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THE RELATIONSHIPS BETWEEN THAI STOCK MARKET AND EXCHANGE RATE: NEW EVIDENCE ON STRUCTURAL COINTEGRATION TEST

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Abstract: *This paper investigates the co-movement of Thai stock market and exchange rates. The sample covers major institutional changes, such as market liberalization and financial crises, so as to examine how the short-term and long-term relations change after such events. The Gregory and Hansen (1996) which allows us to deal with structural breaks easily, is adopted. The empirical results suggest that the Thai stock market is not cointegrated with the exchange rate. The long-run relationship found in previous studies is just caused by the shock of the recent financial crisis. Furthermore, using Granger causality tests the paper, there exist the bi-direction effects between the two markets, indicating the past innovations in stock market have the great effect on future volatility in foreign exchange market, and vice versa.*

JEL classification*: E41, F31, F41*

Keywords*: stock market, exchange rate, co-movement, structural break*

INTRODUCTION

The relationship between exchange rates and stock prices has received substantial attention over the last few decades. Early theoretical studies suggest a traditional view whereby movements in exchange rates affect a firm's overall profits, therefore affect stock prices. According to Luehrman (1991), depreciation of the home currency improves the competitiveness of companies in the home country because they have a price advantage compared with their foreign competitors. Stock prices are affected when the stock market reacts to the good news. However, for companies that need to import components for manufacturing, the depreciation of home currency will increase their cost and hurt their performance in the stock market (Rutledge, Karim, & Li, 2014).

In current years, many researchers have empirically studied the relationships between the stock prices and exchange rates. For example, Granger, Huang and Yang (2000) found that a strong co-movement between stock and foreign exchange

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markets in most Asian countries is present. However, the causality relationship being unidirectional or bidirectional is country-specific. Y. Wu (2001) shows that the Singapore dollar exchange rates vis-a'-vis the developed countries' currencies are negatively related to stock prices whereas the relationship between the Singapore dollar-Malaysian ringgit exchange rate and stock prices is positive instead. Dogan and Yalcin (2007) and Rjoub (2012) there are short-run relationships between exchange rate and Turkish stock prices. The investigations in related studies also confirm the strong co-movement between stock price and exchange rate in China (Rutledge *et al.*, 2014).

Although many studies contribute to this literature, there are only a few of researches on the Thai stock market and exchange rate. There are also some limitations in related literature which deserve further investigation. Apart from the problems presented by their inconsistent results the existing empirical studies are also riddled with methodological weaknesses, such as spurious regression results (Tian & Ma, 2010). Many studies employ the vector autoregressive (VAR) model which do not ascertain cointegration among the set of variables analyzed.

Most empirical studies on the relationships between stock price and exchange rate are based on the cointegration test, the error correction model (ECM) of Engle and Granger (1987) or the VAR-based test (vector error correction model: VECM) of Johansen (1988) and Johansen and Juselius (1990). And the empirical results suggest that the cointegration relation between stock prices and foreign exchange rates is present. However, Gregory and Hansen, here after GH, (1996) argue that some important events may break the mechanism between financial markets and thus change the long-term equilibrium relationships. Traditional cointegration approaches ignore the structural break due to some external events which can lead to a misleading result (Liu & Wan, 2012). In recent years, many extreme events such as the recent financial crisis brought shocks to the Thai stock market, which may break the equilibrium relation between stock and foreign exchange markets. Thus, it is inappropriate to investigate the linkages between Thai stock prices and foreign exchange rates based on the traditional cointegration approaches.

The macroeconomic policy in Thailand changed substantially with an adoption of inflation targeting together with the managed floating exchange rate regime after the 1997–1998 Asian Crisis. Under this framework, the Thai central bank, Bank of Thailand (BOT), intervenes in the foreign exchange markets to prevent excessive short-term volatility or disorderly adjustment of the Thai Baht (THB). Since the crisis, capital inflows have shifted from bank loans to foreign investment. As a result of the sound economic outlook of the country, foreign investment in Thailand amounted significantly increased in the past few years (Abhakorn & Tantisantiwong, 2012).

In the 1990s, most stock markets in Asia experienced considerable growth and turbulence. This process resulted in a profound change in Thailand's economy. The Stock Exchange of Thailand (SET) significantly influences Thai economic development by providing a mechanism for resource re-allocation between different sectors of the Thai economy. As a rapidly developing emerging market the SET also plays an important role in a worldwide context by affecting international capital flows. The experience of the Thai stock market is probably typical of Asian stock markets in general because of its manageable size and diverse characteristics (Bos, Ding, & Fetherston, 1998; Chusanachoti & Kamath, 2002). An understanding of the mechanisms of the Thai stock market's dynamics is, therefore, very important.

