore, the result of this study on Thai market may provide additional information different to the empirical studied.

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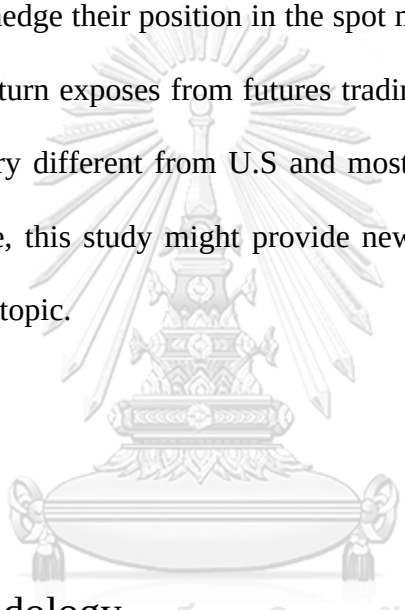
Literature review of the impact on underlying's return

For this topic, we have found no empirical studies directly researched on the underlying's abnormal return caused by futures trading. But to capture return of underlying, Capital Asset Pricing Model (CAPM) which is developed to capture the return using market betas by William Sharpe (1964) and John Lintner (1965) is widely used and developed in applications for the past decade. Fama and French (1996) are also developed the three-factor model to measure the anomalies returns from other 2 additional factors which is the difference of small and large stock return

(i) and difference of low and high book-to-market stock return. To captures the underlying's anomalies returns from futures trading activities, we can add some variable related to futures trading activities into the CAPM model.

The reason that there are no empirical studies directly interested on this topic because the U.S. market consists of trading activities from normal investors which are not directly effect on the spot market and another trading activities from arbitrager which always directly hedge their position in the spot market. That make no reason to determine anomalies return exposes from futures trading activities. But in TFEX, the market dynamics is very different from U.S and most of the transactions consist of Block Trade. Therefore, this study might provide newly insight information and be the solely study on this topic.



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3.Data and Methodology

Data

In this paper, trading activities data for both futures contracts, which are listed on the Thailand Futures Exchange (TFEX), and the underlying stocks, which are listed on the Stock Exchange of Thailand (SET), covering the period from 2017 to 2019 are observed to examine the impact on volatility while trading activities data covering only the period from 2018-2019 are observed to examine the impact on return as details below. The delisted underlying stocks as well as their futures contracts are excluded to preserve the consistency of the data availability during the whole study period. Therefore, 86 underlying are observed to examine the impact on

this paper. All the trading data are collected from SETSMART, REUTERS DATASTREAM, ASPEN Real Time Data and ThaiBMA.

For the underlying stocks in spot market, daily closing price, high price, low price, daily trading volume, total return price, total return index and risk-free-rate are collected to measure the return and variation of underlying price in each day along with daily trading volume. While intraday 30 mins closing prices at 10:00AM, 10:30AM, 11:00AM, … until market morning session closes at 12:30PM and starts again at 2:30 PM until market close after 4:30 PM are collected to estimate the intraday volatility of stock price only from year 2018 and 2019 due to the limited data.

For the futures contracts, they normally have many different specifications and expiry dates at any moment in time. The futures contract data such as contract's multiplier, daily trading volume and daily open interest are collected across all maturity dates.

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Studying period

The main goal of this project is to study how SSF Block Trade transactions have impact on underlying volatility and price, the testing period is set to be only after the introducing of SSF Block Trade transaction in 2014, even though the Single Stock Futures have been introduced to TFEX since 2010. To preserve the consistency of data, the studying period in this paper starts from 1 January 2017 until 27 December 2019.

Hypothesis development

Many of the prior studies have examined on how futures trading has an impact on volatility and documented various conclusions. For example, Bessembinder and

Seguin (1992) found the negative relation of futures trading volume and spot volatility, while Galloway & Miller (1997) found no significant correlation. For the impact on underlying's return, the studies on this particular topic is rather scarce, while we suspect that force closing the SSF positions from the block trades would have some significant impacts on the return.

Hypothesis on the impacts on underlying's volatility

In this part, we will focus on the impact of futures trading volume on the spot volatility. Bessembinder and Seguin (1992) hypothesized the impact on S&P 500 index volatility with 3 components including spot volume, futures volume and open interest of the S&P 500 index futures. For the futures volume, he found that unexpected futures trading volume has a positive relation with spot volatility while the expected futures trading volume (which is roughly equal to the prior day activities level) is negative. A possible explanation is that the low cost of futures trading attracts the investor and causes them to move from equity market to futures market. Consequently, the spot volatility declines with the increase of unexpected futures trading volumes. Galloway & Miller (1997) observed the S&P MidCap 400 stock index volatility and compared its value between before and after the introduction of index futures. He found a decreasing trend in volatility with a significantly increase in underlying trading volume and also found the similar result in the other control sample stocks, but he found no evidence of a relation between futures trading volume and spot volatility.

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While both of the empirical studies are on the U.S market which has higher liquidity from normal trading activities and index arbitrage activities, our study will focus on the Single Stock futures trading activities in TFEX which is very different

from other markets in the previous empirical studies. Most of the futures trading volume in TFEX is the SSF Block Trade transactions which perfectly hedging with the underlying stock. And in fact, not every day that the SSF Block Trade have been trading in the high activities level after the introduction of this transaction. If we compare the volatility prior and after the introduction period, it might lead to biasness. Therefore, our hypothesis will observe the spot volatility impact and scope after the introduction of SSF Block Trade transaction period only. This might have a different answer indicating the impact of SSF Block Trade on the underlying volatility.

Furthermore, investors are required to place the buy/sell volume with the minimum orders size of SSF Block Trade transactions which is quite equal to the big lot order. With the high leverage product, call/force process are also employed to force investor closing their position immediately. From these reasons, trading volume of SSF Block Trade might has a higher impact than the trading volume of underlying.

Hypothesis 1: The trading volume of SSF Block Trade has a positive impact on underlying volatility.

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Hypothesis 2: The trading volume of SSF Block Trade has a higher impact on underlying volatility than the trading volume of underlying subtracted by Block trade trading volume.

Assumption for Hypothesis on the impacts on underlying's return

As SSF Block Trade transactions need both counterparties to take the opposite side to each other in order to open or close the contract position, one taking Long and another taking Short side. But due to the limitation of data, we cannot observe that each of the matching transaction come from Long or Short side taking by investor. So,

this study will assume that majority of the open interest positions are Long side position taking by investor because of the 2 following reasons.

Firstly, the short selling volume data in the market is very small. When investor want to open short position, the broker will eliminate their risk in the hedging process by taking short selling in underlying securities which will include into the short selling report from SET. Table 2 below indicates the proportion of short selling in underlying, including other short selling activities apart from Block Trade, compares to the total trading volume in underlying.

Table 2: Short selling compares to the total trading volume in underlying.

Short selling compares to Total trading volume	
>100%	0
90-100	0
80-90	0
70-80	0
60-70	0
50-60	0
40-50	0
30-40	0
20-30	0
10-20	0
0-10	86
average	3.57%

From SET Statistics 2020. (www.set.co.th)

From this table we will see that the proportion of short selling compares to total trading volume in all underlying are less than 10% and have an average only 3.34% which indicate very small short position taking by investor in Thailand. While

the extreme case which is total short selling compares to Block Trade trading volume also indicates the same way, there are only 3 stocks that have the total short selling volume higher than Block trade volume while another 83 stocks has the total short selling volume lower than Block trade trading volume. But this is just an extreme case, this really doesn't mean that the total short selling came from Block trade transactions. Therefore, we can assume that the Long side position is the majority trade of total trading volume in the market. Table.A2 and Table A3 in appendix for more detail.

Secondly, for the perspective of investment, taking Long side position of SSF Block Trade can infer to the investment in underlying by using the broker to hold the underlying for them while the taking Short side position seem to be speculating activities. Therefore, the investor tends to open Long position with a bigger size and hold the position quite longer compares to open short position.

Furthermore, from the author's working experience, I also notice that the Long side position opening by investor have higher in both of trading volume and outstanding open interest probably come from these reasons above. Therefore, this hypothesis will assume that the majority of the open interest positions are Long side position taking by investor.

