Long Run Relationship between Global Electronic Cycle, Yen/Dollar Exchange Rate and Malaysia Export

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Abstract

Depreciations of the Japanese Yen vis-a-vis the US Dollar have been shown to be negatively affecting East Asian economies. Studies have also shown a high correlation between the Yen/US Dollar exchange rate and the electronic cycle, therefore the negative relationship may be due to the global electronic cycle instead of the Yen/Dollar exchange rate. This paper examines the importance of the fluctuations in the global electronic market and the Yen/ Dollar exchange rate in influencing Malaysia’s exports and subsequently its output by using the ARDL approach.

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Keywords: Electronic Cycle; Yen/Dollar Exchange Rate; Export; Malaysia

1. Introduction

The economy of Malaysia is a growing and relatively open state-oriented and newly industrialized market economy. The electrical and electronic items are the country’s main export which account for 35.4 per cent of Malaysia’s total exports to the key markets such as China, Singapore, Japan, Thailand and the United States. The demands for electronic items fluctuate year by year with regards to the Malaysia’s export conditions. The

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electronics industry in Malaysia can be categorized into four sub-sectors which are consumer electronics, electronic components, electrical and industrial electronics. Malaysia’ Statistic Department indicates that the semiconductor industry is the most important sub-sector and they account for 36 per cent of the total investments approved in the electronics sector. Thus, semiconductors are a cornerstone to the global electronics industry. One of the main characteristics of the semiconductor and electronics industry is the acceleration of technology which renders each new generation of products obsolete fairly quickly. Consequently, product cycles are short and this, in turn, results in a compression of the overall global electronics cycle.

In this context, McKinnon and Schnabl, 2003, showed that East Asian countries’ (Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand) output growth were synchronized with each other during the past two decades. They suggested that the synchronization was caused by the nominal Yen/US Dollar exchange rate. In their view, any shock in the Yen/Dollar exchange rate would affect the East Asian economies. Unlike the Japanese Yen, East Asian countries’ currencies are pegged to the Dollar, and since Japan competes with East Asian countries’ manufacturing exports in the international market, fluctuations in the Yen/Dollar exchange rate would affect East Asian countries exports’ and consequently their output growth. Following the argument, depreciation in the Japanese Yen vis-a-vis the Dollar means that Japanese exports are cheaper or that the East Asia’s exports are relatively more expensive, making them less competitive, ergo their exports and output growth would decrease. Meanwhile, an appreciation in the Yen would lead to a relatively more expensive Japanese exports and an increase in East Asia’s exports and output growth. Doraisami, 2004, echoes this argument for Malaysia’s exports. She studied on the factors which caused the slowdown in export growth occurred in all East Asian economies. She found that misaligned exchange rates and the vulnerability of the downturn in the electronic cycle could also be the factors leading to poor Malaysia’s export performance. She found a unique long-run relationship has existed among the electronic cycle, US/yen dollar rate, and US total new orders for electronics. Meanwhile, McKinnon and Schnabl, 2003, also suggest that the global electronic demand is also influenced Malaysia’s exports growth. However, Kumakura, 2005, suggests that the synchronization of the East Asia’s output growth is due mostly to the global electronic demand, not the Yen/Dollar exchange rate. The strong correlation between the Yen/Dollar exchange rate and output growths in East Asia is due to the electronic cycle because the fluctuations in the Yen/Dollar exchange rate are correlated with the electronic cycle. McKinnon and Schnabl, 2003, and Doraisami, 2004 arguments also assume that Japan’s exports are competing with East Asian countries. This is a strong assumption as Japan is at a different level of economic and technological development compared to the other East Asian countries.

Thus, the objective of this paper is to analyze the relationships among exports, electronic cycle and the Yen/Dollar exchange rate for Malaysia export. We examine the relative importance of the Yen/Dollar exchange rate and the world demand for semiconductor products in determining Malaysian exports for the period of the year 1987 to 2012.

2. Literature Review

Ibrahim, 2007, has assessed the effect of the Yen/Dollar exchange rate on selected macroeconomic variables namely real output, price level and money supply for Malaysia. The result suggested that variations in the Yen/Dollar exchange rate can have significant influences on Malaysia’s macroeconomic variables. It is supported by Tuck and Wong, 2008, that exchange rate variability has an adverse effect on Malaysia’s electrical exports. Additionally, Onafowora, 2003, examined the relationships between the real trade balance and real exchange rate for three ASEAN countries namely Thailand, Malaysia, and Indonesia in their bilateral trade to the US and Japan. For Malaysia-Japan, the result of cointegration analysis indicated that there is a long run steady state relationship among real trade balance and real exchange rate.
Doraisami, 2004, discussed on the Ringgit misalignment. China had undergone a large depreciation at the beginning of 1994, which ultimately brought pressure to bear on other East Asian economies to devalue their own currencies. This view was challenged by Fernald, et al., 1999, on two grounds. First, there was little effective nominal depreciation of the Renminbi at the time, because the apparent devaluation of the official rate simply unified it with the unofficial rate at which most trade transactions already took place. Second, the moderate real depreciation was rapidly reversed by China’s quite high inflation in 1994 and 1995. As a result, China’s real exchange rate appreciated rather than depreciated over the 1993-1997 period. Nevertheless, many East Asian economies did have sharp real depreciations whereas China did not.