Several explanations exist to explain why such a study on Thailand is important. The case study of Thailand is unique. First, the recent opening of the Thai stock market to foreign investors and the liberalization of its currency provide an opportunity to examine the impact of financial liberalization on the relationship between the foreign exchange rate and stock prices. Observations from nine to ten years after the new foreign exchange regime provide enough data to examine the effects of the local currency on stock prices. Second, no other studies exist which examines the impact of appreciation of local currency on stock prices. This study is the first to examine the impact of currency appreciation on stock prices using Thai dataset. Third, since the opening up of Thai stock market, foreign investment in local market has rapidly increased over the last few years, thus our results should be of interest to foreign portfolio investors concerned with their currency exposure in Thailand.

The remainder of the paper is structured as follows. The next section sketches a a brief literature review and the main findings in developed and emerging markets. Section 3 presents the data and methodology employed. Section 4 shows the empirical evidence for the interdependencies between stock prices and exchange rates in Thailand. Finally, Section 5 summarizes key results and discusses policy lessons.

LITERATURE REVIEW

Two main hypotheses explain the relationship between stock prices and exchange rates. First, the goods market hypothesis predicts that the appreciation of a local currency should hurt its exporters and, therefore, the shares of such companies would become less desirable and affect the share market in an export-orientated country. This presumes that causality runs from the exchange rate to the share market in a negative correlation. Secondly, on the other hand, the portfolio balance hypothesis asserts that causality runs from the stock market to the exchange rate.

However, existing empirical studies report mixed and contrasting findings (Kutty, 2010; Tian & Ma, 2010). If the goods market theory prevails, this study would expect the recent appreciation of the THB to have caused its stock market index to fall, assuming Thailand is an export-orientated country.

The relationship between stock prices and the exchange rate has been empirically analyzed over the past three decades. The results are somewhat mixed as to the significance and direction of influences between stock prices and exchange rates. Different studies focused on different countries, sample periods, variables and different econometric techniques and provide inconclusive results (see Table 1).

Table 1
The relationships between stock prices and exchange rates

Authors	*Time coverage*	*Methods*	*Countries covered*	*Relation-ship*
Multi country cases				
Caporale, Hunter, and Menla Ali (2014)	2003-2011	GARCH	6 countries/areas	SP↔ER
Lin (2012)	1986-2010	ARDL model	6 Asian countries	SP→ER
Pan, Fok, and Liu (2007)	1988-1998	VAR model	7 Asian countries	ER→SP
Single country cases				
Dimitrova (2005)	1990-2004	VAR model	US	ER→SP
Dogan and Yalcin (2007)	1997-2003	VAR model	Turkey	ER→SP
Hsing and Hsieh (2012)	2000-2010	GARCH	Poland	ER→SP
Kisaka and Mwasaru (2012)	1993-1999	ECM	Kenya	ER→SP
Kutty (2010)	1989-2006	ECM	Mexico	SP→ER
Liu and Wan (2012)	2005-2011	GH approach	China	SP≠ER
Mishra (2004)	1992-2002	VAR model	India	SP≠ER
Richards, Simpson, and Evans (2009)	2003-2006	VAR model	Australia	SP→ER
Rjoub (2012)	2001-2009	VECM	Turkey	SP↔ER
Rutledge *et al.* (2014)	2001-2011	VECM	China	SP≠ER
Tian and Ma (2010)	1995-2009	ARDL model	China	ER→SP
K.-J. Wu, Lu, Jono, and Perez (2012)	1997-2010	VECM	Philippines	SP→ER
Y. Wu (2001)	1980-1996	VAR model	Singapore	ER→SP
Yang and Ma (2012)	2007-2010	ECM	China	SP↔ER
Zhao (2010)	1991-2009	GARCH	China	SP↔ER

Note: "ER→SP" denotes causality running from exchange rates to stock prices. "SP→ER" denotes causality running from stock prices to exchange rates. "SP↔ER" denotes bidirectional causality between stock prices and exchange rates. "SP≠ER" denotes that neither stock prices is effecting exchange rates nor exchange rates is effecting stock prices.

