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Index Futures Introduction and Spot Market Volatility: The Case of Thai Stock Market

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Abstract
A number of studies examine stock markets and the underlying assets volatility structural change when futures contracts are introduced. Different points of view on this issue have emerged, making futures introduction somewhat inconclusive as a result. This study examines the relationship between futures trading volume, futures open interest, and futures trading transaction and the change of spot SET50 index volatility in Thailand, using the standard GARCH model and the Exponential GARCH (EGARCH) model. Findings show that in the Thai stock market the index futures introduction leads to more spot market efficiency, higher price stability, and less mispricing. The SET50 index futures trading volume positively relates to the change of spot SET50 index volatility. More players (the number of futures open interest outstanding) in futures market enhance price discovery and market efficiency. The results also in indicate that foreign investors invest in Thailand Futures Exchange (TFEX) for hedging purposes and typicallly hold a large amount of underlying stocks in the spot market. Local institutional investors, however, will not create excess spot SET50 volatility as they generally improve market efficiency and contribute to market stabilization. As to local investors, they tend to invest in futures market because of their high degree of leverage.

Keywords: Futures contract, Open interest, SET50 index, Thailand Futures Exchange (TFEX)

1. Introduction

Futures contracts are standardized instruments that are traded in organized futures exchanges (Chance, 2012). The introduction of futures markets provides benefits to participants in several ways. For examples, it encourages price discovery, increases market efficiency, and increases leverage (Hull, 2009; Chance, 2012). There has been a number of studies regarding the effect of futures market introduction on spot market volatility but the results are still inconclusive. Many confirm that futures market introduction significantly affects spot market volatility in certain directions (Niederhoffer & Zeckhauser, 1980; Figlewski & Kon, 1982; Edwards, 1988; Schwert, 1990, Harris, 1989; Antoniou & Holmes, 1995; Gulen & Mayhew, 2000; Ray & Panda, 2011; Gahlot, 2013). In Thailand, the organized futures exchange is called Thailand Futures Exchange (TFEX) and was established in 2004. There are three main groups of investors in the TFEX: foreign investors, local institutional investors, and local investors (TFEX, 2016). The TFEX is quite small as compared with futures markets in developed

countries. The highest monthly futures trading volumes at the TFEX is 3,509,617 contracts. This occurred in September, 2016. Moreover, the number of monthly futures open interest at the TFEX varied greatly during the period 2011-2016. The highest monthly futures open interest amounts to 317,577 contracts. This was in September, 2015. The lowest was 106,470 contracts. This was in December, 2011. The small size of the TFEX limits the futures market dimension. The TFEX needs additional money and participants so as to be attractive to investors. The relationship between TFEX market introduction and spot market volatility remains the subject of constant speculations by academics and practitioners (Techarongrojwong, Sinliamthong, & Waranyasathit, 2017). This has motivated the authors to examine the relationship between futures market introduction and the change of spot market volatility in Thailand. Specifically, this study aims to investigate the relationship between SET50 index futures introduction and the change of spot SET50 index volatility. It explores two futures market factors - futures trading volume and futures open interest - that influence spot index volatility. It also examines the relationship between the futures trading transactions (buy/sell) of different types of investors (foreign, local, and local institutional investors) and the change of spot SET50 index volatility.

2. Literature Review

- Index Futures Introduction and the Change of Spot Market Volatility

The relationship between futures market and the change of spot market volatility is still inconclusive. Some studies found a positive relationship between futures market introduction and the change of spot market volatility (Harris, 1989; Antoniou & Holmes, 1995; Gulen & Mayhew, 2000; Ray & Panda, 2011; Gahlot, 2013). But some studies found a negative relationship between them (Niederhoffer & Zeckhauser, 1980; Figlewski & Kon, 1982; Edwards, 1988; Schwert, 1990). In the U.S. Market, the relationship between index futures and the change of spot S&P volatility structure was examined by Maberly, Allen, and Gilbert (1989) and Harris (1989) for the period 1982-1987. They determined that the spot S&P volatility increases when index futures come into play. Volatility increased after S&P futures introduction. Harris (1989) conducted a covariance cross-sectional analysis of the regression model to measure the mean differences between S&P 500 index stocks and non-S&P 500 index stocks. The results showed that S&P index stocks have higher volatility when compared with non S&P 500 index stocks. The increase was very significant in 1985 but in short time intervals.

