Pre and post crisis analysis of stock price and exchange rate: Evidence from Malaysia

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PRE AND POST CRISIS ANALYSIS OF STOCK PRICE AND EXCHANGE RATE: EVIDENCE FROM MALAYSIA

by

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ABSTRACT

The furore and chaos created by the Asian financial crisis have ignited many studies on numerous subjects, and it is believed that the crisis has changed the way nations being administered and policies formed and implemented especially those regarding monetary and fiscal policies. Johansen (1991) cointegration method was used and the period was divided into two sub periods, albeit pre crisis and post crisis. The results obtained are similar with a number of past literatures pointing to no long run relationship between stock price and exchange rate for both periods.

Keywords: *Stock price, exchange rate, Asian financial crisis, Cointegration.*

JEL code: G14, F31.

1.0 INTRODUCTION

The Asian Financial Crisis in 1997-1998 struck the economy of many Asian countries and these Asian countries suffered continuous currency depreciation and their stock markets were badly hit. Thai Baht was the first to be hit, and soon it spread to its neighbors. In Malaysia, the traditionally stable ringgit collapsed and it was followed by the collapse of the KLSE whereby KL composite index which decreased by 44.8% in the second half of 1997 (Azman-Saini et al., 2006). The issue of whether the stock prices and exchange rates are dynamically related has excited the interest of many researchers. Bahmani-Oskooee and Sohrabian (1992), and Nieh and Lee (2001) found that there are no long-run relationship between stock prices and exchange rates. While the former studied about the scenario in the United States, the latter's study was on the dynamic relationship for G-7 countries, namely Canada, France, Germany, Italy, Japan, United States, and the United Kingdom. A study on Malaysia, Azman-Saini et al. (2006) found

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that during the crisis period, exchange rates led stock price. In their study they used Granger non-causality test proposed by Toda and Yamamoto (1995). However, this paper explore the long run relationship between stock price index and exchange rate (pre and post crisis) using the multivariate Johansen-Juselius method. The other distinct difference is, while Azman Saini et al. use bilateral exchange rate, our study employ the real effective exchange rate (REER) due to some intrinsic reasons.

Malaysia is one of the most open and fast growing economies in South East Asia, hence stock market and foreign exchange market play an integral role in contributing to the financial development and economic growth in Malaysia. The volatility of exchange rates and stock prices would be a hindrance to a healthy and warranted growth. Thus, the understanding of relationship between stock prices and exchange rates is of utmost importance and very vital to capture the co-movement or trends of these two important macroeconomic variables. There are two schools of thoughts on this subject, whereby the traditional approach explained that the exchange rate leads the stock price, and the changes of exchange rates would affect the value of a firm via competitiveness, assets and liabilities. Similarly, the changes of exchange rates would eventually affect the firm's profits or loss and thus, the value of its equity.

In contrast, portfolio approach claims that actually stock prices lead exchange rates. When stock prices decreases, it reflects a reduction in investors' wealth, and this ultimately leads lower of demand for money, which in turn causes the depreciation of the currency. Under portfolio approach, the main assumption is that stock price is inversely related with the exchange rates.

This paper is organized as follow, whereby in the next section, we discuss the method and sources of data used in analysis. The third section will be on the results of the study while the concluding last section contains our conclusion.

2.0 DATA AND METHODOLOGY

The sample period is segregated into two periods, which is January 1988 to June 1997 for the pre crisis period and July 1998 to December 2006 for the post crisis period. The REER was chosen in this study because the Malaysian Ringgit was pegged to the US dollar right after the crisis and this might contribute to a misconstrued finding. The efficiency of the stock market is also in question, if there exist any long run relationship, and then the stock market can be assumed inefficient due to interdependency.

In empirical economics macroeconomic variables comprises of non stationary series. Treating non stationary variables in empirical analysis is important so that the results of spurious regression can be avoided. According to the concept of cointegration, two or more non-stationary time series share a common trend, then they are said to be cointegrated. The theoretical framework highlighted are expressed as follows: the component of the vector $Y_t = (y_{1t}, y_{2t}, \ldots, y_{nt})'$ are considered to be cointegrated of order *d,b,* denoted Yt ~ CI (*d,b*) if (i) all the component Y_t are stationary after n difference, or integrated of order *d* and noted as $Y_t \sim I(d)$. (ii) presence of a vector $\beta = (\beta 1, \beta_2, \ldots, \beta_n)$ in such that linear combination $\beta Y_t = \beta_1 y_{1t} + \beta_2 y_{2t} + \ldots + \beta_n y_{nt}$ whereby the vector β is named the cointegrating vector. A few major characteristics of this model are that the cointegration relationship obtained indicates a linear combination of non-stationary variables, in which all variables must be integrated of the same order and lastly if there are *n* series of variables, there may be as many as *n*-1 linearly independent cointegrating vectors.

Johansen's (1991) cointegration test is adopted to determine whether the linear combination of the series possesses a long-run equilibrium relationship. The numbers of significant cointegrating vectors in non-stationary time series are tested by using the maximum likelihood based λ_{trace} and λ_{max} statistics introduced by Johansen and Juselius (1990). The advantage of this test is that it utilises test statistic that can be used to evaluate cointegration relationship among a group of two or more variables. Therefore, it is a superior test as it can deal with two or more variables that may be more than one cointegrating vector in the system.