The findings of the different studies can be summarized into four main hypotheses. First, goods market hypothesis suggests that there is a unidirectional relationship from exchange rates to stock prices (Dimitrova, 2005). In addition, Y. Wu (2001) examine the relationship between Singapore stock returns and the Singapore dollar-Malaysian ringgit exchange rate. The results find a unidirectional cause from exchange rates to stock returns. Pan *et al.* (2007) scan data from seven East Asian countries, including Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand. Their results from before the 1997 Asian crisis are mixed, but after the crisis, a causal relation from exchange rates to stock prices is found for all countries except Malaysia. Similar results are found by Dogan and Yalcin (2007), Tian and Ma (2010), Kisaka and Mwasaru (2012) and Hsing and Hsieh (2012) for Turkey, China, Kenya and Poland respectively.

Second, portfolio balance hypothesis shows that there is a unidirectional causality from stock prices to exchange rates (Richards et al., 2009). Furthermore, Lin (2012) employ the autoregressive distributed lag (ARDL) model suggest that the comovement between exchange rates and stock prices becomes stronger during crisis periods and most of the spillovers can be attributed to the channel running from stock price shocks to the exchange rate. K.-J. Wu et al. (2012) examine the relationship between Philippine stock exchange index and the USD exchange rate. They find a unidirectional Granger cause from stock index to exchange rate. Similar results are found by Kutty (2010) for Mexico.

Third, feedback hypothesis indicates that there is bidirectional causality between stock prices and exchange rates. This line of research is also not an infant and a number of studies find the bidirectional causality between stock prices and exchange rates for various countries (Caporale et al., 2014; Rjoub, 2012). Moreover, Zhao (2010), Yang and Ma (2012) and Rutledge et al. (2014) examine the association between Chinese stock prices and renminbi exchange rates. Each of these studies finds bidirectional between stocks prices and exchange rates. It implies that the stock prices and exchange rates jointly determine each other.

Fourth, neutrality hypothesis holds when no causality exists between stock prices and exchange rates (Liu & Wan, 2012; Rutledge *et al.*, 2014). Mishra (2004) also find no Granger cause between Indian stock returns and exchange rates. It implies that depreciation of the home currency does not improve the competitiveness of companies in the home country therefore stock prices are not affected when the stock market reacts to the good or bad news and fluctuations of stock prices can have an effect on exchange rates through the current account.

Despite this increasing interest in emerging stock markets, the volume of literature in this area is still far less than that focusing on developed stock markets.

This study fills this important gap in the literature, and provides further evidence that has important implications for the portfolio diversification decision of international investors.

METHODOLOGY

Unit root test allowing for a structural break

The study initially performed the augmented Dickey-Fuller (ADF) unit root test to examine the time series properties of the data without allowing for any structural breaks. The ADF test (Dickey & Fuller, 1981) is conducted using this equation:

$$\Delta y_t = \mu + \beta t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

where y_t denotes the time series being tested, Δ is the first different operator, t is a time trend term, k denotes the number of lagged terms and ε is a white noise disturbance term.

In this study, the lowest value of the Schwartz information criterion (SIC) has been used as a guide to determine the optimal lag in the ADF regression. These lags augment the ADF regression to ensure that the error term is white noise and free of serial correlation. In addition, the Phillips-Perron (PP) test was used as an alternative nonparametric model to control for serial correlation. Using the PP test (Phillips & Perron, 1988) ensures that the higher-order serial correlations in the ADF equation were handled properly. That is, the ADF test corrects for higher-order autocorrelation by including lagged differenced terms on the right-hand side of the ADF equation; whereas the PP test corrects the ADF *t*-statistic by removing the serial correlation in it. This nonparametric *t*-test uses the Newey-West heteroscedasticity autocorrelation consistent estimate, and is robust to heteroscedasticity and autocorrelation of unknown form.

An important shortcoming associated with the ADF and PP tests is that they do not allow for the effect of structural breaks. Perron (1989) argues that if a structural break in a series is ignored, unit root tests can be erroneous in rejecting null hypothesis. Zivot and Andrews, here after ZA (1992) developed methods to search endogenously for a structural break in the data. The study employ their model (*C*), which allows for one structural break in both the intercept and slope coefficients in the following equation:

$$\Delta y_t = \mu + \beta t + \theta DU_t + \gamma DT_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$

where $DU_t = 1$ if $t > TB$, otherwise zero; *TB* denotes the time of break, $DT_t = t - TB$ if $t > TB$, otherwise zero. The lag length is selected using the same approach as in the ADF test.

