Loh Mun Seong

Abstract: Economists and investors alike have to debated whether exchange rates have respond to the stock market or vice versa. This study examined the reactions of exchange rates towards Malaysia stock market during January 1981 to October 2013. This study utilize the Engle-Granger Cointegration and Error Correction Model to determine long run relationships and speed of adjustment between all variables. VARs Granger causality to defines causal relation between variables. The results reveal significant negatively short run and long run associations between exchange rates and Malaysia stock market which consensus to the Goods Market Approach by Dornbusch and Fischer (1980) suggests exchange rates depreciation positively affected to the stock market. The empirical results also denotes bidirectional causality exists between Malaysia stock market and exchange rates which consistent to the Portfolio Balanced Approach postulate negative relationships between stock prices and exchange rates and stock prices have an impact on exchange rates.

Keywords: Econometrics, Causality, Stock Market, Exchange Rates, Time Series

1. Introduction
For an open economy like Malaysia, the level of the exchange rate has an important implications for the competitiveness of exports and domestic price inflation. Even more important is the need to avoid extreme volatility in the exchange rates, which would distort decision making in international transactions, particularly in trade and foreign investment. The exchange rates of the Malaysia ringgit Vis-à-vis the United States dollar and Singapore dollar was very volatile following the floating of the ringgit in July 1997 (Figure 1 and Figure 2). The commodity price shocks that occurred after the transition to a floating exchange rate regime only served to exaggerate this volatility. Apart from the oil price shocks, economic recession and currency speculation were the others main shocks influencing the volatility in the exchange rates. In particular, speculative activity on the ringgit also increase in volatility during the mid-1997s reflected the effects of several factors, the most important being the sharp deterioration in the terms of trade that triggered the recession. The 1997 Asian financial crisis and 2008 U.S. subprime crisis has made a strong pitch for dynamic linkage between the stock prices and exchange rates (Figure 1 and Figure 2). During the crisis period, the world has noticed that the emerging market collapsed due to substantial depreciation of exchange rates as well as dramatic fall in the stock market. The start of 1998 witnessed a sharp increase in the volatility in the both foreign exchange and stock markets. During this period, the Malaysia Ringgit depreciated further following the depreciation of the Korean Won and Indonesian rupiah in early 1998. Meanwhile, the outflow of foreign short-term funds during this period contributed to a progressive tightening of liquidity in the banking system. In 1997, central bank of Malaysia was used to influence domestic interest rates to avoid large capital outflow and the volatile short-term capital flows of the ringgit during the Asian
financial crisis. Under these circumstances, central bank of Malaysia introduced selective exchange control on 1st September 1998 while the exchange rate was fixed at US$1=RM3.80. Objective to executed fixed exchange rate regime is to stabilize the volatile environment in the international foreign exchange and continue to promoting a stable environment for restoring investor to revive the Malaysian economy.

Another period of exchange rate volatility occurred during July 2005 following substantial capital flows during the period. Attempts to central bank of Malaysia to neutralize the impact of the flows on the exchange rate and domestic liquidity did little to reduce the volatility. However, sharp increase in volatility experienced during 2008. Such a level of volatility was unprecedented. The movements in the exchange rates of the ringgit in 2008 were strongly influenced by the contagion effects of developments in the region and world economic recession, which resulted in a loss of investor confidence and large outflows of foreign short-term capital.

**Figure 1:** United States dollar (USD) against Malaysia ringgit (MYR) towards Malaysia Stock Market

![Figure 1: United States dollar (USD) against Malaysia ringgit (MYR) towards Malaysia Stock Market](source: Bloomberg database, October 2013)

