

Cross Country Capital Inflow Evidence of SETI and SETPDI in the Stock Exchange of Thailand During 2004-2012

Chittipa Ngamkroekjoti and Thongdee Kijboonchoo

Abstract - This study investigates whether the Thai & US ratio of interest rate, foreign portfolio investment (FPI), and Stock Exchange of Thailand (SET) index_{t-1} collectively contribute to both SET index (SETI) and SET property development index (SETPDI) from January 2004 to December 2012. This study uses Multiple Linear Regressions (MLR) through SAS enterprise 4.1 software. The impact of the Thai & US ratio of interest rate, foreign portfolio investment (FPI), and SET index_{t-1} to the Thai stock market and SETPDI were identified before, during, and after Hamburger crisis. The study found the significant impact of the Thai & US ratio of interest rate, foreign portfolio investment (FPI), and SET index_{t-1} on stock market indices and it confirmed the correlations suggested by previous studies. Moreover, the findings also provided practical speculative implications for stock investors. SET index_{t-1} had a higher predictive power than other variables in the SET and SETPDI. The findings of this study provided theoretical implications as well as stock speculation for future researches. Therefore, stock investors need to keep an eye on and pay more attention to the change of SET index_{t-1} the most.

Keywords – Exchange rate, Foreign Portfolio Investment (FPI), Property stock, Non-Voting Depository Receipt, SET index, Thai & US ratio of interest rate, and SET index_{t-1}

I. INTRODUCTION

Several researches confirmed that well-functioning stock markets and banks including the 1975 establishment of the Stock exchange of Thailand (SET) promote long-run economic growth [1]-[30]-[28]. [28] proved through the 132.56% growth rate ratio of market capitalization (MCAP) over gross domestic product (GDP) in 1987 and 1995. Also, 77.97% growth rate ratio of value traded over gross domestic product (GDP)

in 1987 and 1995¹. Moreover, SET has been through crises both internally and externally like in 1997 (Tom Yam Kung crisis) and in 2008 (Hamburger crisis). Consequently, crisis led to purchasing and selling shares from/by foreign investors overwhelmingly. SET returns are sensitive to such cross country capital inflow.

Based on the statement of the Bank of Thailand (BOT), real estate sector is highly important to the Thai economy as real estate sector contributes beyond its shares to 8% of GDP and 7% employment, respectively. Furthermore, loans extended to the real estate sector also account for 15 percent of total commercial bank loans, of which a higher portion goes to residential mortgages whereas a lower portion goes to property developers. According to [8], more over than 50 percent of the world's total assets are invested in direct real estate and securitized real estate investment vehicles such as real estate investment trusts (REITs) or real estate stocks. It is clear that investors in real estate can choose to invest directly in physical property or invest indirectly through the purchase of shares in real estate companies. In Thailand, the stocks of these companies are generally known as property stocks. In addition to the SET index, which is calculated from the prices of all common stocks on the main board, the SET also provides industry group and sectorial indices. These types of indices are calculated from the prices of the common stock which share the same basic which characterizes each particular industry group and sector. However, in this study the research emphasizes on property development sector which belongs to the property and construction industry. Based on the statement of [9] Kim et al. (2006), since property stock combines the investment characteristics of direct real estate and general stock, property stock market returns are likely to be different from those of stock markets, especially, in the long term.

Interest rate is normally considered as one of macro-economic factors used to measure sensitivity of stock market. Under the *t*-distribution assumption, [20] found that the degree of sensitivity of the stock returns to interest rate is not very pronounced in comparison with earlier results. [31]-[2]Saunders and Yourougou (1990) indicated that the daily

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¹ MCAP/GDP% 1987 = 10.85 in 1987 and 103.34 in 1995.
VT./GDP% = 9.17 in 1987 and 41.63 in 1995.

data provided greater evidence of exposure sensitivity. To be more specific to the property stocks, [17]-[18] proved that they are also sensitive to interest rate depending on differences in country market condition. Furthermore, due to lower interest rate as a result of hamburger crisis, the Thai/US ratio of interest rate will reflect better the differences in country market condition during 2004-2012.

Foreign portfolio investment is popularly used to measure stock market co-movement before, during, and after financial crisis. [25] shed light on the capacity of the region's equity markets to provide an adequate conduit for the attraction of foreign portfolio capital into the corporate sectors of their home countries, as part of the ongoing post-crisis recovery process. [5] investigated how foreign portfolios affect the host country stock market by comparing the performance of favored and un-favored stocks of foreign investors. The foreign investors favored group outperformed during economic expansion while un-favored group during a recession. This study also uses foreign portfolio investment as one factor to measure the sensitivity of the Thai SETI and SETPDI before, during, and after hamburger crisis or during 2004-2012.