The trimming region in which we searched for *TB* covers the 0.15*T*-0.85*T* period, where *T* is the sample size. Following Chaudhuri and Wu (2003) and Narayan and Smyth (2005), this study selected the break point (*TB*) based on the minimum value of the *t* statistic for α. In this study, k_{max} is set equal to 12.

Cointegration test allowing for a structural break

The lack of evidence of cointegration in previous studies in the literature could be attributed to the ignorance of the structural break in the cointegrating vector. To address this issue the GH (1996) test has also been utilized. GH (1996) postulate three alternative models, similar to those proposed by ZA (1992), to capture the changes in parameters of the cointegrating vector. First, the level shift model (*C*), which assumes a change only in the intercept, is as follows:

$$y_t = \mu_0 + \theta DU_t + \mu_1 x_t + \varepsilon_t \tag{3}$$

The second model, a level shift and change in trend (*C/T*), takes the form:

$$y_t = \mu_0 + \theta DU_t + \beta t + \mu_1 x_t + \varepsilon_t \tag{4}$$

The third model, which allows for changes in both the intercept and slope of the cointegration vector (*C/S*), is presented as:

$$y_t = \mu_0 + \theta DU_t + \beta t + \mu_1 x_t + \mu_2 x_t DU_t + \varepsilon_t \tag{5}$$

where DU_t is defined as previously in Equation (2).

Intuitively, within the range of 0.15*T*-0.85*T*, this technique searches for a particular *TB*, which minimizes the value of the ADF* statistic for $\hat{\varepsilon}_t$. The GH (1996) method tests the null hypothesis of no cointegration against the alternative hypothesis of cointegration with a single structural break at time *TB*, which is determined endogenously.

Granger causality test

Finally, the Granger causality test is conducted. A variable such as Δx_t (the stock returns) Granger causes Δy_t if its past values can explain Δy_t, but past values of Δy_t

do not explain Δx_t (Granger, 1969). If the two variables are not cointegrated, and the coefficient of error correction term is not negative and significant, the following bivariate VAR equations will then be used for the causality test:

$$\Delta y_t = \phi + \lambda_0 \Delta x_t + \sum_{i=1}^{k1} \lambda_i \Delta x_{t-i} + \sum_{i=1}^{k2} \delta_i \Delta y_{t-i} + v_t \tag{6}$$

$$\Delta x_t = \phi' + \lambda_0' \Delta y_t + \sum_{i=1}^{k'1} \lambda_i' \Delta y_{t-i} + \sum_{i=1}^{k'2} \delta_i' \Delta x_{t-i} + v_t' \tag{7}$$

however, if y_t and x_t are cointegrated, these error correction models are adopted:

$$\Delta y_t = \phi + \lambda_0 \Delta x_t + \sum_{i=1}^{k1} \lambda_i \Delta x_{t-i} + \sum_{i=1}^{k2} \delta_i \Delta y_{t-i} + \eta ECM_{t-1} + v_t \tag{8}$$

$$\Delta x_t = \phi' + \lambda_0' \Delta y_t + \sum_{i=1}^{k'1} \lambda_i' \Delta y_{t-i} + \sum_{i=1}^{k'2} \delta_i' \Delta x_{t-i} + \eta' ECM_{t-1} + v_t' \tag{9}$$

The Granger causality test can be conducted under two assumptions. First, if y_t and x_t are not cointegrated, then Equations (6) and (7) are used in order to test the following two null hypotheses: If in Equation (6) $H_o : \lambda_1 = \lambda_2 = ... = \lambda_{k1} = 0$ is rejected, then Δx_t Granger causes Δy_t. Similarly, if, in Equation (7), $H_o' : \lambda_1' = \lambda_2' = ... = \lambda_{k1}' = 0$ is rejected, then the conclusion is that Δy_t causes Δx_t. If both null hypotheses are rejected simultaneously there would be a bidirectional causality between the two variables. Second, if y_t and x_t are in fact cointegrated, then Equations (8) and (9) are employed to test the same two hypotheses.