Hypothesis on the impacts on underlying's return

To captures the asset returns, Capital Asset Pricing Model (CAPM) developed to capture the return using market betas by William Sharpe (1964) and John Lintner (1965) is widely used and developed in applications for the past decade. The model can add the interested variable to capture anomalies in return beyond the market beta return.

As the SSF Block Trade transaction is traded base on the Single Stock Futures, investors need to place the initial collateral margin before open the position which is roughly around 10% to 30% of the contract value. Due to the high leverage nature of futures trading, the call/forced margin process has been employed to force closing the position for both Long and Short positions in the case of insufficient collateral of individual investor. The investor will be immediately forced to close the position when they cannot place more collateral to meet the criteria. Moreover, the block trading activities needs the minimum size of order each time. It requires at least 20, 100, 500, 1000 contracts for the different underlying (Table.A1 in appendix for more details) which were classified as big lot orders. Therefore, if the stock price moves a lot to the opposite way of investor position in the trading time period, those SSF Block Trade investors who are in panic or can't bear more risk may immediately close their huge positions as well as the insufficient margin investors who are forced to close the position in the same time. In the meanwhile, Broker that are in hedge also need to unwind the underlying position in order to match the futures closing price for investors. From these reasons, the closing positions due to the mechanism above cause the decreasing in open interest of individual underlying and may affect the price of underlying causing anomalies in the stock returns.

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To determine the impact of futures trading activities on underlying's return, our hypothesizes will observe the impact of underlying's return using the open interest data as a variable to capture abnormal returns based on Multifactor model. This study has separated the impact of changing in open interest into 2 cases, which is increasing and decreasing in open interest each day, because the impact of decreasing in open interest might come from the call/forced process or selling in panic by

investors, while the impact of increasing in open interest comes from normal trading activities which investor decides to open position themselves without any pressure.

Hypothesis 3: Decreasing in Open interest of SSF Block Trade has a negative impact on underlying's return.

Methodology

The impact on underlying's volatility

The method to determine the effect of SSF Block Trade volume on the volatility of underlying is OLS regression. But as mentioned earlier that the hedging process of SSF Block Trade is directly affected the equal amount in the underlying trading volume. Therefore, the regressand volatility are analyzed by using both Block Trade trading volume as one of the regressor and underlying trading volume subtracted by the Block Trade trading volume as another regressor. The OLS regression model is employed as the following equation.

$$\sigma_t = \beta_0 + \beta_1(Volume_{UL,t} - Volume_{BT,t}) + \beta_2 Volume_{BT,t} + \varepsilon_t \qquad (1)$$

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Whereas;

σ_t is the volatility at time t

$Volume_{UL,t}$ is the trading volume of underlying stock at time t (unit in million shares)

$Volume_{BT,t}$ is the trading volume of SSF Block Trade at time t (unit in million shares)

ε_t is a random error term

For the trading volume of SSF Block trade in each date, we summed up the trading volume, which reported by TFEX, across all the contract series that are currently actively traded in the market.

For the regressand volatility (σ_t), we will use 2 measurement of volatility to test the robustness of this regression. The Parkinson's efficient variance estimator, which is developed by Parkinson (1980), is applied to measure the extreme value of intraday volatility. Another measurement is the intraday historical volatility of price which is the standard deviation of 30 minutes closing price within a day divided by average matched price in that day. The historical volatility is applied to measure the fluctuation of asset price over the time period and divided by average price in order to standardize and compare the variation of price of each individual stock from both measurements.

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The Parkinson variance estimator has the following form.

$$\sigma_t = \sqrt{\frac{1}{4\,ln\,2} \cdot \left[\ln \frac{H}{L}\right]^2} \qquad (2)$$

Whereas;

σ_t is the volatility at time t

H is the highest observation price (day high)

L is the lowest observation price (day low)

The historical volatility has the following form.

$$\sigma_t = \frac{\sqrt{\sum_{i=1}^{n}(P_i - P_{avg})^2/(n-1)}}{P_{avg}}$$

(3)

Whereas;

σ_t is the volatility at time t

n is the number of observations

P_i is the stock price at time i which will be observed every 30 minutes

P_{avg} is the average 30 minutes stock price within a day

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The primary interest for this regression is how significant of the positive β_2 coefficient ($\beta_2 > 0$). If this coefficient, which indicates the impact of SSF Block Trade volume on volatility, is significantly positive implying that the Block Trade transaction have an impact on volatility. But if the coefficient is not statistically significant, it means that the Block Trade volume does not have an impact on the volatility of underlying stock. The second interest for this regression is that the β_2 coefficient higher than β_1 coefficient or not (β_2 - $\beta_1 > 0$). If the β_2 is significantly higher, it can imply that the SSF Block Trade volume have higher impact on the

underlying volatility than the trading volume in its own market. But if β_2 is not higher, it means that the Block Trade volume doesn't have the higher impact on volatility than the underlying trading volume.

The impact on underlying's return

This study will examine the impact of SSF Block Trade transaction on the underlying price by using OLS regression process on multifactor model. The capital asset pricing model (CAPM) of William Sharpe (1964) and John Lintner (1965) are used as a proxy of asset return from each stock. But there still have other anomalies excess return which can be measured as a result of SSF Block Trade activities by capturing the change in open interest. Therefore, the regressand stock return are measured from 3 components which is the market return, change in open interest in case of decreasing and change in open interest in case of increasing. The reason of separating change in open interest into different components because the mechanics of future trading have the call/force process as mentioned earlier. The decreasing in open interest might come from the forced closing position while the increasing in open interest might come from normal activities. The OLS regression model is employed as the following equation.

$$R_t = \beta_0 + R_{f,t} + \beta_1(R_{m,t} - R_{f,t}) + \beta_2(OI_t - OI_{t-1})(DC) + \beta_3(OI_t - OI_{t-1})(IC) + \varepsilon_t \quad (4)$$

Whereas;

R_t is the daily total return of stock at day t

R_f is the risk-free-rate from 10years government bond at day t

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$R_{m,t}$ is the total market return at day t

OI_t is the open interest at day t (unit in million contracts)

DC is the dummy variable of decreasing in open interest,

the dummy variable is denoted as 1 in the case of decreasing in open interest and denote as 0 when it increases

IC is the dummy variable of increasing in open interest

the dummy variable is denoted as 1 in the case of increasing in open interest and denote as 0 when it decreases

For the open interest of SSF Block trade in each date, we summed up the open interest, which reported by TFEX, across all the contract series that currently trading in the market for each underlying.

For the regressand stock return (R_t) and regressor market return ($R_{m,t}$), we use the total stock return and total index return to calculate in the model.

The interest for this regression is how significant of the positive β_2 coefficient ($\beta_2 > 0$). If this coefficient, which indicates the impact of changing in open interest on underlying's return in cease of decreasing, is significantly negative implying that the Block Trade transaction have an impact on stock return. But if the coefficient is not statistically significant, it means that the Block Trade transaction does not have an impact on the return of underlying stock.

Data and Descriptive Statistic

To simplify and summary statistic of raw data before analyzing the result of regression, Table 3, 4 ,5, 6 and 7 below show the descriptive statistic of important variables used in both models which consist of every trading date's data from all the 86 underlying. Table 3 show the descriptive statistic of market total return. Table 4 shows a range of number of Parkinson variance estimator which its mean is quite clustered around 0.01 - 0.02. While another measurement which is 30 minutes price historical volatility per average price in table 5 show that the mean of data is clustered around 0 – 0.01 which is quite lower than the Parkinson variance estimator. To normalize the trading volume from Block trade which has a different range in each stock, table 6 shows the trading volume from Block trade in a proportion of total trading volume. The data indicates that total volume generated by Block trade is only around 0 to 0.2 of total trading volume but in most of stock there are days that the percentage goes up over 0.9 of total trading volume.. Lastly, table 7 shows that underlying total return movement is around -.005 to 0.05%.

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Market total return			
Mean	SD	Min	Max
0.00016	0.006017	-0.02389	0.023228

Table 3: Descriptive statistic of market total daily return in decimal.