Unlike other East Asian countries, Japan does not peg their currencies to the Dollar. In fact, by 2002 the East Asian countries are returning, or have returned, to their pre-crisis practices of pegging to the dollar contrary to the IMF’s urging. McKinnon and Schnabl, 2002, call the mutual exchange rate synchronization as the “East Asian Dollar Standard”. Meanwhile, the Yen has been appreciating against the US Dollar since the Plaza Accord and “stabilize” since 1995. Malaysian Ringgit has been hovering around 2.5RM/USD. The Ringgit was fixed at 3.8RM/USD after the 1997 crisis and only recently is allowed to “float”. If there is misalignment then there should be no relation after the crisis.

Although international trade has been and will be a critical factor in their economic success, it also increases their collective vulnerability to foreign shocks. The fluctuations in the Yen/Dollar exchange rate have been the most important of these shocks. Alone among East Asian countries, Japan has chosen, or been forced to accept McKinnon, 2000, a situation where its currency varies widely against the dollar. The trend of appreciation ended in 1995, fluctuations in the Yen/Dollar exchange rate have not abated in the last decade. By keeping their exchange rates stable against the Dollar, Malaysia has to cope with extraneous fluctuations of the US Dollar against the Yen. Following McKinnon and Schanbl, 2003, and Doraisami, 2004, any relationship should stop if the synchronization is due to exchange rate as the 1997 crisis witness a large depreciation of the Ringgit vis-a-vis the Dollar, and hence if it exists the misalignment should disappear after the large depreciation in Ringgit vis-a-vis the Dollar.

3. Research Methodology

The autoregressive distributive lag (ARDL) model approach proposed by Pesaran and Pesaran, 1997; Pesaran and Smith, 1998; Pesaran et al., 1999; and Pesaran et al., 2001, has been used in this study in order to examine the long run relationship among the variables in the regression. The test is applicable irrespective of whether the underlying regressors are I(0), I(1) or mixture of both. We estimate the conditional error correction version of the ARDL model, as below:

$$\Delta \ln X_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i} \Delta \ln X_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta \ln YenUS_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta \ln elec_{t-i}$$

$$+ \alpha_4 X_{t-1} + \alpha_5 YenUS_{t-1} + \alpha_6 elec_{t-1} + \epsilon_t$$

(1)

where, $\ln X$, $\ln YenUS$ and $\ln elec$ are the natural log for exports, Yen/US Dollar exchange rate and demand for world electronic products respectively. $\Delta$ is the first difference operator. In order to investigate the presence of a long-run equilibrium relationship in a cointegrating vector, Pesaran et al., 2001, proposed the bounds test based on the Wald test ($F$-statistic). The asymptotic distribution of the $F$-statistic is nonstandard under the null hypothesis of no cointegration relationship among the examined variables. The test statistic can be derived by excluding the lagged level variables, $\ln X_{t-1}$, $\ln YenUS_{t-1}$ and $\ln elec_{t-1}$ from the Unrestricted Error
Correction Model (UECM). In other words, we perform a joint significance test (Wald test) for $H_0: \alpha_4 = \alpha_5 = \alpha_6$ against $H_A: \alpha_4 \neq \alpha_5 \neq \alpha_6$. The bounds test procedure for cointegration analysis assumes a uniqueness of the cointegrating vector. The asymptotic critical value bounds for the $F$-statistic are cited in Pesaran et al., 2001. For some of the significance level namely (10 per cent, 5 per cent, or 1per cent), if the computed $F$-statistic (test statistic) exceeds the upper critical value, $I(1)$, then we rejects the null hypothesis. In the case the computed $F$-statistic falls below the lower critical value, $I(0)$, the null hypothesis of no cointegration cannot be rejected. If the computed $F$-statistic falls within the critical value bounds, a conclusive inference cannot be made. The elasticity can be derived from UECM that is the estimated coefficient of the one lagged explanatory variable (multiplied with a negative sign) divided by the estimated coefficient of the one lagged dependent variable as discussed by Bardsen, 1989.

3.1 Data Collection

The global billing for semiconductor industry which represents the actual amount of semiconductor shipments provided by the Semiconductor Industry Association was used as a proxy for the world electronic cycle. Data for Malaysia’s exports is accessed from the UN COMTRADE database. Yen/Dollar exchange rate is taken from the International Financial Statistics. The data set used in this study consists of quarterly data in natural log form from 1990 to 2012.

4. Data Analysis and Finding

Prior to testing for cointegration, we conduct the Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) test for the order of integration for each variable (see Table 1). The time series properties of the data must be known before any conclusion can be drawn as the bounds test is only applicable for $I(0)$ or $I(1)$ regressors.