Antoniou and Holmes (1995) looked at the FTSE-100 stock index futures contracts during the period November 1980-October 1991 in the United Kingdom. They used the GARCH techniquess and removed market wide factors that influence spot price change by using Unlisted Securities Market (USM) as a market-wide factor proxy. USM was used to extract market factors that influence spot market volatility rather than futures themselves. They did not utilize the FT All Share index, the FT 500 index, and the FT 30 index because of their high correlation with the FTSE-100 index. The findings indicate that futures trading led to higher volatility in underlying spot markets. The FTSE-100 index futures affected the spot market volatility but this was not a concern for speculators (Antoniou & Holmes, 1995).

Antoniou, Koutmos, and Pericli (2005) extended their investigations to other countries such as Canada, France, Germany, Japan, and the US. In contrast, the results showed that futures market can help to stabilize the spot market by reducing impact of feedback traders and attracting more rational investors into the market. Overall results indicated that futures market introduction can help to stabilize prices. The longer period of study account for different results in the UK. Matanovic and Wagner (2012) examined the DAX futures market in Germany using the GARCH model during the period 1970-2009. They applied approaches that tested the structural break in the long-term volatility of DAX return and the structural break in the dynamics of conditional volatility of DAX returns. They also relaxed GARCH (p,q) specification to a maximum order of 5 lags to specify the properly reliable model to find the best fitting for ther GARCH model in the study. The results also supported Antoniou et al.'s (2005) findings.

Chang, Cheng, and Pinegar (1995) investigated the impact of futures introduction in the Tokyo stock exchange. They determined that futures trading increases spot portfolio volatility. Only Nikkei stocks were directly affected by futures trading. Their findings suggest that futures trading increases spot portfolio volatility by decreasing the cross-sectional dispersion of security returns. They also suggest that futures-related basket trading strategies increase spot asset volatility and this increase is not diversifiable. Gulen and Mayhew (2000) studied futures introduction in 25 countries in Europe and Asia and in the USA using the GARCH model. The results were mixed in several countries. They confirmed Chang et al.'s (1995) finding that futures trading relates to the increase in conditional volatility in Japan and also in the United States. They are also consistent with Bessembinder and Seguin (1992) who focused on futures open interest and futures trading volume. They found that in most countries volatility decreases in periods of high open interest and increases in periods of high volume as caused by unexpected volume components. Nel and Kruger (2001) studied the relationship between stock index futures introduction and spot market volatility in South Africa Futures Exchange (SAFEX).

One-tail test, hypothesis test at a significance level of 0.05, and the F Distribution were utilized to test the statistics. The findings are in keeping with Gulen and Mayhew (2000), who showed that futures contracts relate to higher volatility in the underlying spot market but in the short term before futures contract expiration. Chelley-Steeley (2008) investigated single stock futures contract in Euronext-Liffe and found that stock market volatility increases after futures introduction. Several researchers, however, found that futures market introduction enhances stability in spot markets (Niederhoffer & Zeckhauser, 1980; Figlewski & Kon, 1982; Edwards, 1988; Schwert, 1990). Most studies in developed countries especially in the U.S. conclude that futures market introduction significantly relates to spot market stabilization. Niederhoffer and Zeckhauser (1980) indicated that index futures can help to reduce speculative activity away from spot markets. Trading in index futures could turn out to be beneficial to anyone who invests in stock markets. Some traders use futures for hedging purposes. On the other hand, speculators may see a new opportunity that is particularly attractive because futures market offers significant leverage. The net result may be much greater stability in the spot market for these securities.

Figlewski and Kon (1982) argued that stock index futures like the S&P 500 and the Value Line Index can help investors benefit from hedging opportunities because stock index futures are proposed on aggregate market index. They concluded that stock index futures allow investors to alter the risk factor very easily both with regard to active and passive portfolio. Edwards (1988) studied the S&P 500 index and Value Line Contract before and after the futures introduction period in the US. The results showed clearly that volatility tends to decrease when futures market are traded. Tosini (1988), who examined the role of S&P index futures on the spot market index in October 1987 in the US. found that 70 percent of open interest in S&P index futures are held by commercial traders. Investors typically hold futures for hedging and arbitrage purposes instead of speculation. Therefore, the S&P 500 index futures market did not lead to spot market volatility in October 1987, but enhanced stability instead. However, according to Schwert (1990), who examined several academic papers and attempted to find out policies to decrease stock market volatility in the US, there are only little evidence to relate stock market volatility to futures or option. It is unclear whether futures and option introduction causes higher volatility in spot market.