Table 4: Descriptive statistic of Parkinson variance estimator in decimal

Parkinson variance estimator				
Range	Mean	SD	Min	Max
>0.10	0	0	0	10
0.09 - 0.10	0	0	0	2
0.08 - 0.09	0	0	0	6
0.07 - 0.08	0	0	0	5
0.06 - 0.07	0	0	0	20
0.05 - 0.06	0	0	0	19
0.04 - 0.05	0	0	0	17
0.03 - 0.04	0	0	0	5
0.02 - 0.03	3	0	0	2
0.015 - 0.02	27	1	0	0
0.01 - 0.015	46	10	0	0
0.005 - 0.01	10	65	1	0
0 - 0.005	0	10	85	0

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Table 5: Descriptive statistic of 30 minutes return Historical volatility in decimal.

30 minutes price Historical volatility				
Range	Mean	SD	Min	Max
>0.10	0	0	0	1
0.09 - 0.10	0	0	0	0
0.08 - 0.09	0	0	0	0
0.07 - 0.08	0	0	0	1
0.06 - 0.07	0	0	0	3
0.05 - 0.06	0	0	0	6
0.04 - 0.05	0	0	0	10
0.03 - 0.04	0	0	0	16
0.02 - 0.03	0	0	0	40
0.015 - 0.02	0	0	0	9
0.01 - 0.015	1	1	0	0
0.005 - 0.01	62	11	0	0
0 - 0.005	23	74	51	0

Table 6: Descriptive statistic of volume from Block trade per total volume in decimal

Trading volume from Block trade / Total trading volume				
Range	Mean	SD	Min	Max
>1	0	4	0	0
0.9 - 1	0	0	0	34
0.8 - 0.9	0	1	0	21
0.7 - 0.8	0	1	0	7
0.6 - 0.7	0	1	0	12
0.5 - 0.6	0	1	0	5
0.4 - 0.5	2	3	0	4
0.3 - 0.4	1	5	0	3
0.2 - 0.3	1	11	0	0
0.1 - 0.2	32	36	0	0
0 - 0.1	50	23	0	0

Table 7: Descriptive statistic of underlying total daily return in decimal

Underlying total return				
	Mean	SD	Min	Max
0.25 - 0.30	0	0	0	1
0.20 - 0.25	0	0	0	1
0.15 - 0.20	0	0	0	5
0.10 - 0.15	0	0	0	13
0.05 - 0.10	0	0	0	59
0.00 - 0.05	48	86	0	7
(-0.05) - 0.00	38	0	15	0
(-0.10) - (-0.05)	0	0	52	0
(-0.15) - (-0.10)	0	0	13	0
(-0.20) - (-0.15)	0	0	2	0
(-0.25) - (-0.20)	0	0	1	0
(-0.30) - (-0.25)	0	0	1	0

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4. Empirical Results

Result of the impact on underlying's volatility

To examine the result of how Block trade transaction effects to the underlying's volatility, we regress variance with Block trade trading volume and underlying trading volume by Block trade trading volume by using linear regression model from equation (1). The significant level of coefficient of Block trade trading volume in each day (β_2) is the interested observation while β_0 and β_1 are constant and the coefficient of underlying trading volume subtract by Block trade trading volume respectively. Since we use 2 measurements of volatility as a regressand (σ_t) to test robustness and compare each other, the regression results of theses 2 measurements will be shown separately below.

Result of the impact on underlying's volatility using Parkinson variance estimator.

Firstly, the results of the regression using Parkinson variance estimator as a regressand are shown in **Table 8 and Table 9.** This regression covers the 3 years period starts from January 2017 until December 2019.

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Table 8. The impact on underlying's volatility using Parkinson variance estimator.

Underlying	β_0 (Robust Std. Err)	β_1 (Robust Std. Err)	β_2 (Robust Std. Err)	$\beta_2 - \beta_1$ (Robust Std. Err)
AAV	0.009836***	0.000207***	0.000092	-0.000115

	(0.000345)	(0.000029)	(0.000149)	(0.000163)
ADVANC	0.004778***	0.000757***	0.001680***	0.000923**
	(0.000302)	(0.000070)	(0.000351)	(0.000386)
AMATA	0.011397***	0.000418***	0.000307***	-0.000111
	(0.000463)	(0.000038)	(0.000085)	(9.74e-05)
AOT	0.006058***	0.000132***	0.000271***	0.000139
	(0.000341)	(0.000019)	(0.000096)	(0.000111)
AP	0.009821***	0.000475***	0.000588***	0.000113
	(0.000398)	(0.000047)	(0.000078)	(7.32e-05)
BA	0.010235***	0.000696***	-0.000684	-0.00138**
	(0.000271)	(0.000121)	(0.000566)	(0.000623)
BANPU	0.009324***	0.000081***	0.000161***	8.00e-05
	(0.000317)	(0.000011)	(0.000059)	(6.78e-05)
BAY	0.008459***	0.004443***	-0.008143*	-0.0126**
	(0.000243)	(0.000556)	(0.004711)	(0.00503)
BBL	0.005866***	0.000348***	0.003472***	0.00312***
	(0.000317)	(0.000082)	(0.000650)	(0.000676)
BCH	0.008976***	0.000608***	0.000679***	7.13e-05
	(0.000436)	(0.000053)	(0.000172)	(0.000198)
BCP	0.009522***	0.000763***	0.000054	-0.000709
	(0.000305)	(0.000099)	(0.000393)	(0.000466)
BDMS	0.008815***	0.000068**	0.000535**	0.000467**
	(0.000754)	(0.000030)	(0.000209)	(0.000231)
BEAUTY	0.012741***	0.000096***	0.001451***	0.00135***
	(0.000805)	(0.000012)	(0.000294)	(0.000298)
BEC	0.017107***	0.000584***	0.000254	-0.000331
	(0.000676)	(0.000127)	(0.000766)	(0.000883)
BEM	0.007643***	0.000088***	0.000110***	2.22e-05
	(0.000253)	(0.000006)	(0.000033)	(3.55e-05)
BH	0.006871***	0.002875***	0.006027***	0.00315*
	(0.000622)	(0.000617)	(0.001539)	(0.00190)
BJC	0.008280***	0.000948***	0.000540***	-0.000408**
	(0.000460)	(0.000087)	(0.000170)	(0.000199)
BLA	0.009823***	0.002429***	-0.000507	-0.00294**
	(0.000291)	(0.000253)	(0.001073)	(0.00121)
BLAND	0.007901***	0.000042***	0.000043***	8.20e-07
	(0.000269)	(0.000007)	(0.000006)	(3.28e-06)
BTS	0.004810***	0.000163***	0.000327***	0.000164***
	(0.000252)	(0.000010)	(0.000048)	(5.03e-05)
CBG	0.011759***	0.001621***	0.002118***	0.000498*
	(0.000523)	(0.000134)	(0.000236)	(0.000265)
CENTEL	0.011177***	0.001568***	0.001275	-0.000293
	(0.000471)	(0.000181)	(0.001092)	(0.00121)
CHG	0.010948***	0.000108***	0.000107	-8.07e-07
	(0.000427)	(0.000012)	(0.000075)	(8.07e-05)
CK	0.008829***	0.000531***	0.000367**	-0.000164
	(0.000426)	(0.000048)	(0.000181)	(0.000166)