DATA AND PRELIMINARY ANALYSIS

The current study focuses on the relationship between Thai stock prices (SP) and THB/USD exchange rates (ER). The overall study period is the nineteen years from 2 July 1996 to 29 May 2015. Daily data (5 days a week) in total of 4,934 observations are from DataStream. This time period is the nineteen-year period beginning with the 1996 opening of Asian financial crisis in Thailand. Daily data are used because the use of greater than daily data (*e.g.*, monthly data) may not be adequate to capture the effects of capital movements, while the use of less that daily data may introduce spurious statistical significance (Rutledge *et al.*, 2014).

Figure 1: Thai stock prices and THB/USD exchange rates

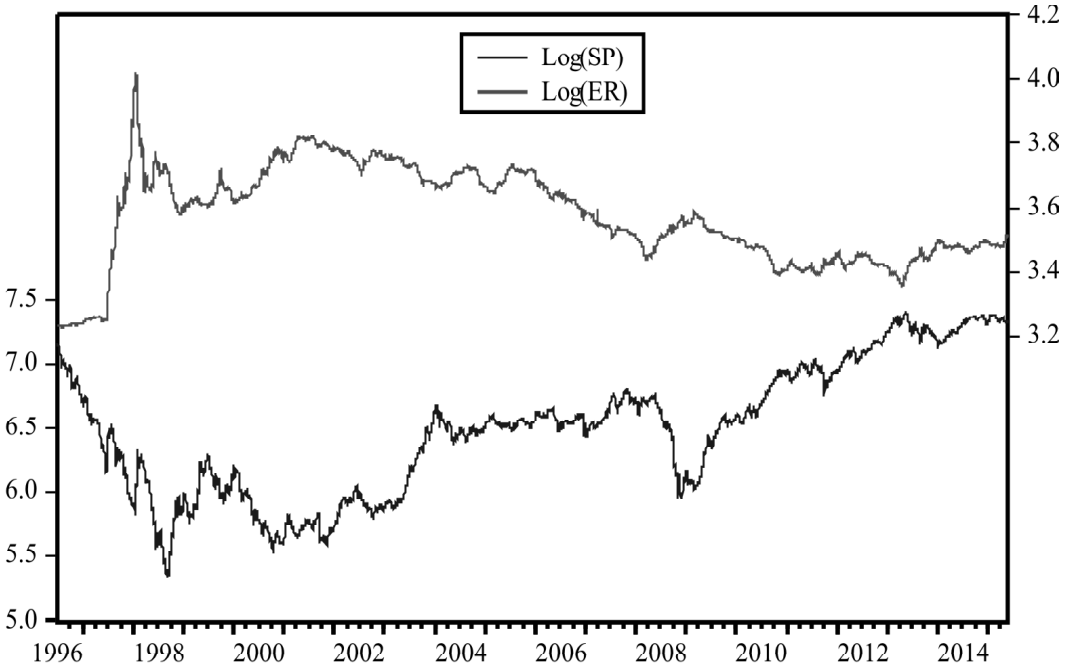


Figure 1 shows the changes of SP and ER over time. The empirical analysis is performed on their logarithmic forms. In addition, Table 2 shows the summary statistics for the changes of each variable. The sample means are greater than 0, and the average monthly return of Thai stock market is 0.006%. In the sample period from 2 July 1996 to 29 May 2015, the average change of exchange rate is positive, which shows that the currency appreciates in the time. In terms of standard deviations, the volatility of stock market is higher than that of exchange market, so the investment risk of stock market is higher than exchange market. The measures for skewness and kurtosis show that both stock return and change of exchange rate is positively skewed and highly leptokurtic with respect to the normal distribution. Jarque–Bera (JB) statistic rejects normality for each of the series at the 1% level of significance.

Table 2
Summary statistics

Variables	*Mean*	*Standard deviation*	*Skewness*	*Kurtosis*	*JB statistics*
Δlog(SP)	0.00004	0.01586	0.05348	10.7184	12247.28***
Δlog(ER)	0.00006	0.00517	0.27555	41.5223	305079.3***

Notes: Δ denotes the first order difference. *** denotes significant at the 1% level.

EMPIRICAL ANALYSIS

Unit root tests

Before proceeding with the co-integration and causality analysis, the empirical study tests the stationarity status for all the variables so as to determine their order of integration. This paper employed the ADF, the PP and the ZA tests. The optimal lag length of ADF test is determined by the SIC. The optimal lag length of PP is determined by the Newey–West criterion. The null hypothesis of ADF, PP and ZA is that the series has a unit root.

Table 3 reports the results of three unit root tests.

