Examining Exchange Rates Exposure, J-Curve and the Marshall-Lerner Condition for High Frequency Trade Series between China and Malaysia

Hooy, Chee-Wooi and Chan, Tze-Haw

Universiti Sains Malaysia, Multimedia University - Centre for Globalisation and Sustainability Research

31 August 2008

Full title: EXAMINING EXCHANGE RATES EXPOSURE, J-CURVE AND THE MARSHALL-LERNER CONDITION FOR HIGH FREQUENCY TRADE SERIES BETWEEN CHINA AND MALAYSIA

Authors: HOY CHEE WOOI
Finance Section
School of Management
Universiti Sains Malaysia
Email: cwhooy@usm.my

CHAN TZE-HAW
Centre for Globalization and Sustainability Research
Faculty of Business and Law
Multimedia University, Malaysia
Email: thchan@mmu.edu.my

Abstract: Over the last decade, China and Malaysia have committed to export-led growth policy based on maintenance of their undervalued currencies. Both nations had succumbed to pressure of revaluation to de-peg their currency against the USD, the same day in July 2005. This unique scenario motivated us to examine the dynamic nexus of exchange rate impact on bilateral export and import flows between China and Malaysia. Our analysis contributed in using high frequency monthly data for the recent period from January 1990 to January 2008, based on the Autoregressive Distributed Lag (ARDL) bound testing procedure and generalised impulse response analysis. Our empirical findings reveal that the Marshall-Lerner condition holds that real depreciation accelerates trade expansion in the long run but only the short run import demands adhere to the potential J-curve pattern. Domestic and foreign incomes are significant and correctly signed, suggesting that the China-Malaysia exports and imports are determined by demand side effects. In brief, the study supports for the complementary role of China instead of conflicting (competing) features in the China-Malaysia bilateral trading.

Keywords: Exchange rates, Trade, J-curve, Marshall-Lerner Condition, ARDL Bounds test

JEL Classification Codes: F31

Conference Track: Track C - Economics

Correspondence to:

HOOY CHEE WOOI
Finance Section,
School of Management
Universiti Sains Malaysia,
11800 USM
Penang, Malaysia
Email: cwhooy@usm.my
Telephone: 604-653-2897
Fax No: 604-657-7448

EXAMINING EXCHANGE RATES EXPOSURE, J-CURVE AND THE MARSHALL-LERNER CONDITION FOR HIGH FREQUENCY TRADE SERIES BETWEEN CHINA AND MALAYSIA

Hooy Chee-Wooi [a,ψ] *and Chan Tze-Haw* [b]

[a] *Universiti Sains Malaysia, Malaysia*
[b] *Multimedia University, Malaysia*

Abstract
Over the last decade, China and Malaysia have committed to export-led growth policy based on maintenance of their undervalued currencies. Both nations had succumbed to pressure of revaluation to de-peg their currency against the USD, the same day in July 2005. This unique scenario motivated us to examine the dynamic nexus of exchange rate impact on bilateral export and import flows between China and Malaysia. Our analysis contributed in using high frequency monthly data for the recent period from January 1990 to January 2008, based on the Autoregressive Distributed Lag (ARDL) bound testing procedure and generalised impulse response analysis. Our empirical findings reveal that the Marshall-Lerner condition holds that real depreciation accelerates trade expansion in the long run but only the short run import demands adhere to the potential J-curve pattern. Domestic and foreign incomes are significant and correctly signed, suggesting that the China-Malaysia exports and imports are determined by demand side effects. In brief, the study supports for the complementary role of China instead of conflicting (competing) features in the China-Malaysia bilateral trading.

Keywords: Exchange rates, Trade, J-curve, Marshall-Lerner Condition, ARDL Bounds test

JEL Classification Codes: F31.