Similar to developed countries, there are plenty of previous studies that examine the relationship between futures market introduction and the change of spot market volatility in emerging countries. Several previous studies found the positive relationship between them in emerging countries. Ray and Panda (2011) and Gahlot (2013) investigated the relationship between futures market introduction and the change of spot market volatility in Indian stock exchange by dividing period of study into pre-futures period and post-futures period. Ray and Panda (2011) used the GARCH odel to examine the relationship between futures market introduction and the change of spot market volatility and found that 8 out of 15 stocks in the study experience changes in volatility pattern after futures introduction. Gahlot (2013) studied the impact of futures trading of the top 7 companies in the automobile and engineering sectors by using the EGARCH M model in India and mthe lagged return of the S&P 500 index to determine spillover effect between Indian and US market. The findings confirmed that futures trading increases volatility for stocks in both the automobile and engineering sectors.

Gahlot, Datta, and Kapil (2010) examined the impact of S&P CNX Nifty in the years 2002-2005. Using the GARCH model to capture stock market volatility, they determined that there was no significant change in S&P CNX Nifty volatility. Shenbagaraman (2003) and Debasish (2009) studied the impact of futures introduction as well as stock index options in the Indian spot market. Shenbagaraman (2003) used the GARCH (1,1) model to test daily closing price in the period 1995-2002 and removed lagged world return, day of the week effect, and market-wide factors that influence Nifty return out of the study. The results inidcate that futures market introduction has no significant impact on spot market volatility. Debasish (2009) used several GARCH techniques to study the effect of futures market introduction on the price volatility of Nifty spot market during the period 1997-2007 in India. It was determined that the most appropriate model for the study of volatility is the GARCH (1,1) model. This is consistent with Shenbagaraman's (2003) determination that futures market introduction reveals no significant change of volatility. Shenbagaraman's (2003) study considered different volatility measurements to avoid test sensibility.

The results confirmed that there is no structural change after futures trading introduction except for the weekly price change method. Several studies found that futures market introduction enhances spot market stabilization in emerging markets. Using the GARCH M model, Gahlot and Datta (2012) examined the impact of futures market introduction in Brazil, Russia, India, and China (BRIC) stock markets. They also investigated day-of-the-week effects on BRIC markets. The GARCH M model implied that futures market introduction led to volatility reduction in the Indian stock market. Chen, Han, Li, and Wu (2012) studied the change of spot market volatility due to futures market introduction in China. They adopted a panel data evaluation approach to construct counterfactual of spot volatility based on correlations between the Chinese stock market and international stock markets and several domestic macroeconomic indicators. Xie and Huang (2014) investigated the Chinese stock market by using daily data of the CSI index during the period 2005-2012. They employed several GARCH models techniques to find the best fitted model. The results from the GARCH M model inidicate that the CSI index futures did not significantly affect to the overall of spot market or influence the nature of the particular volatility. One possible reason behind the insignificant result was that the stock index futures mechanisms and relevant market regulations are still undeveloped.

- Futures Trading Volume and Futures Open Interest

Futures trading volume and futures open interest are important factors in futures markets. Several studies have investigated the impact of futures trading volume and futures open interest factors on the change of spot market volatility and showed different results (Bessembinder & Seguin, 1992; Daigler & Wiley, 1999; Gulen & Mayhew, 2000; Floros, 2007; Lin, 2010; Pati, 2010; Sharma & Malhotra, 2015; Maitra, 2014). Chen, Cuny, and Haugen (1995) examined the relationship between spot market volatility and the basis and the open interest of S&P 500 stock index futures. They determined that as spot market volatility increases, the basis of futures decreases, and the open interest of S&P 500 index futures increases. When stock markets go down, investors tend to sell stocks and futures, which leads to overall market higher volatility (Chen et al., 1995). Therefore, a new market equilibrium is characterized by a lower futures basis and higher futures open interest. On the other hand, when the overall market volatility decreases, the new equilibrium is characterized by a higher futures basis and a lower futures open interest.