Table 1. Unit Root Test

<table>
<thead>
<tr>
<th>Variable</th>
<th>DF/ADF test statistic (with trend and intercept)</th>
<th>PP test statistic (with trend and intercept)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Export (ln X)</td>
<td>-3.13</td>
<td>-3.066</td>
</tr>
<tr>
<td>Yen/US (lnYen/US)</td>
<td>-3.05</td>
<td>-3.929</td>
</tr>
<tr>
<td>Elect (ln elec)</td>
<td>-3.45</td>
<td>-2.869*** (4)</td>
</tr>
</tbody>
</table>

Notes: *,**, and *** means significant at 1 per cent, 5 per cent and 10 per cent respectively. Figures in brackets are the lag length chosen by the SBC model selection procedure.

Further, it means that the null hypothesis that $\delta=0$ can be rejected and thus the time series is stationary. Table 1 above shows that there is a mixture of $I(1)$ and $I(0)$ of underlying regressors and therefore, the ARDL testing could be proceeded. However, the lag length would depend on the lag selection criterion chosen.

Next, the equation (1) is estimated to examine the long-run relationships among the variables. Since the observations are in quarterly, Pesaran et al., 1999, and Narayan and Smyth, 2004, suggest choosing 1 as the maximum order of lags in the ARDL. We also used the Schwarz-Bayesian criteria (SBC) to determine the optimal number of lags to be included in the conditional ECM (error correction model), whilst ensuring there
was no evidence of serial correlation, as emphasized by Pesaran et al., 2001. The lag length that minimizes SBC is one. The calculated $F$-statistics for the cointegration test is displayed in Table 2. The critical value used as suggested by Narayan and Smyth, 2004, using small sample size between 30 and 80.

A maximum of one lag are used, i.e. $i = 1$ and the above model is selected using the Schwartz Info Criterion (SIC). All of the variables are in the form of logarithm.

Table 2. Wald Test Result

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>Lag</th>
<th>Significance level</th>
<th>Bound critical values (restricted intercept and no trend)</th>
<th>Bound critical values (restricted intercept and trend)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F$-Statistic</td>
<td>3.656113</td>
<td>1</td>
<td>1%</td>
<td>4.048, 5.092</td>
<td>5.099, 7.122</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td></td>
<td>2.946, 3.862</td>
<td>2.451, 4.811</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10%</td>
<td></td>
<td>2.482, 3.334</td>
<td>3.455, 4.784</td>
</tr>
</tbody>
</table>

Note: The critical values are from Narayan (2004), with number of observation = 75 and number of regressors $k = 3$.

The $F$-statistic result is 3.656 which exceed the upper bound critical value by Narayan and Smyth, 2004, with level of significance at 10 per cent using intercept and no trend. It means that we may reject the null hypothesis of no long-run relationship and conclude that there exists a long run relationship among the variables.

In order to interpret the unrestricted error correction coefficient, the ARDL model requires us to divide the coefficient with the coefficient of level form of dependent variable (in this case $\ln X$) and change the sign.

Tabel 3. Long-Run Coefficient Model

<table>
<thead>
<tr>
<th>Dependent Variable: $\ln X$</th>
<th>Independent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\ln$YenUS $\ln$elec</td>
</tr>
<tr>
<td>5.0769292</td>
<td>-3.8697049</td>
</tr>
<tr>
<td>(1.619534)</td>
<td>(-1.037297)</td>
</tr>
</tbody>
</table>

Note: The $t$-ratio in parentheses

From the result above, it shows that $t$-ratio of $\ln$YenUS is 1.619534 and it has a positive sign. Hence, it is insignificant in the 1 per cent level of significance. This indicates that $\ln$YenUS is an important variable in influencing the variation in the quantity of the Malaysian export. If the exchange rate of the Yen/Dollar appreciates by 1 per cent, the Malaysian export will increase by 5.077 per cent. This is no doubt to supports the theoretical argument developed by De Grauwe, 1988, that a very risk-averse exporter, who is concerned with depressing effect on export earnings, may export more when the exchange rate uncertainty increases. Similarly, Doraisami, 2004, exchange rate monitoring and export diversification could be used to enhance the performance of the Malaysian exports sector.

The $t$-ratio of $\ln$elec is -1.037 is negative and significant. This implies that 1 per cent increase in the quantity of world demand for semiconductor would decrease the quantity of Malaysian export by 3.869 per cent. To mitigate these adverse effects, there should be attempts to increase the diversification of electronics products apart from diversifying into new export markets through trade promotion strategy. Moreover, government should emphasize on the importance of increasing investments in science and technology to
improve the exports sector.

5. Conclusion

The active engagement in the global electronics industry has been a powerful growth engine for the country but leave the economy vulnerable to cyclical fluctuations in the world electronics market. This situation would most likely occur in countries where the share of export of electronic and electrical products is large. In the case of Malaysia, it is evident that the high emphasis on the electronics industry has made it vulnerable to its economy since the world demand of semiconductors has a positive long run effect to its export.

Acknowledgement

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