1. Introduction

The recent devaluation and USD de-pegging of both Chinese yuan (renmimbi) and Malaysian ringgit on July 2005 have open a new scenario to the trade sector in both countries. Since the opening of mainland Chinese economy in 1978, renminbi was pegged to the USD and a dual-track currency system was instituted, where renminbi is only usable locally while foreign exchange certificates are forced on foreigners. China abolished the dual-track system and introduced single free floating currency effective January 1, 1994 and the renminbi turn freely convertible under current account transaction effective December 1996. In the decade until 2005, renminbi was tightly pegged at 8.2765 yuan to the USD. Since launching the reform program from 1979 to 2005, China turn out to enjoyed real GDP grew at an average annual rate of 9.7%. On July 21, 2005 People's Bank of China announced the 2.1% revaluation to 8.11 yuan per USD and move from USD pegging to managed-floating based on a basket of foreign currencies. To date, the yuan is traded at around 6.95 yuan (June 2008), appreciated about 16% since 2005. On the other hand, the Malaysian ringgit was trading as a free float currency at around RM2.50 per USD since early 1970s. During the 1997 Asian financial crisis, Malaysian riggit suffered sharp depreciation by more than 40% within a year to about RM 4.00 against the USD. Bank Negara Malaysia (BNM) decided to impose capital control and peg ringgit to the USD in September 1998 at RM3.80. On July 21, 2005, BNM responded to China's de-pegging announcement within an hour after the 7-year pegging. Akin to the Chinese policy, BNM allows the ringgit to operate in a managed floating system based on a basket of several major currencies. Together, both renmimbi and ringgit show analogous trend of subsequent appreciation against the weakened USD. By June 2008, the USD exchanges for 3.20 Malaysian ringgits.

China, for most episodes during 1990s-2000s and Malaysia, particularly throughout the capital control regime, were alleged as committed to export-led growth policy based on maintenance of their undervalued currencies against the USD. For instance, the US has claimed that the Renmimbi-US Dollar peg is responsible for its bilateral trade deficits with China that accounted for $103.1 billion and

[ψ] Corresponding Author: Hooy Chee Wooi, Finance Section, School of Management, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia; Tel: 604-653-2897; Fax: 604-657-7448; E-mail: cwhooy@usm.my

$124.0 billion in year 2002 and 2003 respectively. A relevant argument put forward by some economists implies that Chinese foreign exchange strategy poses her as a formidable export competitor and offers further threat to the crowding out of other developing Asian economies. Malaysia, on the other hand, earned substantial trade surplus in the post-crisis years after some years of persistent external imbalances prior to currency turmoil in 1997. Putting together, both countries might have violated the WTO rule of fair and free trade among member countries. A couple of appealing question thus arises: is the emergence of China has shown complementary or conflicting (competing) features to Malaysia, or the other way? Was the devaluation strategy expansionary or contractionary?[1]

Motivated by the concerned issue, this study investigates the dynamic nexus of China-Malaysia bilateral trade balances and exchange rates. Both economies are of different regulatory regimes, different degrees of development and trade openness, but within a comparable development in exchange rate regime. Thus far, to our best knowledge, no empirical study has yet investigated the China-Malaysia case among the limited recent East Asian works (e.g. Tang, 2004; Tang, 2005; Bahmani-Oskooee and Wang, 2006; Bahmani-Oskooee and Harvey, 2006). Our analyses also take concerns of the possible transmission channels via macro-variables (e.g. domestic output, foreign income) as in standard international trade model. The Marshall-Lerner condition and J-curve effect are investigated as well via the combination the elasticity and absorption approaches of balance of payment, within the Autogressive Distributed Lag (ARDL hereafter) bound testing procedure and unrestricted error correction framework.

The ARDL procedure can be applied irrespective of whether the regressors are stationary, i.e. I(0), or stationary at first difference, i.e. I(1), or mutually cointegrated. It avoids the conventional pre-testing procedure of unit roots in Johansen-Juselius cointegration technique and has the advantage of easily understood within the context of traditional error correction modelling approaches. Also, regardless of the possible exogeneity of explanatory variables, the long and short-run parameters, with appropriate asymptotic inferences, can be obtained by applying OLS to an autoregressive distributed lag model with appropriate lag length (see Duarte and Holden, 2001).

The present study is organized in the following manner. In section 2, relevant literature on the issue of exchange rate impact on trade is discussed. Section 3 then shows the theoretical representation of trade-exchange model that forms the basis of our empirical model. This is followed by the estimation procedures and data description. Estimation results are discussed in section 4. Finally, in the closing section, conclusions are drawn.

2. The Issue of Exchange Rate Devaluation and Trade

The issue of exchange rate devaluation on international trade has long been a major topic of study in international economics. The conventional elasticity approach was firstly addressed by Bickerdike-Robinson-Metzler (BRM, 1920; 1947; 1948) and was later make known by Marshall and Lerner (1923; 1944) as the Marshall-Lerner condition (MLC henceforth). According to MLC, the demand elasticity of both exports and imports must exceed one to improve trade balances from devaluation. There is an excess supply of currencies when the exchange rate is above the equilibrium level and excess demand when it is below. Only with this condition a nominal devaluation will affect real exchange rates to enhance competitiveness and hence improves trade balances. Since then, the MLC has become the underlying assumptions of currency devaluation policy.