**Figure 2:** Singapore dollar (SGD) against Malaysia ringgit (MYR) towards Malaysia Stock Market

![Figure 2: Singapore dollar (SGD) against Malaysia ringgit (MYR) towards Malaysia Stock Market](source: Bloomberg database, October 2013)
2. Literature Reviews
In this sections will review previous works done by the academicians, researchers and policymakers on the reactions of exchange rate to the stock market. In recent times, the relationships between exchange rate and stock prices has attracted considerable attention among academicians, economists, policymakers and investors. Economists and investors alike have to debated whether exchange rates have respond to the stock market or vice versa. Ajayi and Mougoue (1996), Sheng and Shuh (2004) and Smith (1992) demonstrated exchange rate fluctuation have a very strong significant impact upon the stock prices of these economies. However, Franck and Young (1972), Solnik (1987), Chow et al. (1997), Jorion (1990, 1991), Bodnar and Gentry (1993), Bartov and Bodnar (1994), Naeem and Rasheed (2002) signify there is no significant relationships between stock market and foreign exchange rate. On the others hand, Kate and Fabiola (2005), Aggarwal (1981), Giovannini and Jorion (1987) and Roll (1992) suggested that stock price and exchange rates are positively related but Soenen and Hennigar (1988) revealed strong negative relationships between stock prices and effective exchange rates. In addition, Li and Huang (2009), Bahmani and Sohrabian's (1992), Chien & Cheng (2001) found that exchange rate granger cause stock market but Pan, Fok & Lui (1999) found that the exchange rate granger cause stock prices with less significant causal relations from stock prices to foreign exchange. Contrary with Horobet et al. (2007), Kate and Fabiola (2005) and Libly (1993) results provide stock prices granger cause exchange rates. Apart from that, Granger, Huang and Yang (2000) and Mansor (2000) found the unidirectional causality exists between stock market and exchange rate and the direction of the causality is from stock market to exchange rates. However, Li and Huang (2009), Bahmani and Sohrabian (1992), Chien & Cheng (2001) and Yu (1997) found that exchange rates and stock returns have short run unidirectional causality. Besides that, Bhmani and Sohrabian (1992) also suggested in the long run there are no causal relationship between stock prices and exchange rates.

3. Methodologies and Empirical Results
In this study employed monthly time series data ranging from January 1981 to October 2013. The basic linear function used in this study as stated in equation (1),

$$ KLCl_t = f(USDMyR_t, SGDMyR_t) $$

Where $KLCl_t$ proxy Kuala Lumpur Stock Exchange, $USDMyR_t$ proxy United States dollar (USD) to Malaysia ringgit (MYR) e.g. US$1=RM3.80 and $SGDMyR_t$ proxy Singapore dollar (SGD) to Malaysia ringgit (MYR) e.g. SG$1=RM2.50. All data were obtained from Bloomberg database.

3.1 Unit Root test
As a first step to determine the stationary of each of the variable, I employed the Augmented Dickey-Fuller (ADF) test. The ADF model is given as follows:

$$ \Delta KLCl_t = \beta_1 + \beta_2 t + \alpha KLCl_{t-1} + \sum_{i=1}^{n} \delta_i \Delta KLCl_{t-1} + \epsilon_t $$

$$ \Delta USDMyR_t = \beta_1 + \beta_2 t + \alpha USDMyR_{t-1} + \sum_{i=1}^{n} \delta_i \Delta USDMyR_{t-1} + \epsilon_t $$

$$ \Delta SGDMyR_t = \beta_1 + \beta_2 t + \alpha SGDMyR_{t-1} + \sum_{i=1}^{n} \delta_i \Delta SGDMyR_{t-1} + \epsilon_t $$

where $\epsilon_t$ is a pure white noise error term. The null hypothesis of the unit root test is $\alpha=0$. We reject null hypothesis of the unit root if the t-statistic of $\alpha$ is smaller than 99% Dickey-Fuller critical value given by Mackinnon (1991).
Table 1: ADF unit root test

<table>
<thead>
<tr>
<th>Variables</th>
<th>Augmented Dickey Fuller (ADF)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level, I(0)</td>
<td>First Difference, I(1)</td>
</tr>
<tr>
<td>KLCI</td>
<td>-0.6907 (0.8463)</td>
<td>-11.1295 (0.0000)*</td>
</tr>
<tr>
<td>USDMYR</td>
<td>-1.5978 (0.4828)</td>
<td>-17.7728 (0.0000)*</td>
</tr>
<tr>
<td>SGDMYR</td>
<td>-0.7971 (0.8184)</td>
<td>-20.3186 (0.0000)*</td>
</tr>
</tbody>
</table>

Note: * denotes 1% significant level. AIC is used to select the lag length. ( ) Numbers in parentheses denotes p-value

The ADF unit root test presented at Table 1 indicate we cannot reject hypothesis in level but we can reject hypothesis in the first different based on Mackinnon's critical at 1% level of significance because all variables are stationary.