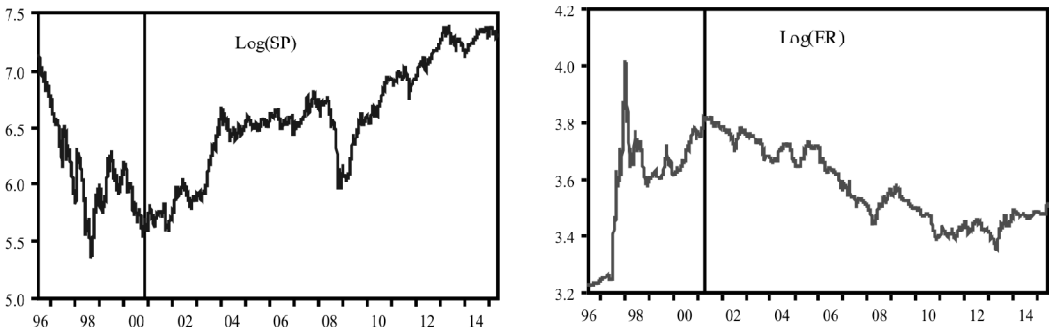
Table 3
The results of unit root tests

	ADF		*PP*		*ZA*		
	Level	*1st difference*	*Level*	*1st difference*	*Level*	*1st difference*	*Break point*
log(SP)	-1.05	-45.35***	-1.00	-65.41***	-4.24	-16.80***	Oct 12, 2000
log(ER)	-2.34	-31.94***	-2.41	-60.47***	-4.18	-9.81***	Apr 10, 2001

Note: *** denotes significant at the 1% level.

For original price series, ADF, PP and ZA statistics cannot reject the null hypothesis, indicating that each series follows a unit root process. Moreover, for the first order difference series, ADF, PP and ZA statistics consistently indicate a stationary process. Therefore, it can conclude that both stock price and exchange rate series are *I*(1) processes. The reported *TB*s in the last column were endogenously determined by the ZA test. In addition, Figure 2 shows SP and ER as well as their corresponding structural breaks obtained by the ZA test. It is not surprising that the endogenously-determined structural breaks in these variables occurred just around the 2001 economic recession (see *TB*s for SP and ER in Table 3).

Figure 2: TBs for Thai stock prices and THB/USD exchange rates



Cointegration test

In existing literature, the Engle-Granger two-step test (1987) or the VECM of Johansen (1988) and Johansen and Juselius (1990) are always used to examine the cointegration relationship between stock prices and exchange rates. However, GH (1996) point out that many extreme events may structurally break the relationship among variables and change their long-term mechanism. Due to the presence of a structural break, the use of a traditional approach may result in a wrong conclusion. In view of that, this paper uses a cointegration test which allows for a structural break to analyze the relationship between the Thai stock prices and exchange rates. The results are reported in Table 4.

Table 4
The results of GH Cointegration test

		*ADF**		
		Test statistic	*Break point*	*k*
SP on ER	*C*	-3.08425	Mar 15, 2007	11
	C/T	-4.42947	Jan 4, 2007	11
	C/S	-3.52251	Jul 7, 2002	11
ER on SP	*C*	-2.89646	Sep 19, 2011	11
	C/T	-4.40115	Jan 25, 2007	11
	C/S	-3.04327	Jul 26, 2010	11

Note: ** and *** denotes significant at the 5% and 1% levels, respectively.

The result that the exact time points of structural break are not consistent under different model assumptions. However, most of the break points fall in the first quarter of 2007, around the time when the recent global financial crisis broke out. Therefore we can consider that the recent financial crisis made the long-term mechanism between Thai stock prices and exchange rates fundamentally change. Under the assumption of three models, none of the ADF* statistics is significant. Therefore, it can conclude that there is no cointegration relationship between Thai stock prices and exchange rates. This conclusion is not consistent with many existing studies in which the significant cointegration relationships between stock price and exchange rate are obtained (Caporale et al., 2014; Liu & Wan, 2012; Pan et al., 2007). The major reason is that existing studies do not take into account the effects of a possible structural break.

Granger causality test

The Granger causality test is performed based on VAR model because there is no cointegration relation between SP and ER. Based on the SIC, the optimal lag (k) is two for both variables. Table 5 displays the results of the linear Granger causality

test between SP and ER. A bi-directional Granger causality was found between SP and ER. In other words, there are two way relationships between Thai stock market and exchange rates. This finding is in line with Rjoub (2012) who state that there could be a two-way relationship between exchange rates and stock prices.