However, several previous studies found that futures trading volume positively relates to excess spot market volatility. Bessembinder and Seguin (1992) looked at the relations between spot and futures trading activity (volume and open interest) and S&P index volatility during the period January 1978-September 1989. They partitioned volume and open interest into expected and unexpected components. First of all, they de-trended data by deducting 100-day moving average from the volume and open interest data. They then partitioned the de-trended data into expected and unexpected components. The expected component reflected forecasted activity and unexpected component to be a shock. The results showed that unexpected components have la arger effect than expected components. Moreover, they also found that unexpected futures volume components positively relates to spot market volatility. In contrast, futures open interest negatively related to spot market volatility.

Bessembinder and Seguin (1993) extended their study to physical and financial futures markets (currency market, metal market, agricultural commodities, and financial contracts) during the period May 1982-March 1990 in the US. They examined relations between futures volatility, futures trading volume, and market depth (open interest) and partitioned futures trading volume and market dept (open interest) into expected and unexpected components. The results supported Bessembinder and Seguin's (1992) finding that unexpected volume components have a larger effect on volatility. Unexpected volume components have an effect seven times larger than expected volume components. They also found that futures volatility negatively relates to expected open interest components in all futures markets. Shenbagaraman (2003) extended the work of Bessembinder and Seguin (1992) to different markets around the world. Following Bessembinder and Seguin (1992), Shenbagaraman (2003) decomposed futures trading volumes and futures open interest into expected and unexpected components. Shenbagaraman (2003), however, did not find any linkages between futures trading volumes, futures open interest, and spot market volatility. In addition to studying the effects of futures market introduction in 25 countries in the US, Europe, and Asia, .Gulen and Mayhew (2000) examined futures open interest and futures trading volume. The findings indicate that volatility decreases in period of high open interest in most countries and increases in period of high volume, caused by unexpected volume component.

Floros (2007) studied the relationship between stock index futures price and open interest using the GARCH (1,1) model in Greece and found that futures open interest negatively relates to futures price volatility. The finding was in line with Bessembinder and Seguin (1992). Moreover, cointegration test showed long run relation between futures open interest and futures price. Floros (2007) suggested that futures open interest can use to predict futures price in long run. Therefore, market dept did not have effect on Greek stock index futures price changes. Focusing on the Thai stock market, Techarongrojwong, Sinliamthong, and Waranyasathit (2017) investigated the role of RSS3 futures as a hedging product in the Thai stock market. They found that there is no significant relationship between RSS3 futures and the stock market and concluded that in general RSS3 futures could be added in portfolios for hedging purpose.

Moreover, they suggested that RSS3 futures can help to diversify risk, especially during the market downturn period. Tangjitprom, Chavalittumrong, and Leelalai (2016) sought to determine whether real estate funds provide diversification benefits to investors in the Thai stock market. Using regression analysis, they found that there is a positive relationship between the return of real estate funds and the return of the stock market. However, they mentioned that real estate funds are nevertheless attractive and provide diversification benefits to investors because of low beta of real estate funds and outperforming returns when compared with returns of stock market overall.

3. Research Methodology

This study aims to examine the relationship between the SET50 index futures introduction and the change of spot SET50 index volatility in Thailand by using daily secondary data from the period 2003-2016. Based on the above literature review, it was determined that to examine spot market volatility, two of the GARCH models were to be used as statistical tools - the standard GARCH model and the Exponential GARCH (EGARCH) model. Initially, the

standard GARCH model appeared to be preferable since, as we just saw above, several previous studies strongly confirmed that using a simple model is more accurate and reliable as compared to more complicated methods. That said, this study also uses the EGARCH model in order to eliminate several limitations inherent in the simple GARCH model, namely, allowance for nonnegative parameters, asymmetric response, and leverage effect. The standard GARCH model and the EGARCH model are thus both suitable as statistical tools for this study, which uses first difference proceeding non-stationary data. Therefore, all values of test statistic are less than critical values, which means that all of the proceeded data are stationary data.

Once all the data were converted into stationary data, the best Autoregressive Moving Average (AMA) model was determined by using the correlogram test and then generating volatility equations from the GARCH (*p,q*) model and the EGARCH (*p,q*) model with combinations of $p = 1,2$ and $q = 1,2$. The best GARCH (*p,q*) model and EGARCH (*p,q*) model were selected by choosing the minimum number of Schwarz Criterion (SIC) model. It was concluded that the best model for this study required to provide the lowest number of SIC as compared to other models. The study then used the best model to estimate the conditional variance of the data and analyze the results of the study.