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CKP	0.009456***	0.000173***	0.000138	-3.57e-05
	(0.000312)	(0.000018)	(0.000095)	(0.000109)
CPALL	0.005199***	0.000168***	0.000217***	4.81e-05
	(0.000234)	(0.000013)	(0.000054)	(5.92e-05)
CPF	0.008273***	0.000196***	0.000085	-0.000111
	(0.000373)	(0.000016)	(0.000099)	(0.000105)
CPN	0.007955***	0.000426*	0.002838***	0.00241***
	(0.001132)	(0.000222)	(0.000610)	(0.000730)
DELTA	0.010980***	0.001907***	-0.001274	-0.00318**
	(0.000774)	(0.000691)	(0.001129)	(0.00126)
DTAC	0.011295***	0.000754***	0.001095**	0.000341
	(0.000615)	(0.000138)	(0.000434)	(0.000544)
EGCO	0.008117***	0.002459*	0.009335***	0.00688*
	(0.001080)	(0.001436)	(0.002455)	(0.00356)
EPG	0.011687***	0.000813***	0.000586**	-0.000227
	(0.000397)	(0.000071)	(0.000290)	(0.000308)
GLOBAL	0.008990***	0.000887***	0.000987***	9.95e-05
	(0.000444)	(0.000080)	(0.000262)	(0.000309)
GPSC	0.011784***	0.000386***	0.002750***	0.00236***
	(0.000324)	(0.000075)	(0.000567)	(0.000624)
GUNKUL	0.011943***	0.000065**	0.000253**	0.000188
	(0.000626)	(0.000033)	(0.000104)	(0.000126)
HANA	0.011402***	0.001894***	0.001880***	-1.42e-05
	(0.000602)	(0.000232)	(0.000598)	(0.000722)
HMPRO	0.007651***	0.000224***	0.001603***	0.00138***
	(0.001130)	(0.000073)	(0.000372)	(0.000435)
ICHI	0.012100***	0.001780***	0.000900**	-0.000880**
	(0.000364)	(0.000108)	(0.000364)	(0.000371)
INTUCH	0.007908***	0.000225**	0.000653	0.000428
	(0.000866)	(0.000106)	(0.000465)	(0.000495)
IRPC	0.009309***	0.000059***	0.000039	-1.96e-05
	(0.000382)	(0.000005)	(0.000027)	(2.92e-05)
ITD	0.010034***	0.000240***	0.000129**	-0.000112*
	(0.000366)	(0.000026)	(0.000055)	(6.18e-05)
IVL	0.007314***	0.000487***	-0.000284***	-0.000771***
	(0.000472)	(0.000031)	(0.000091)	(0.000110)
JAS	0.009695***	0.000133***	0.000235***	0.000102**
	(0.001106)	(0.000025)	(0.000060)	(5.16e-05)
KBANK	0.004387***	0.000658***	0.002567***	0.00191***
	(0.000408)	(0.000063)	(0.000486)	(0.000501)
KCE	0.011495***	0.000891***	0.002864***	0.00197**
	(0.000669)	(0.000116)	(0.000780)	(0.000845)
KKP	0.005354***	0.000903***	0.000623	-0.000280
	(0.000271)	(0.000080)	(0.000382)	(0.000413)
KTB	0.005780***	0.000113***	0.000093**	-2.03e-05
	(0.000270)	(0.000010)	(0.000037)	(3.75e-05)
KTC	0.008790***	0.000631***	0.000905***	0.000274

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	(0.000968)	(0.000074)	(0.000216)	(0.000202)
LH	0.009399***	0.000081***	0.000111***	3.06e-05
	(0.000518)	(0.000016)	(0.000033)	(3.61e-05)
LPN	0.009392***	0.000693***	0.000951***	0.000258
	(0.000382)	(0.000068)	(0.000307)	(0.000339)
MAJOR	0.010961***	0.001602***	0.000041	-0.00156
	(0.000381)	(0.000166)	(0.001327)	(0.00134)
MINT	0.009114***	0.000453***	0.000639***	0.000186
	(0.000584)	(0.000057)	(0.000140)	(0.000150)
MTC	0.010155***	0.000689***	0.003395***	0.00271***
	(0.000574)	(0.000067)	(0.000580)	(0.000591)
PLANB	0.013080***	0.000512***	-0.000109	-0.000621***
	(0.000381)	(0.000051)	(0.000145)	(0.000184)
PSH	0.007464***	0.001133***	0.001112***	-2.14e-05
	(0.000327)	(0.000126)	(0.000240)	(0.000188)
PTT	0.004837***	0.000094***	-0.000081**	-0.000175***
	(0.000335)	(0.000007)	(0.000038)	(4.29e-05)
PTTEP	0.004954***	0.000480***	0.001216***	0.000736**
	(0.000525)	(0.000065)	(0.000263)	(0.000300)
PTTGC	0.005751***	0.000379***	0.000195*	-0.000184
	(0.000435)	(0.000033)	(0.000107)	(0.000121)
QH	0.007640***	0.000112***	0.000104***	-8.04e-06
	(0.000379)	(0.000009)	(0.000013)	(1.33e-05)
RATCH	0.005746***	0.000750***	0.004988**	0.00424*
	(0.000549)	(0.000281)	(0.001972)	(0.00223)
S	0.010726***	0.000328***	-0.000189	-0.000516**
	(0.000290)	(0.000033)	(0.000240)	(0.000261)
SAMART	0.013681***	0.001448***	0.001392***	-5.65e-05
	(0.000377)	(0.000134)	(0.000185)	(0.000159)
SAWAD	0.011753***	0.000663***	0.001689***	0.00103*
	(0.000740)	(0.000114)	(0.000527)	(0.000582)
SCB	0.006881***	0.000335***	0.000748	0.000413
	(0.000722)	(0.000129)	(0.000477)	(0.000591)
SCC	0.005879***	0.000874***	0.001889***	0.00101
	(0.000567)	(0.000279)	(0.000517)	(0.000701)
SIRI	0.009584***	0.000069***	0.000062***	-7.39e-06
	(0.000365)	(0.000007)	(0.000010)	(9.83e-06)
SPALI	0.009587***	0.000659***	-0.000256	-0.000914***
	(0.000395)	(0.000070)	(0.000339)	(0.000351)
SPCG	0.007600***	0.001099***	0.001671***	0.000573***
	(0.000158)	(0.000073)	(0.000127)	(0.000164)
STA	0.013539***	0.000683***	0.000958	0.000275
	(0.000439)	(0.000088)	(0.000767)	(0.000835)
STEC	0.009973***	0.000371***	0.000394***	2.31e-05
	(0.001022)	(0.000091)	(0.000135)	(0.000193)
STPI	0.011889***	0.001138***	-0.000007	-0.00114*
	(0.000381)	(0.000092)	(0.000558)	(0.000616)

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TASCO	0.011386***	0.000333***	0.000429*	9.58e-05
	(0.000337)	(0.000028)	(0.000223)	(0.000234)
TCAP	0.006149***	0.001254***	0.001528***	0.000274
	(0.000282)	(0.000094)	(0.000255)	(0.000273)
THAI	0.013735***	0.000550***	0.000191	-0.000359
	(0.000357)	(0.000072)	(0.000313)	(0.000352)
THCOM	0.012652***	0.001371***	0.000488**	-0.000883***
	(0.000425)	(0.000125)	(0.000245)	(0.000266)
TISCO	0.005374***	0.001439***	0.000291	-0.00115**
	(0.000380)	(0.000121)	(0.000500)	(0.000557)
TMB	0.009740***	0.000029***	-0.000027	-5.62e-05*
	(0.000514)	(0.000003)	(0.000034)	(3.39e-05)
TOP	0.009284***	0.000501***	0.000508***	7.94e-06
	(0.000343)	(0.000048)	(0.000163)	(0.000171)
TPIPL	0.011760***	0.000029***	0.000073***	4.37e-05**
	(0.000265)	(0.000007)	(0.000012)	(1.77e-05)
TRUE	0.009584***	0.000051***	0.000073***	2.26e-05**
	(0.000307)	(0.000003)	(0.000010)	(1.03e-05)
TTA	0.011958***	0.000506***	-0.000231	-0.000738*
	(0.000273)	(0.000075)	(0.000383)	(0.000441)
TTW	0.006043***	0.000926***	0.001389***	0.000463
	(0.000299)	(0.000076)	(0.000326)	(0.000316)
TU	0.007563***	0.000424***	0.000993**	0.000569
	(0.001010)	(0.000121)	(0.000472)	(0.000568)
UNIQ	0.011376***	0.000849***	-0.000988***	-0.00184***
	(0.000301)	(0.000086)	(0.000264)	(0.000333)
VGI	0.011407***	0.000267***	0.000646***	0.000378**
	(0.000401)	(0.000033)	(0.000168)	(0.000178)
WHA	0.007795***	0.000055***	0.000062***	7.49e-06
	(0.000242)	(0.000004)	(0.000020)	(2.14e-05)

Note: *This table present the regression results of model from equation (1). The numerical values in the table indicate the estimated coefficients of the variables and the numerical values contain in brackets () indicate the robust standard error of the variables. ***, **, and * indicates that the statistics value reaches significant level of 1%, 5%, and 10% respectively*.

Table 9. Summary statistics of the impact on underlying's volatility using Parkinson variance estimator.