Prior to testing for the number of significant cointgrating vectors, the likelihood ratio (LR) tests are performed to determine the lag length of the vector autoregressive system. In the Johansen procedure, following a vector autoregressive (VAR) model, it involves the identification of rank of the *n x n* matrix ∏ in the specification given by:

$$\Delta Y_t = \delta + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \Pi Y_{t-k} + \varepsilon_t \quad (1)$$

where Y_t is a column vector of the *n* variables, Δ is the difference operator, Γ and ∏ are the coefficient matrices, *k* denotes the lag length and δ is a constant. In the absence of cointegrating vector, ∏ is a singular matrix, which means that the cointegrating vector rank is equal to zero. On the other hand, in a cointegrated scenario, the rank of ∏ could be anywhere between zero. In other words, the Johansen cointegration test can determine the number of cointegrating equation and this number is named the *cointegrating rank.*

The Johansen Maximum likelihood test provides a test for the rank of ∏, namely the trace test (λ_{trace}) and the maximum eigenvalue test (λ_{max}). Firstly, the λ_{trace} statistic test whether the number of cointegrating vector is zero or one. Then, the λ_{max} statistic test whether a single cointegration equation is sufficient. Both test statistics are given as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} \ln(1 - \hat{\lambda}) \quad (2)$$

$$\lambda_{trace}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (3)$$

where *p* is the number of separate series to be analysed, T is the number of usable observations and λ is the estimated eigenvalues.

3.0 EMPIRICAL RESULTS

There have been numerous studies examining the relationship between stock prices and exchange rates. And the results are mixed, such as stock prices affecting exchange rates as found by Abdalla and Murinde (1997), *vice versa* feedback effect as found by Ajayi and Mougoue (1996) or no relationship found by Ibrahim (2000). However, the empirical results of long run relationship between stock prices and exchange rates are at best mixed. This is because of different data set and methodology used. In this study, the data set consists of monthly real effective exchange rates (REER) and stock prices index (SP) for Malaysia covering the period from January 1988 to December 2006. In the analysis, the period of study is divided into two sample periods: first, the pre-crisis period spanning from January 1988 to June 1997; and second, the post-crisis period from July 1998 to December 2006.

Before proceeding to the cointegration test, the order of integration of the series was determined using the Augmented Dickey-Fuller (ADF) unit root test. Table 1 reports the result of the unit root test. The results clearly shows that the null hypothesis of a unit root cannot be rejected at the 5% level for REER and SP in their levels. However, the null hypothesis is rejected at 5% level when REER and SP one in their first-differences. Thus, these indicated that REER and SP are integrated of order one, $I(1)$, in other words they are difference stationary process.

Since the series are of the same order, we proceed to test the existence of cointegrating relations among the REER and SP using the Johansen cointegration test. The results are reported in Table 2. The results indicate that the null hypothesis of no cointegration cannot be rejected in the pre- and post-crisis periods. Therefore, we concluded that there is no evidence of long run relationship between the real effective exchange rate (REER) and the stock price index (SP) for both periods, more specifically, pre and post crisis periods. In addition the results show that the relationship between the stock price and the real effective exchange rate did not change before and after the Asian Financial crisis.

4.0 CONCLUSION AND IMPLICATION

The results clearly show that both the variables of interest, the REER and SP are not cointegrated for both period, pre and post crisis. Our findings support the results obtained by Ibrahim (2000) but in contrast with Azman Saini et al. (2006). This might be due to different sets of variables chosen and also different method used in the analysis. The result also clearly show that Malaysia's stock market can be considered efficient since it is found to independent of exchange rate. The findings of no long-run equilibrium between stock price index and exchange rate imply that Malaysian stock market is informational efficient. Under the efficient market hypothesis, market participants cannot use the growth of the exchange rates as a trading rule in order to exploit abnormal profit. On the other hand, if the variables are cointegrated or have a long-run equilibrium relationship, then the movements in exchange rate can be exploitable as a trading rule to reap abnormal profit.

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Table 1: Results of the Unit Root Tests

ADF Test				
	Level		First Difference	
Variables	Constant, No Trend	Constant, Trend	Constant, No Trend	Constant, Trend
<u>Before Crisis</u>				
REER	-2.5511	-3.2227	-7.5299**	-7.5146**
	(2)	(2)	(0)	(0)
SP	-1.3931	-3.0751	-6.7332**	-6.7165**
	(1)	(2)	(0)	(0)
<u>After Crisis</u>				
REER	-1.8119	-2.1411	-10.2628**	-10.2413**
	(1)	-1	(0)	(0)
SP	-2.7934	-3.4297	-7.0962**	7.0767**
	(1)	(1)	(0)	(0)

Note: ** denotes significant at 5% significance levels, respectively. Figures in parenthesis ( ) refer to the selected lag length. The lag length was arbitrarily selected using SIC.

Table 2: Results of Cointegration Test

Vectors	r = 0	r ≤ 1
Pre-crisis results (Jan, 1988 - June, 1997), Lags = 4		
Trace test	11.61	0.47
5% level	15.41	3.76
Max-Eigen test	11.15	0.47
5% level	14.07	3.76
Post-crisis results (July, 1998 - Dec, 2006), Lags = 4		
Trace test	12.40	2.59
5% level	15.41	3.76
Max-Eigen Test	9.81	2.59
5% level	14.07	3.76

Note: r indicates the number of cointegrating vectors. Trace and Max-Eigen denote the trace statistic and maximum eigenvalue statistic. The critical values are obtained from Osterwald-Lenum (1992). Lag selection (k) is based on Schwert (1987) formula.