Table 5
The result of causality test

The null hypothesis	*F statistic*	*P value*
SP $-/\rightarrow$ ER	4.3200**	0.0134
ER $-/\rightarrow$ SP	49.4068***	0.0000

Notes: $-/\rightarrow$ implies does not Granger cause. ** and *** denotes significant at the 5% and 1% levels, respectively.

CONCLUSION

This paper systematically analyzes the co-movement between the Thai stock market and THB/USD exchange rates. In the existing studies, researchers always use the Engle-Granger two-step test (1987) or the VECM of Johansen (1988) and Johansen and Juselius (1990) to test the cointegration relationship between stock prices and exchange rates. Because this approach ignores the structural break resulting from some extreme events, it may lead to an awkward test conclusion. Therefore, this paper employs a cointegration test allowing for a structural break of GH (1996) to analyze cointegration relation between SP and ER. The empirical results suggest that recent financial crisis change their long-term mechanism. The conclusion based on traditional approaches that the cointegration relation exists between SP and ER may be an illusion caused by the shock of the recent financial crisis. Therefore, the change of SP (or ER) is invalid to forecast the long-term behavior of ER (or SP).

In existing studies, researchers always use the conventional Granger causality test (Granger, 1969) to test the causality relation between stock prices and foreign exchange rates. Therefore, this paper adopts a Granger causality test approach the same as others, which can be used to test the linear causality relationship between two variables. Empirical results indicate that there are two way relationships between SP and ER. The Granger causality test describes short-term co-movement. Thus, evidence from the causality test also suggests that the change of exchange rate can provide some useful information in forecasting future short-term stock prices. Therefore, the short-term investors in stock markets should pay close attention to the change of exchange rate.

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References

Abhakorn, P., & Tantisantiwong, N. (2012). A reexamination of capital controls' effectiveness: Recent experience of Thailand. *Journal of Asian Economics, 23*(1), 26-38. doi: 10.1016/j.asieco.2011.11.004.

Bos, T., Ding, D., & Fetherston, T. A. (1998). Searching for periods of volatility: A study of the behavior of volatility in Thai stocks. *Pacific-Basin Finance Journal, 6*(3-4), 295-306. doi: 10.1016/S0927-538X(98)00014-6.

Caporale, G. M., Hunter, J., & Menla Ali, F. (2014). On the linkages between stock prices and exchange rates: Evidence from the banking crisis of 2007–2010. *International Review of Financial Analysis, 33*, 87-103. doi: 10.1016/j.irfa.2013.12.005.

Chaudhuri, K., & Wu, Y. (2003). Mean reversion in stock prices: Evidence from emerging markets. *Managerial Finance, 29*(10), 22-37. doi: 10.1108/03074350310768490.

Chusanachoti, J., & Kamath, R. (2002). Market conditions, return distributions and the day-of-the-week effects in Thailand: The experience of the 1990s. *American Business Review, 20*(1), 6-14.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*(4), 1057-1072. doi: 10.2307/1912517.

Dimitrova, D. (2005). The relationship between exchange rates and stock prices: Studied in a multivariate model. *Issues in Political Economy, 14*, 1-24.

Dogan, N., & Yalcin, Y. (2007). The effects of the exchange rate movements on the Istanbul stock exchange. *Applied Financial Economics Letters, 3*(1), 39-46. doi: 10.1080/17446540601029136.

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica, 55*(2), 251-276. doi: 10.2307/1913236.

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37*(3), 424-438. doi: 10.2307/1912791.

Granger, C. W. J., Huang, B.-N., & Yang, C.-W. (2000). A bivariate causality between stock prices and exchange rates: Evidence from recent Asian flu. *Quarterly Review of Economics and Finance, 40*(3), 337-354. doi: 10.1016/S1062-9769(00)00042-9.

Gregory, A. W., & Hansen, B. E. (1996). Residual-based tests for cointegration in models with regime shifts. *Journal of Econometrics, 70*(1), 99-126. doi: 10.1016/0304-4076(69)41685-7.