[36] suggested that the detected time irreversibility in US stock index return series may be attributed to volatility asymmetry and that such asymmetry may be captured using a proper EGARCH model. [34] studied the impact of the Asian financial crisis on Hang Seng index options and future markets in Hong Kong. A MLR analysis on the ex-post arbitrage profit suggests that there were structural changes during the Asian financial crisis and the Hong Kong government intervention periods. [29] explored the stock market integration of leading stock exchanges across various countries during 2004-2012. The Granger casualty results provides mixed evidences, although some changes are noticed about the causality between stock prices from pre-recession to post recession period in Chinese stock markets. Nevertheless, this paper also determined the time irreversibility of $SETI_{t-1}$ towards SETI.

This study uses annual data and Multiple Linear Regression (MLR) model to determine the correlations between Thai & US ratio of interest rate, foreign portfolio investment (FPI), SET index_{t-1} and SETI and SETPDI.

II. LITERATURE REVIEW

A. Interest Rate

The volatility of interest rate over the past century is crucial for the pricing of assets, because they represent opportunity cost and negative relationship between the value of financial instrument and the level of interest rate. High interest rate reduces the present values of future cash flow, thereby reducing the attractiveness of investment opportunities. For this reason, real interest rate is a key determinant of business investment expenditure. Interest rates are not only crucial for financial markets but also upon the real sector of the economy and consumption. The consideration of interest rates must be expanded to include the effect of inflation. With a higher

inflation rate, a baht will be worth less in purchasing power than a baht at the time the stock was bought. Various factors interact to determine an equilibrium structure of interest rate. Forecasting interest rate is one of the most difficult parts of applied Macroeconomics. The expected rate of inflation is one of the most important factors influencing interest rate forecasts. When the rate of inflation is higher, it will cause lenders to demand higher nominal rate of interest as to compensate for the erosion in their purchasing power. Borrowers are forced to pay higher rate if they want the loan.

B. The Relationships between Interest Rate and Stock Market

The relationships between interest rate and stock markets have been investigated by great number of studies. [33] studies how significance of interest rate affects stock exchange index in Karachi, Pakistan. This study did not find a significant effect. [13] studied interest rate sensitivity of the US property/liability insurer stock; this study found that the US property/liability insurers' stock returns are sensitive to interest rate changes. Moreover, it also found that the interest rate sensitivity of insurer stock returns is varied. According to [9] property stocks are also generally sensitive to changes in the long-term and short-term interest rates. They analyzed data for property stock indexes from 1987 to 2003, and they found that the results indicate changes in the interest rate level and volatility effects before and after the 1997 Asian financial crisis. Nevertheless, these changes are not similar and depend on the individual property market. Most of the literatures reveal that there is a positive relationship between interest rate and stock markets, such as the studies of [14]-[24]. However, [15] argued that the long-term and short-term interest rates are not affecting stock prices in the same direction.

C. Non-Voting Depository Receipt (NVDR) or Foreign Portfolio Investment in Thailand

The 2001 establishment of Thai non-voting depository receipts (NVDRs) amount allowed foreign investors to invest over the limit with full participation in dividends and other rights, except for voting rights [27]. NVDR is issued by the Thai NVDR Co., Ltd.², a subsidiary wholly owned by SET [37]. The main purpose is to encourage investments in the deprived Thai stock including property market the impact of this foreign share substitute seems to have overcome the declining standard deviation effect [35]. In order to prevent takeover, NVDR holders must report the acquisition or disposal of their NVDRs and underlying stocks to the Thai NVDR Co., Ltd. in the same manner as reporting acquisition or disposal of the underlying stocks [37]. [37]. Henceforth, this study will use Foreign Portfolio Investment (FPI) for NVDR.