Moreover, following Antoniou and Holmes (1995), the study uses the Market for Alternative Investment (MAI) index which was established by the Stock Exchange of Thailand (SET) acts as a stock market for small and medium-sized listed companies to proxy the market factor. The reason for using the MAI index is that it trades in the stock market and reflects market conditions, circumstances, and incoming news. The market factor was extracted as one variable in the model in order to eliminate market risk that may influence the spot index volatility instead of the futures trading index itself. It is important to note that even though, as part of the stock market, the SET index and the SET100 index also reflect market conditions the way the MAI index does, they are not suitable to use in this study as their high correlation with the SET50 index may cause the results to be bias.

The MAI index is therefore more preferable as compared to the SET and SET100 indexes. In keeping with Patel and Sarkar's (1998) study, financial crisis periods were identified. A crisis can be defined as an event in the stock market that causes a decline relative to the historical maximum of more than 20 percent for developed markets and 35 percent for emerging markets (Patel & Sarkar, 1998). During the period under consideration in this study, there was a market declined relative to the historical maximum of more than 35 percent in Thailand. This occured between May 21, 2008 and August 19, 2010 with the subprime crisis. It started on May 21, 2008. By that time, the stock index had reached its historical maximum of 884.19 points. After the crash occured, the SET index declined to 528.71 points. It dropped by more than 35 percent relative to the historical maximum on October 7, 2008 and reached its lowest at 389.81 points on November 27, 2008. The SET index regained its pre-crash maximum level ts on August 19, 2010 (891.23 points on that day). The equation of the SET50 index is as below:

$\sigma^2 SET50_t$ = (Selected GARCH/EGARCH typed models variables) + a_0 + $a_1 RMAI_t$ + $a_2 DCRISIS_t + a_3 DFUTURES + a_4 VOL + a_5 OI + a_6 FB + a_7 FS + a_8 IB + a_9 IS + a_{10} LB + a_{11} LS$

Where:

σ^2 = Conditional variance
$SET50_t$ = Change in daily spot SET50 index
$RMAI_t$ = Change in daily Market for Alternative Investment (MAI)
$DCRISIS_t$ = Financial crisis, use dummy variable "0" when not during financial crisis period and "1" when during financial crisis period
DFUTURES = SET50 index futures introduction, use dummy variable "0" pre-SET50 index futures period and "1" post-SET50 index futures period
VOL = SET50 index futures Trading Volume
OI = SET50 index futures Open Interest
FB = Foreign investor buy SET50 index futures contract
FS =Foreign investor sell SET50 index futures contract
IB = Local institution investor buy SET50 index futures contract
IS = Local institution investor sell SET50 index futures contract
LB = Local investor buy SET50 index futures contract
LS = Local investor sell SET50 index futures contract

The study assumes that local institutional investors are classified as informed investors. Therefore, the futures trading transactions of local institutional investors should not create excess volatility, noise, and mispricing in the spot index market. On the other hand, futures trading transactions of local institutional investors should reduce spot market volatility or influence the market to stay average and insignificant instead. For local investors, the study assumes that they are individual investors who are interested in opening positions based on their particular perception. Local investors can be classified as uninformed investors. Therefore, the study considers that there will be a significant relationship between the futures trading transactions of local investors and the change of spot SET50 index volatility. Futures trading transactions of local investors should create excess volatility, noise, and mispricing in the spot index market.

4. Empirical Results and Discussion

This study used Dickey-Fuller model for testing non-stationary data. The augmented Dickey-Fuller (ADF) test is an autoregressive model. Hypothesis testing is summarized in Table 1.