Coefficient	Positive impact on volatility				Negative impact on volatility				To U
	Significant level 1%	Significant level 5%	Significant level 10%	Not significant	Significant level 1%	Significant level 5%	Significant level 10%	Not significant	
β_1	81	3	2	0	0	0	0	0	
β_2	45	11	2	15	2	1	1	9	
$\beta_2 - \beta_1$	9	8	5	25	6	8	4	21	

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From the summary results show in table 9, the estimated coefficient β_2, which is our primary interested in this regression, indicate that 58 stocks have a significant positive relation between regressand (Parkinson variance estimator) and regressor (Block trade trading volume). From those 58 stocks, there are 45 stocks have a significant level at 1%, 11 stocks have a significant level at 5% and another 2 stocks have a significant level at 10%. On the other hand, there also have 4 stocks indicate negative relation and the rest 24 stocks indicate not significant with a mixed positive and negative relation. Therefore, we can conclude that Block trade trading volume

have a positive impact on underlying's volatility. Said otherwise, underlying's volatility is getting higher when there is higher Block trade trading volume.

Moreover, the estimated coefficient β_1 indicate that all the 86 stocks have a significant positive relation between regressand, which is Parkinson variance estimator, and underlying trading volume subtracted by Block trade trading volume. This can be implied that the underlying its own volume is a major variable that have an impact on volatility. Then if we compare the impact of 2 independent variables which is Block trade trading volume and underlying trading volume subtracted by Block trade trading volume ($\beta_2 - \beta_1$), the regression results of 22 stocks indicates that Block trade volume has a higher impact on volatility, 18 stocks indicates lower impact while the rest majority 46 stocks indicate mixed higher and lower impact on volatility but not statistical significant.

This regression results provide a different information comparing to the empirical studies, Antonios Antoniou, Phil Holmes and Richard Priestley (1998) and Galloway & Miller (1997), which found negative impact on volatility and no relation respectively. There are 2 possible reasons could be explained for the different results. First, the different in market dynamics, the empirical studies use all futures trading volume in U.S. market as a regressor while this study use Block trade trading volume which is a big lot order using futures as an instrument. Second, the empirical studied examine impact by comparing pre and post introduction of futures trading while this paper examine the impact within the period after introduction of futures trading.

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Result of the impact on underlying's volatility using 30 minutes price historical volatility

Secondly, the results of the regression using 30 minutes price historical volatility as a regressand are shown in **Table 10 and Table 11.** This regression covers the 2 years period starts from January 2018 until December 2019 due to the limited of data.

Table 10. The impact on underlying's volatility using 30 minutes price historical volatility.

Underlying	β_0 (Robust Std. Err)	β_1 (Robust Std. Err)	β_2 (Robust Std. Err)
AAV	0.005674***	-0.000016	-0.000106
	(0.000219)	(0.000011)	(0.000109)
ADVANC	0.003842***	0.000060	-0.000039
	(0.000201)	(0.000037)	(0.000168)
AMATA	0.005621***	0.000040**	0.000049
	(0.000278)	(0.000017)	(0.000038)
AOT	0.003536***	0.000024**	-0.000024
	(0.000285)	(0.000011)	(0.000090)
AP	0.006232***	-0.000029	0.000025
	(0.000252)	(0.000021)	(0.000076)
BA	0.005692***	-0.000034	-0.000197
	(0.000185)	(0.000091)	(0.000655)
BANPU	0.005939***	-0.000001	0.000034*
	(0.000301)	(0.000007)	(0.000019)
BAY	0.004229***	0.001257***	-0.001509
	(0.000135)	(0.000349)	(0.001974)
BBL	0.003997***	-0.000015	-0.000226
	(0.000136)	(0.000013)	(0.000238)
BCH	0.006005***	-0.000027	0.000324
	(0.000260)	(0.000018)	(0.000267)

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BCP	0.005530***	-0.000029	-0.000029
	(0.000192)	(0.000040)	(0.000073)
BDMS	0.005574***	-0.000003	0.000082
	(0.000178)	(0.000003)	(0.000078)
BEAUTY	0.010380***	0.000004	-0.000020
	(0.000558)	(0.000004)	(0.000126)
BEC	0.008804***	0.000040	0.000299
	(0.000351)	(0.000034)	(0.000325)
BEM	0.005188***	0.000001	0.000043
	(0.000168)	(0.000003)	(0.000034)
BH	0.004629***	0.000047	0.000705
	(0.000357)	(0.000207)	(0.001210)
BJC	0.005650***	-0.000031	0.000140
	(0.000224)	(0.000025)	(0.000093)
BLA	0.005661***	0.000109	-0.000327
	(0.000184)	(0.000147)	(0.000442)
BLAND	0.004205***	-0.000000	-0.000002
	(0.000126)	(0.000002)	(0.000002)
BTS	0.004219***	0.000006*	0.000089***
	(0.000153)	(0.000003)	(0.000026)
CBG	0.008704***	-0.000056	-0.000053
	(0.000397)	(0.000075)	(0.000133)
CENTEL	0.006977***	0.000020	-0.000903
	(0.000276)	(0.000063)	(0.000605)
CHG	0.006473***	0.000002	-0.000072***
	(0.000256)	(0.000004)	(0.000020)
CK	0.005254***	0.000037	-0.000014
	(0.000174)	(0.000024)	(0.000057)
CKP	0.005723***	-0.000003	0.000090
	(0.000230)	(0.000009)	(0.000055)
CPALL	0.003820***	-0.000001	0.000041
	(0.000181)	(0.000006)	(0.000045)
CPF	0.005611***	0.000010	-0.000028
	(0.000224)	(0.000008)	(0.000056)
CPN	0.004838***	-0.000041**	0.000082
	(0.000178)	(0.000017)	(0.000131)
DELTA	0.005234***	0.000022	-0.000518
	(0.000238)	(0.000109)	(0.000365)
DTAC	0.007482***	-0.000049	-0.000217
	(0.000398)	(0.000030)	(0.000229)
EGCO	0.004101***	0.000193	0.001614
	(0.000223)	(0.000213)	(0.001035)
EPG	0.006987***	0.000041	0.000247
	(0.000266)	(0.000041)	(0.000283)
GLOBAL	0.006130***	0.000030	0.000043
	(0.000266)	(0.000032)	(0.000143)
GPSC	0.006172***	0.000040	-0.000170
	(0.000240)	(0.000032)	(0.000212)

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GUNKUL	0.005733***	0.000011	-0.000035
	(0.000228)	(0.000007)	(0.000036)
HANA	0.007716***	-0.000071	-0.001307
	(0.000354)	(0.000096)	(0.000861)
HMPRO	0.005149***	0.000005	0.000356**
	(0.000293)	(0.000011)	(0.000178)
ICHI	0.006961***	0.000211***	-0.000053
	(0.000297)	(0.000078)	(0.000215)
INTUCH	0.004268***	-0.000004	0.000009
	(0.000141)	(0.000009)	(0.000242)
IRPC	0.006106***	-0.000000	0.000038**
	(0.000274)	(0.000003)	(0.000019)
ITD	0.005699***	0.000010	0.000026
	(0.000209)	(0.000013)	(0.000056)
IVL	0.006505***	0.000039**	-0.000202***
	(0.000366)	(0.000016)	(0.000063)
JAS	0.006589***	0.000004	0.000005
	(0.000221)	(0.000003)	(0.000007)
KBANK	0.003912***	0.000058	0.000115
	(0.000278)	(0.000037)	(0.000288)
KCE	0.008881***	-0.000019	-0.000336
	(0.000379)	(0.000028)	(0.000391)
KKP	0.003783***	-0.000064*	-0.000027
	(0.000185)	(0.000037)	(0.000233)
KTB	0.004151***	0.000000	-0.000009
	(0.000179)	(0.000005)	(0.000016)
KTC	0.006961***	0.000115***	-0.000024
	(0.000446)	(0.000031)	(0.000072)
LH	0.005639***	0.000001	0.000022*
	(0.000180)	(0.000003)	(0.000012)
LPN	0.005908***	0.000013	-0.000205
	(0.000244)	(0.000032)	(0.000221)
MAJOR	0.005410***	0.000354***	-0.000971
	(0.000197)	(0.000078)	(0.000814)
MINT	0.005842***	0.000041*	0.000083
	(0.000266)	(0.000024)	(0.000100)
MTC	0.007283***	0.000041	-0.000257
	(0.000343)	(0.000038)	(0.000433)
PLANB	0.006853***	0.000010	0.000067
	(0.000261)	(0.000025)	(0.000069)
PSH	0.004732***	-0.000093*	-0.000140
	(0.000187)	(0.000054)	(0.000091)
PTT	0.004455***	0.000008	0.000029
	(0.000312)	(0.000005)	(0.000026)
PTTEP	0.005041***	0.000020	0.000448***
	(0.000392)	(0.000035)	(0.000166)
PTTGC	0.005788***	-0.000024	0.000025
	(0.000317)	(0.000015)	(0.000076)