² Thai NVDRs Company Limited is located at the 7th Floor, the Stock Exchange of Thailand Building Ratchadapisek rd., Klongtoey, Bangkok 10110. Tel (662) 3591200-01 Fax (662) 359-1259, email : contact.tsd@set.or.th website : www.set.or.th/nvdr

D. The Relationships between Foreign Portfolio Investment (FPI) and Stock Market

The recent researches occurred in Bombay Stock Exchange (BSE) and Taiwan Stock Exchange (TSE). [3] explored the effects of FPI in India on financial returns and corporate governance during 2008-9 of BSE companies. They concluded that FPI significantly affected financial returns and corporate governance factors. In TSE, [5] evaluated how foreign portfolio investment outperformed the others. During recession period, he suggested domestic investors obtain better returns when they invested in foreign unfavorable stocks. This is because foreign investors tend to withdraw their favored grouped outperformed portfolio investment from the host country and ignore unfavorable stocks, causing stock prices to plummet. [35] investigated how much foreign equity ownership restrictions have an effect on share prices in the Thai capital market. The standard deviation of return result supported risk-return financial behavior. Foreign investors tend to invest in private, large and highly traded companies for which they are willing to pay higher premiums while avoid highly volatile stocks. However, they concluded that characteristic of domestic market is the most important factor. Its stability and liquidity in relation to foreign capital inflows will promote potential benefits received from foreign –share premiums. [27] Pavabutr and Yan (2007) analyzed the impact of foreign portfolio flows on the volatility of SETI between 1995 and 2002. Their research result revealed that foreign investors are net buyers during extraordinarily high volatility in Asian financial crisis. They concluded that foreign flows play an instrumental role in promoting market liquidity.

E. Time lag

Among stylized facts about stock market volatility, this study suggests to line SETI and SETPDI as to the flow of in-/outflow money shown by daily index between one day before and today's index of every month between 2004-2012. Concerning SETI, it is an index represented a portfolio of securities traded on the Thai stock market that is largely opined to reflect the market as a whole. Percentage change in numerical value of the index (this study use SET_{t-1} to forecast SET_t) rather than its absolute numerical value conveys more meaning. The index is a convenient way to determine if the market is on the way up or down. There are specialized indices to measure performance of specific segments of the market alone like SETPDI, instead of the entire market. This index reflects the performance of only property development market segment alone [16].

F. The relationship between time lag and Stock Market

[32] evaluated the political implications of financial reform in the People's Republic of China from the key reforms of 1994 to China's entry into the World Trade Organization (WTO). This paper uses the period before and after 1994 to find how the old and new economic systems reflecting from the stock market are clashing with each other and how the political interests associated with the old economic system and

conflicting with those interests associated with the emerging new system. [6] compared risk relevant factors using tracking error (TE) or in this study called time lag of funds of funds (FoF). In order to minimize the impact of time lags, this study suggests a measure to adjust the TE of Net Asset Value (NAE) of FoF considering the problem of non-synchronous data.

III. MODEL DEVELOPMENT AND HYPOTHESES

This study investigates Thai & US ratio of interest rate, FPI, and SET index_{t-1} collectively contribute to both SETI and SETPDI between January 2004 and December 2012.

A. SET index (SETI)

According to [26], stock market indices, as an aggregate measure, provide information to investors on the market performance by characterizing the development of global markets and specified market segments. He further stated that Index numbers are applied in the measurement of movements at the stock market. An Index number effectively summarizes hundreds of price movements.

B. SET Property Development Index (SETPDI)

The SET index, which is calculated from the prices of all common stocks on the main board, the SET also provides industry group and sectorial indices. Both these types of indices are calculated from the prices of the common stock which share the same basic which characterize each particular industry group and sector. As a result, SETPDI is one of the sectors in the property and construction industry.

C. Interest rate: Policy Rate (IR)

Policy rate is an interest rate set by Bank of Thailand (BOT) in order to conduct monetary policy under the inflation-targeting framework the monetary stance is indicated through the policy rate. According to BOT, the 14-days repurchase rate was used at policy rate up until 16 January 2007. Then, since 12 February 2008, the policy rate was switched again to the 1-day bilateral repurchase rate. In Thailand, policy rate is the benchmark of the interest rates. In addition, changes in the policy rate lead to a chain of events that affect loan rate, short-term interest rate, fixed deposit rate, long-term interest rate, the amount of money and credit and related issues.

Hypothesis 1 – The Thai/US interest rate ratio has impact upon SETI and SETPFI

D. Foreign Portfolio Investment (FPI)

FPI represents certain financial benefits (but not voting rights) attached to a Security of the relevant Target Company. The number of FPI to be issued to the Investor in accordance with this Prospectus will be equal to the number of Securities purchased by the Issuer. The purchase price for one FPI will be equal to the price of one Security [37]. [27] determines foreign flows as all foreign trades regardless of their origins. Foreign investment flows to host countries should be collected from final investment destinations to avoid a serious measurement error. Especially Thailand, those inflows come

from an intermediary source where an investment regional office is located in Hong Kong or Singapore.