Table 1: Summary of Hypotheses 1 -9 Results

	Null Hypothesis (Ho)	Z-Stat	Prob.	SIC
1	There is no significant relationship between SET50 index futures introduction and the change of spot SET50 index volatility	-2.637314	0.0084	-5.916356

2	There is no significant relationship between SET50 index futures trading volume and the change of spot SET50 index volatility	7.795806	0.0000	-6.292470
3	There is no significant relationship between SET50 index futures open interest and the change of spot SET50 index volatility	-7.353926	0.0000	-6.292470
4	There is no significant relationship between foreign investor buy volume in the futures market and the change of spot SET50 index volatility	-4.661508	0.0000	-6.292470
5	There is no significant relationship between foreign investor sell volume in the futures market and the change of spot SET50 index volatility	-2.501453	0.0124	-6.267455
6	There is no significant relationship between local institutional investor buy volume in the futures market and the change of spot SET50 index volatility	1.013683	0.3107	-6.292470
7	There is no significant relationship between local institutional investor sell volume in the futures market and the change of spot SET50 index volatility	-1.761834	0.0781	-6.267455
8	There is no significant relationship between local investor buy volume in the futures market and the change of spot SET50 index volatility	2.397891	0.0165	-6.292470
9	There is no significant relationship between local investor sell volume in the futures market and the change of spot SET50 index volatility	2.479714	0.0131	-6.267455

– *Hypothesis 1*

The result shows that Hypothesis 1 rejected the null hypothesis at 1% significance level. This means that there is a negative relationship between SET50 index futures introduction and the change of spot SET50 index volatility. The spot SET50 index volatility decreases significantly since SET50 index futures have been introduced in Thailand. As the results show, the spot market is more efficient since the SET50 index futures started to be traded in Thailand. Furthermore, the SET50 index futures introduction enhances the spot price stability and reduces spot market mispricing.

- *Hypothesis 2*

Hypothesis 2 rejected the null hypothesis at 1% significance level. Therefore, there is a significant relationship between the SET50 index futures trading volume and the change of spot SET50 index volatility structure. The relationship between index futures trading volume and the change of spot index volatility was explained by Clark's (1973) Mixture of Distribution Hypothesis, which refers to the conditional variance of price change proportionally to volume. The SET50 index futures trading volume positively relates to the change of spot SET50 index volatility. This is in line with several studies conducted elsewhere (Bessembinder & Seguin, 1992; Bessembinder & Seguin, 1993; Daigler & Wiley, 1999; Girard & Omran, 2009; Lin, 2010; Maitra, 2014; Sharma & Malhotra, 2015). In summary, the higher the SET50 index futures trading volume in the TFEX, the higher the spot SET50 index volatility in the Thai stock market.

- *Hypothesis 3*

Hypothesis 3 rejected the null hypothesis at 1% significance level. The SET50 index futures open interest negatively relates to the change of spot index volatility. When the SET50 index futures open interest increases, the spot SET50 index volatility tends to decrease. When participants open positions in futures markets, it will be counted as numbers of futures open interest outstanding. The results show that when numbers of SET50 index futures open interest increase, the spot SET50 index volatility tends to decrease significantly. The result of this study is in line with several previous studies conducted in other countries (Bessembinder & Seguin, 1992; Bessembinder & Seguin, 1993; Floros, 2007; Maitra, 2014). In summary, the number of SET50 index futures open interest outstanding in Thailand Futures Exchange (TFEX) negatively relate to the change of spot market volatility. The results support the fact that the more players (the number of futures open interest outstanding) in futures market , the higher the price discovery and market efficiency. Mispricing assets in both spot and futures market are eliminated by arbitrage strategies.

- *Foreign Investors (H 4-5)*

As to foreign investors, Hypotheses 4 and 5 rejected the null hypothesis at 5% significant level. Both the buy or sell trading transaction of foreign investor in the futures market negatively relate to the change of spot SET50 index volatility. All trading transactions of foreign investors in the futures market reduce the spot SET50 index volatility. Foreign investors invest in the TFEX for hedging purposes. They typicallly hold a large amount of underlying stocks in the spot market. If the spot market volatility increases considerably, they tend to open futures positions in the TFEX to manage their desired risks in portfolios to protect losses in the spot

market. They attempt to manage portfolios based on the primary functions of the futures market that provide price discovery and offer risk management tools. Moreover, the futures market can provide valuable information about the underlying asset prices on which futures contracts are based (Chance, 2012). Their hedging positions tend to reduce spot market volatility as a result.

- *Local Institutional Investors (H 6-7)*

For local institutional investors, the testing results show that both Hypotheses 6 and 7 failed to reject the null hypothesis at 1% significance level. There is no significant relationship between the buy and sell trading transactions of local institutions in futures market and the change of spot SET50 index volatility. In other words, either the buy or sell transactions of local institutional investors in the futures market do not lead to the change of spot SET50 index volatility. As expected, local institutional investors will not create the excess spot SET50 volatility since they are informed traders who know the stock market situation very well as they have access to thorough financial data to analyze the market situation. It can be concluded that local institutional investors in the TFEX rationally invest in the futures market. Consequently, local institutional investors generally improve market efficiency and contribute to market stabilization (Daigler & Wiley, 1999). They are proponents of market completion or market stabilization.