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QH	0.004939***	0.000004	0.000012*
	(0.000183)	(0.000003)	(0.000007)
RATCH	0.003291***	0.000089*	0.000531
	(0.000143)	(0.000051)	(0.000585)
S	0.005696***	0.000041*	-0.000181**
	(0.000196)	(0.000021)	(0.000083)
SAMART	0.007398***	-0.000015	0.000036
	(0.000236)	(0.000063)	(0.000101)
SAWAD	0.007672***	0.000005	0.000083
	(0.000348)	(0.000047)	(0.000234)
SCB	0.004418***	0.000001	0.000185
	(0.000197)	(0.000021)	(0.000128)
SCC	0.003715***	0.000084***	-0.000356***
	(0.000133)	(0.000028)	(0.000134)
SIRI	0.005153***	0.000003	-0.000000
	(0.000178)	(0.000003)	(0.000004)
SPALI	0.005365***	-0.000010	-0.000250
	(0.000252)	(0.000039)	(0.000208)
SPCG	0.004116***	-0.000021	0.000918
	(0.000159)	(0.000098)	(0.000664)
STA	0.007247***	0.000048	0.000486**
	(0.000337)	(0.000047)	(0.000229)
STEC	0.006019***	0.000013	-0.000048
	(0.000239)	(0.000009)	(0.000053)
STPI	0.006996***	0.000067	0.000312
	(0.000288)	(0.000055)	(0.000459)
TASCO	0.006382***	0.000017	-0.000194*
	(0.000258)	(0.000028)	(0.000101)
TCAP	0.004590***	0.000038	-0.000071
	(0.000191)	(0.000052)	(0.000130)
THAI	0.006867***	0.000034	-0.000499
	(0.000255)	(0.000060)	(0.000325)
THCOM	0.006988***	-0.000039	0.000036
	(0.000334)	(0.000075)	(0.000477)
TISCO	0.003897***	-0.000014	0.000655
	(0.000325)	(0.000090)	(0.000471)
TMB	0.005752***	0.000001	-0.000019*
	(0.000198)	(0.000001)	(0.000012)
TOP	0.006461***	-0.000048*	0.000011
	(0.000322)	(0.000027)	(0.000091)
TPIPL	0.005138***	-0.000005	-0.000017
	(0.000193)	(0.000006)	(0.000024)
TRUE	0.006866***	0.000002	-0.000008
	(0.000255)	(0.000001)	(0.000006)
TTA	0.006268***	0.000103	-0.000816***
	(0.000206)	(0.000078)	(0.000315)
TTW	0.004323***	0.000109**	0.000067
	(0.000186)	(0.000046)	(0.000138)

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TU	0.005672***	0.000002	-0.000081
	(0.000248)	(0.000014)	(0.000212)
UNIQ	0.006413***	-0.000042	0.000373
	(0.000218)	(0.000048)	(0.000289)
VGI	0.006116***	0.000006	0.000049
	(0.000236)	(0.000012)	(0.000070)
WHA	0.004783***	-0.000000	0.000010
	(0.000214)	(0.000002)	(0.000008)

Note: *This table present the regression results of model from equation (1). The numerical values in the table indicate the estimated coefficients of the variables and the numerical values contain in brackets () indicate the robust standard error of the variables. ***, **, and * indicates that the statistics value reaches significant level of 1%, 5%, and 10% respectively.*

Table 11. Summary statistics of the impact on underlying's volatility using 30 minutes price historical volatility.

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Coefficient	Positive impact on volatility				Negative impact on volatility				T
	Significant level 1%	Significant level 5%	Significant level 10%	Not significant	Significant level 1%	Significant level 5%	Significant level 10%	Not significant	
β_1	5	4	4	42	0	1	3	27	
β_2	2	3	3	35	4	1	2	36	

From the summary results show in table 11, both estimated coefficient β_1 and β_2, which is the interested observation, indicate the same way. For the estimated coefficient β_2 represent Block trade trading volume, there are 71 stocks indicate not significant with a mixed positive and negative relation while only 8 stocks have a significant positive relation on historical volatility. For the estimated coefficient β_1 represent underlying trading volume subtracted by Block trade trading volume, there are 69 stocks indicate not significant with a mixed positive and negative relation while only 13 stocks have a significant positive relation on historical volatility. The results from regression is also in line with the empirical studied, Galloway & Miller (1997), which found no relation between futures trading volume and underlying's volatility

Then, if only most of the estimated coefficient β_2 found not significant, this can be concluded that there is no relation between 30 mins historical volatility and Block trade trading volume. But in this case, we also found not significant on most of the coefficient β_1 too implying that there is also no relation between historical volatility and the stock its own trading volume subtracted by Block trade trading volume. On the other hand, this regression results can also be implied that it might have a problem on its own regressand measurement which is the 30 minutes price historical volatility including 2 possible reasons. Firstly, there are only 12 closing price data on each day to calculate historical volatility which are not huge enough. Secondly, the 30 mins closing price capture the last price of each single 30 minutes period which could be either bid price or ask price. Then, the captured closing price might capture the same data even its already shifted up/down 1 tick depend on the last price is bid or ask.

Result of the impact on underlying's return

To examine the result of how Block trade transaction effects to the underlying's return, we use linear regression model from equation (4) to regress underlying total return with market total return, change in open interest in case of increasing and in case of decreasing. The significant level of coefficient of the change in open interest in case of increasing (β_2) and coefficient of the change in open interest in case of decreasing (β_3) which causes by Block trade trading activities are the interested observation while β_0 and β_1 are constant and the coefficient of market total return respectively.

The results of this regression are shown in **Table 12 and Table 13.** This regression covers the 3 years period starts from January 2017 until December 2019.

Table 12. The impact on underlying's return.

Underlying	β_0 (Robust Std. Err)	β_1 (Robust Std. Err)	β_2 (Robust Std. Err)	β_3 (Robust Std. Err)
AAV	-0.001546**	0.838402***	0.158642	0.943318
	(0.000624)	(0.097400)	(0.863219)	(0.694489)
ADVANC	0.000647	0.818935***	-4.890994*	-5.735361**
	(0.000478)	(0.066550)	(2.681807)	(2.347062)
AMATA	0.000492	1.689556***	-2.493499	-1.254644
	(0.000975)	(0.116646)	(2.251314)	(1.651700)
AOT	-0.000011	1.090065***	-1.422170**	0.978992
	(0.000558)	(0.066465)	(0.634915)	(1.186114)
AP	0.000320	0.988591***	-0.973642*	-1.500020**
	(0.000597)	(0.102098)	(0.497627)	(0.697271)
BA	-0.001200**	0.811364***	5.975794***	0.319767
	(0.000525)	(0.088405)	(2.100774)	(5.334788)
BANPU	-0.000887	1.421672***	0.591373	0.903560***
	(0.000736)	(0.115532)	(0.438351)	(0.256828)
BAY	-0.000443	0.782500***	22.369078**	28.329863**
	(0.000385)	(0.068134)	(9.941810)	(11.074658)
BBL	-0.000003	0.638427***	-12.099414**	-11.597396**
	(0.000530)	(0.074660)	(5.042470)	(4.522814)