Hypothesis 2 – The FPI has impact upon SETI and SETPDI

E. $SETI_{t-1}$

$SETI_{t-1}$ is an index that represents a portfolio of securities traded on the Thai stock market that is largely opined to reflect the market as a whole. Percentage change in numerical value of the index of yesterday is used to forecast percentage change of today's stock market.

Hypothesis 3 – The $SETI_{t-1}$ / $SETPDI_{t-1}$ has impact upon SETI and SETPDI

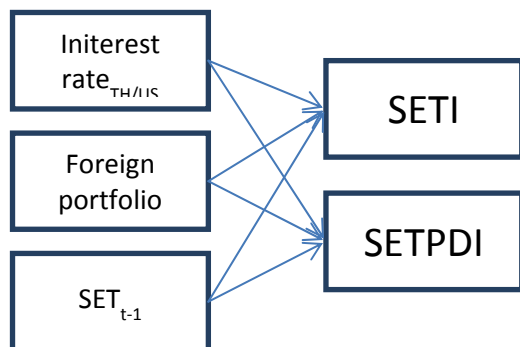
IV. SAMPLINGS AND DATA COLLECTION

Most secondary data were collected from the database provided by SET market analysis and reporting tool (SETSMART), the web-based application from the SET that can seamlessly integrate comprehensive sources of the Thai listed company data including historical stock prices, historical indices, listed company profile and historical news. Another source of secondary data was the website of the Bank of Thailand. Last source of secondary data was the website of Bureau of Trade and Economic Indices. All secondary data for this research were obtained ranging from 1 January 2004 to 31 December 2012.

V. RESEARCH MODEL

This study uses Multiple Linear Regression (MLR) model to determine the correlations between Thai & US ratio of interest rate, FPI, SET_{t-1} / $SETPDI_{t-1}$ and SETI and SETPDI. Moreover, the regression model is illustrated in Fig. I.

Figure I – Conceptual model



VI. STATISTICAL RESULTS

Table I – Analysis of Variance with 2201 number of observation used

Analysis of Variance	SETI	SETPDI
	$IR_{th/us} + NVDR + SET_{t-1}$	$IR_{th/us} + NVDR + SETPDI_{t-1}$
Pr>F	<0.0001	<0.0001
F value	17177.9	13614.9
Mean Square	32095448	895551
Error	1868.42	65.77705

Table I indicates that based on 2201 days observations the p value of $SETI = IR_{th/us} + FPI + SET_{t-1}$ is <0.0001. Thus, $IR_{th/us} + FPI + SET_{t-1}$ is reliable to predict the SETI at a significant level of 95%. The p value of $SETPDI = IR_{th/us} + FPI + SETPDI_{t-1}$ is <0.0001. Thus, $IR_{th/us} + FPI + SETPDI_{t-1}$ is reliable to predict the SETPDI at a significant level of 95%.

Table II – Overall Model Fit

Overall Model fit	SETI	SETPDI
	$IR_{th/us} + NVDR + SET_{t-1}$	$IR_{th/us} + NVDR + SETPDI_{t-1}$
Root MSE	43.225	15.894
Dependent Mean	803.347	126.914
Coeff. Var	5.381	12.523
R-Square	0.959	0.804
Adj-R-Sq	0.959	0.804

Table II shows R-square of SETI and SETPDI. R-square of SETI is 0.959 which implies that 96% of the variation in the SETI can be explained by the model. R-square of SETPDI is 0.804 which implies that 80% of the variation in the SETPDI can be explained by the model.

Table III Testing result

Parameter Estimate (SETI)	DV	$IR_{th/us}$	FPI	SET_{t-1}	$IR_{th/us} + FPI + SET_{t-1}$
Parameter Estimate	SETI	0.175	2E-08	0.989	3.73E-08
	SETPDI	0.138	4E-09	0.982	6.57E-09
Std. error	SETI	0.167	7E-10	0.007	3.12E-09
	SETPDI	0.026	1E-10	30.42	5.26E-10
T-value	SETI	1.05	23.15	149.7	11.97
	SETPDI	5.28	30.42	157.4	12.49
Pr> t	SETI	0.296	<.0001	<.0001	<.0001
	SETPDI	<.0001	<.0001	<.0001	<.0001

Table III presents Parameter Estimates or beta coefficients of the two models. For SETI model, the study found that FPI and SET_{t-1} are positively correlated to SETI, and statistically significant at 0.05. The study found very strong correlation (0.989) between SET_{t-1} and SETI. The correlation between $IR_{th/us}$ and SETI is positive but not statistically significant. For SETPDI model, the study found very strong correlation (0.982) between $IR_{th/us}$, FPI, $SETPDI_{t-1}$, and SETPDI.