However, Dornbusch and Krugman (1976) argue that there would be a perverse temporal negative response of the trade balance to a real depreciation in short run, followed by the larger export and import elasticities that would improve the trade balance. The so-called J-curve phenomenon is mainly due to the of overtaken price effect of volume effect at early stage. Nevertheless, empirical studies not only reported J-curve but also S-curve. For instance, Backus et al. (1994) deployed the dynamic-general equilibrium models and found that the trade balance is negatively correlated with current and future movements in the terms of trade (which are measured by the real exchange rate), but positively correlated with past movements. Over time, the cross correlation function of the trade balance and the

[1] The impact of devaluation on output is theoretically ambiguous and the relevant empirical evidence is largely inconclusive. On one hand, devaluation generates an expansionary effect via aggregate demand; on the other hand, through its effect on the cost of imported intermediate inputs, it has a negative impact on the aggregate supply. A survey of the subject can be cited via Bahmani-Oskooee and Miteza (2003).

terms of trade display an S-shape. Marwah and Klein (1996) estimate trade balance equations for US and Canada, and find that there is a tendency for trade balances to worsen first after a depreciation and then to improve, but after several quarters there appears to be a tendency to worsen again, which produces an S-pattern.

Arguments that currency devaluations are more contractionary and inflationary for developing countries than for industrial countries have been observed in numerous studies, which partially explained the practice of rigid exchange rate regime by many developing countries (see for example Eichengreen and Hausmann, 1999; Calvo and Reinhart, 2001). Additionally, the simultaneous occurrence of currency depreciation and recession during the Mexico crisis (1995) and the Asian Financial crisis (1997/98) appears to contradict the conventional view that devaluations are expansionary, as noted by Rajan and Shen (2001) and Ahmed et al. (2002), among others. The reversals of pegged exchange rates policy during crisis as governments ran out of reserves, witnessed the sharp declines in investor confidence, heavy capital outflows and concordant deteriorations of output and inflation performance.

Apparently, at present stage, neither the theoretical nor the empirical works have established definitively whether currency devaluation (nominal or real) has caused trade expansion or trade deterioration, or even if exchange rates play a role in determining trade flows. The issue has become more vital following the recent development of regional episodes. With the China's recent accession to WTO (November 2001) as well as the emergence of ASEAN10+3 Free Trade Area due to the Chiang Mai Initiative (2000) and the Bali Dialogue (2003), the need for an amendment of regional trade policy and currency arrangements anchoring by China is well understood but less being investigated.

3.1 Export Demand and Import Demand Models

We posit that the demand for import goods depends upon the relative price of imports and domestic income, expressed as follow:

$$IM_{CH(MY)} = IM_{CH(MY)}\left(RP_{CH(MY)}, Y_{CH}\right) \tag{1}$$

where $IM_{CH(MY)}$ represent China demand for imports from Malaysia, $RP_{CH(MY)}$ is the relative imported price of Malaysia goods to domestic price in China, and Y_{CH} refers to China real income. Letting $FX_{\frac{CH}{MY}}$ represents the nominal exchange rate, defined as the unit of yuan per ringgit, the relative price of imported goods can be expressed as:

$$RP_{CH(MY)} = FX_{\frac{CH}{MY}}\left(\frac{P_{MY(EX)}}{P_{CH}}\right) = FX_{\frac{CH}{MY}}\left(\frac{P_{MY}}{P_{CH}}\right)\left(\frac{P_{MY(EX)}}{P_{MY}}\right) = \left(\frac{1}{RFX_{\frac{CH}{MY}}}\right) RP_{MY(CH)} \tag{2}$$

where $RFX_{\frac{CH}{MY}} = \dfrac{P_{CH}}{FX_{\frac{CH}{MY}} P_{MY}}$

$P_{MY(EX)}$ is the Malaysian currency price of its exports, P_{CH} and P_{MY} are the price indexes of all goods in China and Malaysia, respectively, $RFX_{\frac{CH}{MY}}$ is the real exchange rate, defined as the relative price of yuan to Malaysian goods, i.e. $RFX_{\frac{CH}{MY}} = \dfrac{P_{CH}}{FX_{\frac{CH}{MY}} P_{MY}}$, and $RP_{MY(CH)}$ is the relative price of Malaysian exports to Malaysian produced goods. With real exchange rates, $RFX_{\frac{CH}{MY}}$ thus defined, an increase (decrease) in its value indicates a real devaluation (appreciation) of the Chinese yuan. Substituting $RP_{CH(MY)}$ from equation 1, we obtain:

$$IM_{CH(MY)} = IM_{CH(MY)}\left(\frac{RP_{MY(CH)}}{RFX_{\frac{CH}{MY}}}, Y_{CH}\right) \tag{3}$$