BCH	-0.000531	0.906945***	-4.323479**	-0.600534
	(0.000688)	(0.092257)	(1.944778)	(1.310036)
BCP	-0.000195	0.978259***	-0.859398	-0.250405
	(0.000502)	(0.083916)	(2.547989)	(2.263010)
BDMS	-0.000540	0.594404***	-2.353740**	-0.008809
	(0.000518)	(0.087045)	(0.994713)	(0.665693)
BEAUTY	-0.000851	1.975537***	-0.791476	-3.754919
	(0.001605)	(0.243290)	(1.895947)	(3.172762)
BEC	-0.002803**	1.402647***	2.949680	11.066744***
	(0.001146)	(0.169485)	(2.531224)	(2.791769)
BEM	0.000269	0.696805***	-0.164470	0.173096
	(0.000484)	(0.077772)	(0.323340)	(0.293685)
BH	-0.000605	0.884319***	-36.208969***	-25.997236*
	(0.000567)	(0.087995)	(9.197512)	(14.877331)
BJC	-0.000409	1.336065***	-3.916303**	-3.557420**
	(0.000581)	(0.088440)	(1.610141)	(1.537783)
BLA	-0.001309**	0.977191***	13.628007**	15.520751***
	(0.000610)	(0.094820)	(6.045036)	(5.850611)
BLAND	-0.000173	0.581185***	0.096449*	0.077048*
	(0.000372)	(0.055419)	(0.058462)	(0.046484)
BTS	0.000343	0.533810***	-0.406551*	0.197684
	(0.000389)	(0.064458)	(0.238202)	(0.270053)
CBG	-0.001122	1.701774***	-0.945531	7.249081
	(0.001197)	(0.154260)	(2.721279)	(4.752037)
CENTEL	-0.001285*	1.210450***	-22.451658***	-8.679551
	(0.000711)	(0.110605)	(6.874802)	(6.532904)
CHG	0.000581	0.931187***	-0.032998	-0.765390
	(0.000876)	(0.108994)	(0.553079)	(0.802408)
CK	-0.000094	1.062037***	1.704116*	-0.092996
	(0.000525)	(0.083763)	(0.983157)	(0.652402)
CKP	-0.000762	1.162920***	-0.054112	1.675638**
	(0.000682)	(0.104066)	(0.399002)	(0.764862)
CPALL	-0.000014	0.930493***	-2.300236***	-1.971756***
	(0.000406)	(0.065994)	(0.539575)	(0.582498)
CPF	-0.000293	0.840710***	-0.685332	-0.053951
	(0.000564)	(0.075812)	(0.573944)	(0.629670)
CPN	-0.000163	1.079999***	-2.337082	0.412124
	(0.000492)	(0.076247)	(2.317257)	(2.200496)
DELTA	-0.000460	0.590990***	0.371120	1.402605**
	(0.000691)	(0.113174)	(0.390319)	(0.656217)
DTAC	0.000332	1.345664***	-1.080628	-0.118715
	(0.001045)	(0.144707)	(4.222566)	(3.350517)
EGCO	0.000241	0.651906***	-19.413377**	7.584041
	(0.000484)	(0.070784)	(8.466833)	(15.978413)
EPG	-0.001208	1.168677***	-1.568409	0.746930
	(0.000780)	(0.134357)	(2.091128)	(2.127651)
GLOBAL	0.000431	1.197158***	-0.618526	-3.239944**

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	(0.000641)	(0.107319)	(1.700320)	(1.473876)
GPSC	0.000734	1.435677***	5.324211*	11.426330**
	(0.000786)	(0.119641)	(3.044163)	(5.430565)
GUNKUL	-0.000498	1.092923***	0.939451*	1.147758
	(0.000629)	(0.114072)	(0.517787)	(1.017541)
HANA	-0.000035	0.998659***	-3.094752	-0.664136
	(0.000883)	(0.160137)	(6.253687)	(4.656135)
HMPRO	-0.000122	0.889724***	-3.634393**	0.188590
	(0.000629)	(0.089951)	(1.541493)	(1.697169)
ICHI	-0.000881	1.245226***	11.173019	12.568826***
	(0.000968)	(0.140106)	(9.296072)	(2.625574)
INTUCH	-0.000786	0.838902***	-5.716050***	4.376553
	(0.000511)	(0.069373)	(1.407510)	(3.939254)
IRPC	-0.000058	1.518400***	-0.085412	-0.228811
	(0.000670)	(0.106373)	(0.212391)	(0.170477)
ITD	-0.002210***	1.354112***	0.779408**	1.985094***
	(0.000566)	(0.089102)	(0.324486)	(0.525688)
IVL	-0.000693	2.009047***	-1.398804**	0.192944
	(0.000762)	(0.120631)	(0.635936)	(0.847069)
JAS	0.000807	1.424688***	1.003697*	0.553128***
	(0.001127)	(0.185772)	(0.539754)	(0.201994)
KBANK	0.000625	1.108298***	-7.340058	-17.301486***
	(0.000628)	(0.085486)	(4.661729)	(3.214715)
KCE	-0.000372	1.468291***	-2.950262	-10.283140
	(0.001177)	(0.166265)	(9.482864)	(7.132645)
KKP	-0.000220	0.874452***	-5.271259**	3.420603
	(0.000394)	(0.061261)	(2.535204)	(2.264564)
KTB	-0.000090	0.788877***	-0.532464**	-0.491719*
	(0.000368)	(0.061339)	(0.233780)	(0.280337)
KTC	0.001449	1.728367***	-1.238271	1.236496
	(0.001043)	(0.190367)	(2.220620)	(1.534517)
LH	0.000640	0.655847***	0.362144**	-0.108976
	(0.000452)	(0.082020)	(0.143628)	(0.151004)
LPN	-0.001236**	0.984998***	1.444694	2.168979
	(0.000611)	(0.111870)	(0.949160)	(1.906632)
MAJOR	-0.000592	0.701170***	-14.668523*	-3.201789
	(0.000600)	(0.099846)	(8.841791)	(3.224730)
MINT	-0.000373	1.163298***	-2.564438**	-1.218852
	(0.000604)	(0.080364)	(1.008208)	(1.745767)
MTC	0.001403	1.498652***	-7.306726	-8.056211
	(0.000892)	(0.117314)	(6.965901)	(5.613404)
PLANB	-0.000101	0.991669***	-2.276186**	-0.467120
	(0.000776)	(0.119903)	(1.131532)	(0.804041)
PSH	-0.000294	0.829942***	0.924813	0.342597
	(0.000469)	(0.089142)	(2.438792)	(1.262851)
PTT	0.000187	1.481501***	-1.217851*	-0.879075*
	(0.000379)	(0.075204)	(0.715028)	(0.530612)

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PTTEP	-0.000134	1.503886***	-5.559753***	-2.453515
	(0.000611)	(0.104369)	(2.083668)	(2.011115)
PTTGC	0.000020	1.547037***	-1.547829	-1.776159
	(0.000574)	(0.085916)	(1.060267)	(1.158756)
QH	-0.000204	0.883295***	-0.395782	-0.094521
	(0.000520)	(0.080245)	(0.264437)	(0.153765)
RATCH	0.000352	0.484439***	-1.041064	4.222166
	(0.000359)	(0.073160)	(4.689594)	(3.813700)
S	-0.001484**	0.966875***	1.699219*	4.524194***
	(0.000578)	(0.101694)	(1.014112)	(0.943820)
SAMART	-0.002319***	1.129470***	-1.843028	12.485338***
	(0.000781)	(0.114513)	(1.531390)	(4.025408)
SAWAD	0.000323	1.853630***	-11.261102**	-6.930250*
	(0.001031)	(0.157276)	(5.124203)	(3.761958)
SCB	-0.000575	1.021685***	-6.026460***	-3.270893
	(0.000458)	(0.067512)	(2.187585)	(2.476852)
SCC	-0.000120	0.835665***	-12.554595***	-15.130650***
	(0.000395)	(0.060625)	(3.522901)	(3.438322)
SIRI	-0.000092	0.959127***	0.043491	-0.083428
	(0.000604)	(0.088474)	(0.108404)	(0.146290)
SPALI	-0.000493	0.882438***	-1.620393	1.845245
	(0.000541)	(0.079861)	(1.379231)	(1.853205)
SPCG	-0.000207	0.697138***	7.798649**	12.780119**
	(0.000504)	(0.070832)	(3.774720)	(5.258899)
STA	0.000694	1.428996***	9.870094**	1.505151
	(0.001242)	(0.140742)	(4.844010)	(4.097506)
STEC	-0.000600	1.465701***	-2.011208	-3.072254*
	(0.000823)	(0.144226)	(2.130789)	(1.663800)
STPI	-0.001189	1.163199***	7.222610***	12.737721***
	(0.000841)	(0.129726)	(1.285092)	(2.004015)
TASCO	0.000354	1.181114***	3.390709**	3.291971**
	(0.000712)	(0.094120)	(1.335956)	(1.590590)
TCAP	0.000040	0.846423***	-5.627241	-1.227401
	(0.000498)	(0.083767)	(3.995533)	(1.871581)
THAI	-0.002389**	1.258139***	1.476092	8.220256
	(0.001034)	(0.154525)	(1.977427)	(6.391392)
THCOM	-0.002021**	1.262027***	2.035129	4.463061
	(0.000898)	(0.164751)	(4.219103)	(4.096856)
TISCO	0.000544	0.767892***	-11.923435**	-8.277310**
	(0.000554)	(0.071710)	(4.966158)	(3.914473)
TMB	-0.001262**	0.904459***	-0.623123***	0.115609
	(0.000613)	(0.105733)	(0.204006)	(0.252139)
TOP	-0.000040	1.488457***	-5.567741***	-4.668291
	(0.000680)	(0.112021)	(2.081865)	(3.105892)
TPIPL	-0.000433	0.819339***	0.289766***	0.183933***
	(0.000548)	(0.092832)	(0.016651)	(0.056393)
TRUE	-0.000038	1.588786***	0.256069	0.035947