Table IV – Testing result of Durbin-Watson D Output

Durbin-Watson D Output	SETI	SETPDI
	$IR_{th/us} + NVDR + SET_{t-1}$	$IR_{th/us} + NVDR + SETPDI_{t-1}$
Durbin-Watson D	0.085	0.068
1st-Order Autocorrelation	0.957	0.965

The Durbin-Watson statistic ranges in value from 0 to 4. A value near 2 indicates non-autocorrelation; a value toward 0 indicates positive autocorrelation; a value toward 4 indicates negative autocorrelation.

Table V – Testing result of Multicollinearity Statistics

Variable	Tolerance		Eigenvalue		VIF	
	SETI	SETPDI	SETI	SETPDI	SETI	SETPDI
Intercept	0.00	0.00	2.97	2.97	0.000	0.000
$IR_{th/us}$	0.46	0.46	0.60	0.60	2.159	2.159
FPI	0.98	0.98	0.42	0.42	1.023	1.023
SET_{t-1}	0.49	0.00	0.02	0.000	2.183	0.000
$SETPDI_{t-1}$	0.00	0.46	0.00	0.016	0.000	2.183

$IR_{th/us}$, FPI, and SET_{t-1} of both indices in Table V indicate the variance inflation factors at lower than 5 which are 2.16, 1.02 and 2.18, respectively. There is very little multicollinearity among independent variables. Also, the tolerances of $IR_{th/us}$, FPI, and $SETPDI_{t-1}$ are 0.46, 0.98 and 0.49 which is higher than 0.20. The tolerances result confirms that these three independent variables have no multicollinearity problem.

VII. IMPLICATIONS AND CONCLUSIONS

This research emphasized both Indices (SETI and SETPDI). Given that both indices are sensitive to the ratio of Thai/US interest rate, FPI, and SET_{t-1} / $SETPDI_{t-1}$. The identification of the significant impact of the ratio of Thai/US interest rate, FPI, and SET_{t-1} / $SETPDI_{t-1}$ on the Thai stock market confirmed the relationship between them introduced by many previous studies. Moreover, the result of this study indicated that Thai stock market and Thai property stock market movements are going in the same direction. This result also has implications for local/foreign stock market investors, stock

market regulators such as Securities and Exchange Commission (SEC), policy makers like Thai NVDR Co., Ltd. and stock market financial/securities analysts.

For both local and foreign investors and stock analysts, they could predict the direction of cross country between US & Thai stock market and earn profits. In this case, it is clear that foreign capital (US or intermediary stock brokers) will invest in SETI as well as SETPDI especially crisis period.

As for stock market regulators, they could take steps to monitor the activities of companies to prevent manipulation of stock prices and get the general public educated on the stock market and encourage them to invest in stocks. Finally, policy makers should be more aware of these cross country foreign capital across the country during crisis. These motivating factors effects on the Thai stock market could make their decisions more effectively and accurately. An important aspect of this study relates the impacts of $IR_{th/us}$, FPI, and SET_{t-1} / $SETPDI_{t-1}$ to Thai property stock market which can be positive or negative depending on model parameters. Although it is now well recognized that Thai property stock market reacts to fluctuation in cross country capital inflow, the definite prediction of the impacts of $IR_{th/us}$, FPI, and SET_{t-1} / $SETPDI_{t-1}$ on SETPDI can be predicted similarly as SETI.

However, our results will help local and foreign investors and stock brokers deepen their understanding of their relationships implications in Thai property stock markets. Additionally, policy makers may play a role in influencing the volatility on Thai property stock markets through the use of cross country capital inflow. Moreover, time lag of both SETI and SETPDI are very important factors affecting SETI and SETPDI.

The findings also provide practical implications for academics who would like to research further on this field of study. They would serve for profitable investment in the Thai stock market. Future researches can be conducted on other industries or sectors in the SET and it is also suggested to include other factors such as GDP, gold price, oil price, unemployment rate and related factors. In the future, academicians who wish to extend this research can increase the number of years in which their researches are carried out. It would also be interesting to find out whether or not the conclusion drawn from Thai stock market would be applicable to other developing countries like China, Malaysia, Singapore.

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