3.2 Cointegration test (Engle-Granger test)

The Engle-Granger procedure consists of estimating the cointegrating regression by Ordinary Least Square (OLS), obtain their residuals and applying unit roots test for the residual (Engle & Granger, 1987). Thus, if the time series is found to be non-stationary and integrated of the same order from the ADF test, the Engle-Granger cointegration test is performed. To obtain the residual, the following cointegrating regressions are performed:

\[
\begin{align*}
KLCI_i &= \beta_0 + \beta_1 USDMYR_i + \beta_2 SGDMYR_i + e_{KLCI} \\
USDMYR_i &= \beta_0 + \beta_1 KLCI_i + \beta_2 SGDMYR_i + e_{USDMYR} \\
SGDMYR_i &= \beta_0 + \beta_1 KLCI_i + \beta_2 USDMYR_i + e_{SGDMYR}
\end{align*}
\]

and the ADF test is as follows:

\[
\Delta \hat{e}_t = \alpha_1 \hat{e}_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta \hat{e}_{t-i} + \epsilon_i
\]

where \(\Delta \hat{e}_t\) include \(e_{KLCI}, e_{USDMYR},\) or \(e_{SGDMYR}\) sequence and with the null hypothesis of \(H_0: \alpha_1 = 0\) (no cointegration). The value of optimal lag length \(p\) is selected by the smallest Akaike information criterion (AIC) and Schwartz criterion (SC). Since the residual series is calculated from a cointegrating equation, an intercept of time trend is omitted from the equation (Enders, 1995).

Table 2: Engle-Granger Cointegration test

<table>
<thead>
<tr>
<th>ADF Test Statistic</th>
<th>1% Critical Value</th>
<th>5% Critical Value</th>
<th>10% Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4.3097*</td>
<td>-3.4468</td>
<td>-2.8687</td>
<td>-2.5706</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDUAL</td>
<td>-0.0932</td>
<td>-4.3097*</td>
</tr>
</tbody>
</table>

Note: * denote 1% significant level. AIC=10.8232 and SC=10.8434

Table 2 presented Engle-Granger Cointegration test. The result showed that all variables were cointegrated at 1% significant level. This means that there are long run equilibrium relationships between stock market and exchange rates. This result conversely with the
findings of Mansor (2000) and Li and Huang (2009) found there are no long run relationships between stock prices and foreign exchange.

3.3 Granger Representation Theorem (Engle-Granger Two-Step Error Correction Model)

Though the study adopts Ferson and Harvey (1998) Asset Pricing Model as the theoretical framework, the Engle-Granger (1987) two-step error correction model procedure was adopted for the estimation of the models. The models are specified as below:

$$\Delta KLCI_t = \alpha_0 + \alpha_1 \text{USDMYR}_t + \alpha_2 U_{t-1} + \varepsilon_t$$
$$\Delta KLCI_t = b_0 + b_1 \text{SGDMYR}_t + b_2 U_{t-1} + \varepsilon_t$$

Where $\Delta$ denotes the first difference operation on the respective variables, $\alpha_1$ and $b_1$ are the coefficients showing the short run equilibrium relationships connecting the independent and dependent variables, $\alpha_2$ and $b_2$ are the coefficient showing the long run relationships connecting the explanatory variables and dependent variable. $U_{t-1}$ is the residual obtained from the linear regression of the I(1) variables and lagged by one as a requirement of the granger representation theorem. $\varepsilon_t$ is the disturbance term for the model.