Similarly, the foreign country's demand for imports depends upon foreign income as domestic relative export prices:

$$IM_{MY(CH)} = IM_{MY(CH)}\left(RP_{CH(EX)} RFX_{\frac{CH}{MY}}, Y_{MY} \right) \tag{4}$$

Given that domestic exports are foreign imports and vice versa, that is,

$$EX_{CH(MY)} = IM_{MY(CH)} \text{ and } EX_{MY(CH)} = IM_{CH(MY)} \tag{5}$$

Thus, in our empirical model we express the balance of trade as a function of the real exchange rate and the levels of domestic and foreign incomes. Taking natural logarithm of both sides, the following model is obtained, with a stochastic term added to capture short-term departures from long run equilibrium:

$$\ln(EX_t) = a_{EX} + b_{EX} \ln(Y_{MY,t}) + c_{EX} RFX_t + \varepsilon_{EX,t} \tag{6}$$

$$\ln(IM_t) = a_{IM} + b_{IM} \ln(Y_{CH,t}) + c_{IM} RFX_t + \varepsilon_{IM,t} \tag{7}$$

where ln represents natural logarithm, and ε_t represents a white noise process. Given the definition of the real exchange rates, the absolute sum of c_{EX} and c_{IM} must exceed unity for the Marshall Lerner condition to holds, that is, if a real devaluation of the domestic currency improves the trade balance.

3.2 The ARDL Estimation Procedures

This paper employed the ARDL Bounds test advanced by Pesaran et al. (2001). Similar methods was adopted in recent studies of trade-exchange rates relationship for East Asia emerging markets, see for example, Tang (2004) on ASEAN-5, Tang (2005) on South Korea; Bahmani-Oskooee and Wang (2006) on China; Bahmani-Oskooee and Harvey (2006) on Malaysia. The approach of ARDL follows a 2-step procedure. The first is to identify the cointegration of the series involved applying a bound test on the following export and import demand functions:

$$\begin{aligned}\Delta \ln\left(EX_{CH,t}\right) = a_o &+ \sum_{i=1}^{12} b_i \Delta \ln\left(EX_{CH,t-i}\right) + \sum_{i=1}^{12} c_i \Delta \ln\left(Y_{MY,t-i}\right) + \sum_{i=1}^{12} d_i \Delta RFX_{t-i} \\ &+ \lambda_1 \ln\left(EX_{CH,t-1}\right) + \lambda_2 \ln\left(Y_{MY,t-1}\right) + \lambda_3 RFX_{t-1} + \kappa_1 Trend_t \\ &+ \kappa_2 D97_t + \kappa_3 DFIX_t + e_t\end{aligned} \tag{8}$$

$$\begin{aligned}\Delta \ln\left(IM_{CH,t}\right) = a_o &+ \sum_{i=1}^{12} b_i \Delta \ln\left(IM_{CH,t-i}\right) + \sum_{i=1}^{12} c_i \Delta \ln\left(Y_{CH,t-i}\right) + \sum_{i=1}^{12} d_i \Delta RFX_{t-i} \\ &+ \lambda_1 \ln\left(IM_{CH,t-1}\right) + \lambda_2 \ln\left(Y_{CH,t-1}\right) + \lambda_3 RFX_{t-1} + \kappa_1 Trend_t \\ &+ \kappa_2 D97_t + \kappa_3 DFIX_t + e_t\end{aligned} \tag{9}$$

Noted that in the above models, a time trend (*Trend*), and two structural breaks dummies, i.e. *D97* and *DFIX* are added to capture the impact of the 1997 Asian financial crisis and the regime of fixed exchange rates of Malaysia. The bound test involved the test of null hypothesis of non-existence of long run relationship, which is defined as:

$$H_0 : \lambda_1 = \lambda_2 = \lambda_3 = 0 \quad \text{against } H_A : \lambda_1 \neq 0, \lambda_2 \neq 0, \lambda_3 \neq 0 \tag{8a}$$

$$H_0 : \kappa_1 = \kappa_2 = \kappa_3 = 0 \quad \text{against } H_A : \kappa_1 \neq 0, \kappa_2 \neq 0, \kappa_3 \neq 0 \tag{9a}$$

The critical value bounds of the F-statistics for different numbers of regressors are tabulated in Pesaran *et al*. (1996). Cointegration is confirmed irrespective of whether the variables are *I*(1) or *I*(0) if the computed F-statistic falls outside the upper bound; and rejected if falls outside the lower bound. Nevertheless, if F-statistic falls within the critical value band, no conclusion can be drawn without knowledge of the time series properties of the variables.