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	(0.000826)	(0.110867)	(0.205307)	(0.214029)
TTA	-0.001228*	1.263266***	2.754610	4.786053*
	(0.000637)	(0.095495)	(1.975822)	(2.460263)
TTW	0.000421	0.224840***	0.378565	2.074472
	(0.000408)	(0.069320)	(2.035895)	(1.902556)
TU	-0.000478	0.828868***	0.454488	0.231394
	(0.000687)	(0.097174)	(2.234234)	(2.495620)
UNIQ	-0.001109*	1.555199***	1.087678	-0.641574
	(0.000618)	(0.118383)	(1.349275)	(1.709815)
VGI	-0.000371	0.865476***	-3.133488***	0.013091
	(0.000704)	(0.104261)	(1.194665)	(0.944458)
WHA	0.000037	1.177455***	-0.031694	0.230274
	(0.000531)	(0.084108)	(0.137337)	(0.182610)

Note: *This table present the regression results of model from equation (4). The numerical values in the table indicate the estimated coefficients of the variables and the numerical values contain in brackets () indicate the robust standard error of the variables. ***, **, and * indicates that the statistics value reaches significant level of 1%, 5%, and 10% respectively.*

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Table 13. Summary statistics of the impact on underlying's return

Coefficients	Positive impact on return				Negative impact on return				To
	Significant level 1%	Significant level 5%	Significant level 10%	Not significant	Significant level 1%	Significant level 5%	Significant level 10%	Not significant	
β_1	86	0	0	0	0	0	0	0	
β_2	3	7	6	15	10	14	5	26	
β_3	10	6	2	28	3	6	5	26	

From the summary results show in table 13, both estimated coefficient β_2 and β_3 indicate the same way even β_2 is our main interested observation on this regression. For the estimated coefficient β_2 represent the change in open interest in case of decreasing, there are 41 stocks indicate not significant with a mixed positive and negative relation while the rest 16 stocks indicate significant positive impact and 29 stocks indicates significant negative impact on underlying return. For the estimated coefficient β_3 represent the change in open interest in case of increasing, there are 54 stocks indicate not significant with a mixed positive and negative relation while the rest 32 stocks indicate mixed results including both significant positive and significant negative impact on underlying return. Even the β_2 and β_3 represent the coefficient in different cases of change in open interest which should show the different results as stated in hypothesis, but the results from regression indicate not significant for both cases. Therefore, this can be concluded that there is no relation between change in open interest and underlying's return.

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Moreover, the regression results also indicate that the estimated coefficient β_1 of all the 86 underlying, which is market total return, have a significant positive impact on underlying's return. So, this can be concluded that there is a strong positive

relation between underlying's return and market's return which align with Capital Asset Pricing Model (CAPM) developed by William Sharpe (1964) and John Lintner (1965).

Multicollinearity detection

To secure our regression result, multicollinearity detection has been employed to check pairwise correlations among independent variables. If the correlation is higher than 0.8 which can cause problems to the interpreting result, then we can conclude that there is a severe multicollinearity.

For the first model, impact on volatility, the correlation among both independent variables which is Block trade trading volume and underlying trading volume subtracted by Block trade trading volume have been checked for all the 86 studied stocks. We found multicollinearity only 1 stock which is BAY at 0.8465 while other 85 stock found no multicollinearity. More details are showed in **Table A3 in appendix**.

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For the second model, impact on underlying return, the correlation among 3 independent variables which is market total return, change in open interest in case of decreasing and in case of increasing have been checked for all 86 studied stocks. We found out that all the 86 stocks have correlation below 0.8 then we can conclude that there is no multicollinearity. More details are showed in **Table A4 in appendix**.

5. Conclusion

As there is a concern of how high leverage product have an impact on its own underlying trading activities in many markets also in Thailand, most of the empirical

studied have investigated on the relation between futures trading volume and underlying's volatility on U.S. market. However, the results indicated mixed conclusion including negative impact and no relation. This study tries to examine the impact of Block trade transactions, which uses futures trading as an instrument, on underlying's volatility and return by using linear regression model. To preserve the consistency of data, 86 underlying are covered in this study.

For the impact on volatility, this paper use 2 measurement as a regressand volatility which is Parkinson variance estimator and 30 minutes price historical volatility. This paper use 1. Block trade trading volume and 2. underlying volume subtracted by Block trade trading volume as a regressor. The regression results using Parkinson variance estimator address that Block trade trading volume have an impact on volatility align with the impact from underlying regular trading volume because the hedging process of Block trade transaction also need to buy and sell underlying. But to compare the impact from 2 types of trading volume, most stocks indicate mixed results which is higher and lower impact on volatility but not statistically significant. This can be implied that the investor might not over trading using this instrument to switch on the call/forced process. While another measurement, 30 minutes price historical volatility, indicates no relation from both regressor. However, there is still have an unclear problem on the second measurement that the historical volatility uses only 12 data from 30 minutes closing in each day which is quite a small group of data. Another problem is that 30 minutes closing price could captured either bid or ask price which could be the same data even the stock price had already shifted up or down. Anyway, the results from the first regression indicate a support evidence that when stocks movement is highly volatile, Block trade trading volume might be

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one of the reason of this movement to widen the high/low spread in each day and can be a good reminder for investor to not panic buy at the peak or sell at the bottom.

Furthermore, this study also investigates the impact of Block trade trading activities on underlying's daily return by using 1. change in open interest in case of increasing, 2. Change in open interest in case of decreasing and 3. market total return as a regressor. The regression results address that there is no relation from both cases of change in open interest while the market total return indicate positive relation. For investor, this can be implied that even the Block trade trading volume can increase stock's volatility from the details above but it is just only an extreme movement causing high or low price in a day not the close price at the end of day which is used to calculate daily return. As there is no different between decreasing and increasing change in open interest, the results also rejects my hypothesis that the change in open interest in case of decreasing might have an impact to underlying's return due to the over trading behaviour making call margin and force closing position process work. Therefore, this regression address that there is no impact on return from the transaction which use Block trade as an instrument implying that investor can just consider the change in open interest as just a normal trading flow to underlying stock not a factor which can cause the abnormal return or losses from underlying.

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In summary, Block trade trading activities causes underlying stock movement more volatile but there is no conclusion on the impacts on daily return. In comparison to impact from trading volume in the underlying stock in the regular channel, Block trade trading volume impact underlying price volatility more in some stocks but less in the others. Although there is no conclusive direction to the overall stock market

whether the impact of Block trade trading volume has exceeded that of the underlying stock trading volume, it may be interesting to conduct a research more on the common characteristics of underlying stocks that are relatively more sensitive to Block trade trading volume. On the final note, investors should still beware of Block trade when market is volatile due to the fact that Block trade allows investors to leverage granting investors higher buying power. So, even though the per volume generated by Block trade may not have a clear impact, the spike in Block trade volume alone could cause a high underlying price volatility.

As my intention, I hope that this study might be helpful for regulators who are trying to enhance and improve market efficiency or impose relevant controls to the market volatility, that Block trade may not necessarily always be the culprit of the market volatility. I also hope that investors or traders can use this study to understand more about the extent of Block trade impact to the market when they are deciding or managing their stock positions in portfolio.

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