Table 3: Engle-Granger Two-Step Error Correction Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>USDMYR</td>
<td>-231.6488</td>
<td>-6.458284*</td>
</tr>
<tr>
<td>RESIDUAL</td>
<td>-0.052916</td>
<td>-2.730645*</td>
</tr>
<tr>
<td>SGDMYR</td>
<td>-170.7504</td>
<td>-2.238743**</td>
</tr>
<tr>
<td>RESIDUAL</td>
<td>-0.037782</td>
<td>-1.874858***</td>
</tr>
</tbody>
</table>

Note: *, ** and *** denote 1%, 5% and 10% significance level

Table 3 demonstrate Engle-Granger Two-Step Error Correction Model. The result exhibit USDMYR had a significant negative short run and long run relationship with the stock market at 1% significant level. Besides that, result also show SGDMYR had a significant negative short run and long run relationship with the stock market at 5% and 10% level of significance respectively. The long run coefficient was significant implying that stable exchange rates in the long run would help to improve the performance of the Malaysia stock market.

The long run equilibrium coefficients had a expected a priori negative sign implying that the model where appropriately specified (Abraham, 2012). This implies that 5.29% and 3.78% of the short run distortions affecting the performance of Malaysia stock market could be corrected in the long run.

3.4 VARs Granger Causality test

The VAR can be considered as a means of conducting causality tests or more specifically Granger causality tests. By using F-test to jointly test for the significance of the lags on the explanatory variables, this in effect tests for ‘Granger causality’ between these variables. It is possible to have causality running from variable X to Y, but not Y to X; from Y to X, but not X to Y and from both Y to X and X to Y. The ‘Granger causality’ test are specified as below:

$$Y_t = \delta_1 + \gamma_1 X_t + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=1}^{q} \beta_j X_{t-j} + e_{1t}$$
$$X_t = \delta_2 + \gamma_2 Y_t + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{j=1}^{q} \lambda_j X_{t-j} + e_{1t}$$
Table 4: VARs Granger Causality test

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Dependent Variables</th>
<th>KLCI</th>
<th>USDMYR</th>
<th>SGDMYR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>43.0386</td>
<td>36.7396</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0008)*</td>
<td>(0.0057)*</td>
<td></td>
</tr>
<tr>
<td>KLCI</td>
<td>USDMYR</td>
<td>28.0997</td>
<td>42.9690</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0606)**</td>
<td>(0.0008)*</td>
<td></td>
</tr>
<tr>
<td>USDMYR</td>
<td></td>
<td>38.9302</td>
<td>50.6258</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0029)*</td>
<td>(0.0001)*</td>
<td></td>
</tr>
<tr>
<td>SGDMYR</td>
<td>USDMYR</td>
<td>50.6258</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0001)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SGDMYR</td>
<td>USDMYR</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * and *** indicates 1% and 10% significance level
( ) Numbers in parentheses denotes p-value

Table 4 shows VARs Granger causality test in all the variables. Based on the empirical results shows bidirectional VARs causality exists between KLCI and USDMYR and KLCI and SGDMYR which consensus with Granger, Huang and Yang (2000), Mansor (2000), Li and Huang (2009), Bahmani and Sohrabian's (1992), Chien and Cheng (2001), Yu (1997), Horobet et al. (2007), Kate and Fabiola (2005) and Libly (1993). The result also shows bidirectional causality between USDMYR and SGDMYR.

4. Conclusion

This study examined the reactions of exchange rates towards to Malaysia stock market. The findings of Mansor (2000) and Li and Huang (2009) found there are no long run relationships between foreign exchanges and stock prices. But the results contrary reveal there are significant negatively short run and long run associations between exchange rates and Malaysia stock market which consensus to the Goods market approach by Dornbusch and Fischer (1980) and Mao and Kao (1990) suggests exchange rates depreciation it make the local products more attractive and demand for these exporting goods increases in the foreign market hence the revenue is positively affected to the stock market.

The empirical results also denotes bidirectional causality exists between Malaysia stock market and exchange rates which consensus with Granger, Huang and Yang (2000), Mansor (2000), Li and Huang (2009), Bahmani and Sohrabian's (1992), Chien and Cheng (2001), Yu (1997), Horobet et al. (2007), Kate and Fabiola (2005) and Libly (1993). The result seems consistent to the Portfolio balance approach postulate a negative relationships between stock prices and exchange rates and stock prices have an impact on exchange rates. A rise in domestic stocks market will attract foreign investors to invest in the stock market and diversify their portfolios. A rise in stock prices encourages investors to buy more domestic assets simultaneously selling foreign assets to obtain domestic currency will cause domestic currency appreciation.
References