- *Local Investors (H 8-9)*

For local investors, both Hypotheses 8 and 9 rejected the null hypothesis at 5% significance level. Either the buy or sell trading transactions of local investors in the futures market positively relates to the change of spot SET50 index volatility. The trading transactions of local investors therefore increase the spot SET50 index volatility. They invest in the TFEX) for speculative purposes. Local investors tend to invest in futures markets because of the high degree of leverage. They may see new opportunities to make more profit. Therefore, speculation generally leads to excess spot market volatility and fluctuation. The results of futures trading transaction by local investors means that they create excess volatility in the stock market because local investors are known as uniformed traders. As such they often make irrational investment decisions, which lead to increasing volatility and destabilizing forces. Moreover, local investors are recognized as noise traders, who often trade on short-term strategies and then create excess price volatility in the stock market.

5. Conclusions and Recommendations

This study examines the relationship between two factors in the futures market (futures trading volume and futures open interest) and the change of spot index volatility in Thailand. The results show that SET50 index futures trading volume positively relates to the change of spot index volatility. When the SET50 index futures trading volume increases, the spot SET50 index volatility tends to increase as well. The higher the volume of index futures trading in the TFEX, the higher the spot index volatility in the Thai stock market. The testing results of futures open interest indicate that SET50 index futures open interest negatively relates to the change of spot index volatility. When the SET50 index futures open interest increases, the spot SET50 index volatility tends to decrease. In summary, the higher the number of SET50 index futures open interest outstanding in the TFEX, the more it negatively relates to the change of spot SET50 market volatility.

Lastly, the testing results suggest that foreign investors invest in the TFEX for hedging purposes. They typically hold a large amount of underlying stocks in the spot market. If the spot market volatility increases considerably, they tend to open futures positions in the TFEX as a way to manage their desired portfolio risks and avoid losses in the spot market. Both buy or sell trading transactions of foreign investors in futures market are used for hedging purposes and their hedging positions tend to reduce spot market volatility as a result. It can be concluded that local institutional investors rationally invest in the futures market. They generally improve market efficiency, which contributes to market stabilization (Daigler & Wiley, 1999). In contrast, local investors' either buy or sell trading transaction in futures market positively relates to the change of spot SET50 index volatility.

Local investors tend to invest in futures market because of a high degree of leverage, which creates opportunities to make more profit. Speculation, however, generally leads to excess spot market volatility and fluctuations. The results suggest that local investors generally create excess volatility in the stock market as they are known to be uniformed traders. As such, they often make irrational investment decisions, which lead to increasing volatility and represent a destabilizing force in the stock market. Moreover, perceived as noise traders, they often engage in short-term strategies and thus create excess price volatility in the stock market.

- Recommendations for Further Research

The study contributes to the academic lore in several ways. First, it examines the relationship between the SET50 index futures introduction and the change of spot index volatility. Moreover, it investigates the relationship between two factors in the futures market (future trading volume and future open interest) and the change of spot index volatility. Academics are interested in the consequences of factors in futures market to spot index structural change. Second, since Thailand is an emerging economy, the TFEX is a newly-established derivative market, which has not yet been highly investigated. This makes the results of this study of great interest to academics and observers who focus on futures market in emerging markets.

Moreover, this study examines the relationship between futures trading transaction (buy/sell) of different types of investor (foreign investors, local institutional investors, and local investors) and the change of spot index volatility. Segregating the trading transaction into types of investors would enable future research to these relationships in more details and enhance the accuracy of the analysis. The study can also enable investors to prudently structure their strategies investing in both spot markets and futures markets. Its results can be used as a guideline for strategic investments for any portfolios in post-index futures periods. This is especially the case for investors who build portfolios based on factors related to futures markets (futures trading volume, futures open interest, and futures trading transaction). This study can also be a starting point for future studies to extend to other products in the Thai stock market and also to other factors in futures market apart from futures trading volume, futures open interest, and futures trading transaction of different types of investors.

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