Hsing, Y., & Hsieh, W.-j. (2012). Impacts of macroeconomic variables on the stock market index in Poland: New evidence. *Journal of Business Economics and Management, 13*(2), 334-343. doi: 10.3846/16111699.2011.620133.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control, 12*(2–3), 231-254. doi: 10.1016/0165-1889(88)90041-3.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration — with applications to the demand for money. *Oxford Bulletin of Economics and Statistics, 52*(2), 169-210. doi: 10.1111/j.1468-0084.1990.mp52002003.x

Kisaka, S. E., & Mwasaru, A. (2012). The causal relationship between exchange rates and stock prices in Kenya. *Research of Finance and Accounting, 3*(7), 121-130.

Kutty, G. (2010). The relationship between exchange rates and stock prices: The case of Mexico. *North American Journal of Finance and Banking Research, 4*(4), 1-12.

Lin, C.-H. (2012). The comovement between exchange rates and stock prices in the Asian emerging markets. *International Review of Economics & Finance, 22*(1), 161-172. doi: 10.1016/j.iref.2011.09.006.

Liu, L., & Wan, J. (2012). The relationships between Shanghai stock market and CNY/USD exchange rate: New evidence based on cross-correlation analysis, structural cointegration and nonlinear causality test. *Physica A: Statistical Mechanics and its Applications, 391*(23), 6051-6059. doi: 10.1016/j.physa.2012.07.036.

Luehrman, T. A. (1991). Exchange rate changes and the distribution of industry value. *Journal of International Business Studies, 22*(4), 619-649. doi: 10.1057/palgrave.jibs.8490317.

Mishra, A. K. (2004). Stock market and foreign exchange market in india: Are they related? *South Asia Economic Journal, 5*(2), 209-232. doi: 10.1177/139156140400500202.

Narayan, P. K., & Smyth, R. (2005). Cointegration of stock markets between New Zealand, Australia and the G7 economies: Searching for co-movement under structural change. *Australian Economic Papers, 44*(3), 231-247. doi: 10.1111/j.1467-8454.2005.00262.x

Pan, M.-S., Fok, R. C.-W., & Liu, Y. A. (2007). Dynamic linkages between exchange rates and stock prices: Evidence from East Asian markets. *International Review of Economics & Finance, 16*(4), 503-520. doi: 10.1016/j.iref.2005.09.003.

Perron, P. (1989). The great crash, the oil price shock and the unit root hypothesis. *Econometrica, 57*(6), 1361-1401. doi: 10.2307/1913712.

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*(2), 335-346. doi: 10.2307/2336182.

Richards, N. D., Simpson, J., & Evans, J. (2009). The Interaction between exchange rates and stock prices: An Australian context. *International Journal of Economics and Finance, 1*(1), 3-23. doi: 10.5539/ijef.v1n1p3.

Rjoub, H. (2012). Stock prices and exchange rates dynamics: Evidence from emerging markets. *African Journal of Business Management, 6*(13), 4728-4733. doi: 10.5897/AJBM11.2761.

Rutledge, R. W., Karim, K. E., & Li, C. (2014). A study of the relationship between renminbi exchange rates and Chinese stock prices. *International Economic Journal, 28*(3), 381-403. doi: 10.1080/10168737.2014.913652.

Tian, G. G., & Ma, S. (2010). The relationship between stock returns and the foreign exchange rate: the ARDL approach. *Journal of the Asia Pacific Economy, 15*(4), 490-508. doi: 10.1080/13547860.2010.516171.

Wu, K.-J., Lu, C.-C., Jono, H., & Perez, I. (2012). Interrelationship between Philippine Stock Exchange Index and USD Exchange Rate. *Procedia - Social and Behavioral Sciences, 40*(0), 768-782. doi: 10.1016/j.sbspro.2012.03.264.

Wu, Y. (2001). Exchange rates, stock prices, and money markets: Evidence from Singapore. *Journal of Asian Economics, 12*(3), 445-458. doi: 10.1016/S1049-0078(01)00107-5.

Yang, Y., & Ma, X. (2012, October 20-21). *The relationship between exchange rate and stock prices – An empirical study since the exchange rate system reform of China.* Paper presented at the 2012 International Conference on Information Management, Innovation Management and Industrial Engineering, Sanya Tianze Beach Resort, Sanya, China.

Zhao, H. (2010). Dynamic relationship between exchange rate and stock price: Evidence from China. *Research in International Business and Finance, 24*(2), 103-112. doi: 10.1016/j.ribaf.2009.09.001.

Zivot, E., & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil-price shock and the unit-root hypothesis. *Journal of Business & Economic Statistics, 10*(3), 251-270. doi: 10.1080/07350015.1992.10509904.