Once cointegration is confirmed, the second step is to estimate the ARDL models:

$$\begin{aligned}\alpha(L,r)\ln\left(EX_{CH,t}\right) = {} & \beta(L,m)\ln\left(Y_{MY,t-m}\right) + \delta(L,n)RFX_{t-n} + d_1 Trend_t \\ &+ d_2 D97_t + d_3 DFIX_t + \mu_t\end{aligned} \tag{8b}$$

$$\begin{aligned}\alpha(L,s)\ln\left(IM_{CH,t}\right) = {} & \beta(L,p)\ln\left(Y_{CH,t-p}\right) + \delta(L,q)RFX_{t-q} + d_1 Trend_t \\ &+ d_2 D97_t + d_3 DFIX_t + \mu_t\end{aligned} \tag{9b}$$

where L is the back-shift operator such that $Ly_t = y_{t-1}$. The lag orders *r*, *m*, *n* for export demand model, and *s*, *p*, *q* for import demand model are selected based on AIC lag selection criterion. The long run coefficients for the response of dependent variable to a unit change in the independent variable can then be calculated based on Pesaran *et al*. (1996).

To trace the short run adjustments towards long run equilibrium, we can form an unrestricted error correction model to allow a more efficient estimate of the short-run coefficients (Stučka, 2004). This is given by:

$$\Delta y_t = -\phi(1,\hat{p})EC_{t-1} + \sum_{i=1}^{k}\beta_{i0}\Delta x_{it} + \delta^{'}\Delta w_t - \sum_{j=1}^{\hat{p}-1}\phi_j^{*}\Delta y_{t-j} - \sum_{i=1}^{k}\sum_{j=1}^{\hat{q}_i-1}\beta_{ij}^{*}\Delta x_{i,t-j} + \mu_t \qquad (10)$$

where $EC_t = y_t - \sum_{i=1}^{k}\hat{\theta}_i x_{it} - \hat{\psi}^{'} w_t$

Alternatively, the J-curve phenomenon can be graphically illustrated via the generalised impulse response function (IRF) analysis from the unrestricted vector autoregression (VAR) framework. VAR is capable for analyzing the dynamic impact of random disturbances on the system of variables. In our case, an impulse response function traces the effect of a one-time shock to one of the innovations of real exchange rates on current and future values of the export or import variables. If J-curve is present, countries are able to correct external imbalances via exchange rate devaluation after temporal adjustments of external competitiveness, or otherwise.

3.3 Data Description

Our analyses are all based on high frequency monthly data. The sample period spanned from January 1990 to January 2008, a period of trade expansion and major changes in currency regime for both China and Malaysia. Real exchange rates are compiled by having the nominal exchange rates (local currency/USD) adjusted for relative price changes proxy by consumer price index (CPI) series; whereas trade balance ratios are computed based on the export-import series. Then, domestic and foreign incomes are represented by the domestic industrial production index (IP) as GDP is not available for high frequency monthly observation. All trade series are sourced from the Direction of Trade Statistics compiled by International Monetary Fund while the CPI, IP and exchange rates are sourced from DataStream.

4. Empirical Results and Discussion

Descriptive statistics for all the series are reported in Table 1. All the time series basically are not univariate normal. To avoid spurious regression problem, the stationarity of all the series are examined using the Augmented Dickey Fuller (ADF) unit root test for both intercept and intercept plus trend models. The ADF results suggest that the data are mix of I(0) and I(1) series; where the export and import trade series and real yuan/ringgit exchange rate series are not stationary. The conventional Johensen-Juselius cointegration test is thereby inappropriate and the ARDL Bound test is applied.

Table 1: Summary of Descriptive Statistics and Unit Root Tests

	$\ln(EX_{CH})$	$\ln(IM_{CH})$	$\ln(Y_{MY})$	$\ln(Y_{CH})$	RFX
Mean	5.2574	5.8142	4.3959	4.7307	0.6447
Std. Dev.	1.1677	1.2378	0.3820	0.0512	0.2231
Maximum	7.4795	7.9654	4.9712	4.8629	0.9899
Minimum	3.0751	3.3438	3.5752	4.3682	0.0696
Jarque-Bera	10.0452***	13.6371***	13.5503***	1129.8340***	44.7863***
Unit Root 1	0.1548	0.2319	-4.3057***	-3.9077***	-2.5356
Unit Root 2	-1.8850	-2.4701	-4.3921***	-3.8125**	-2.0368

Note: Figures in the parenthesis are probability values. Std. Dev. denotes standard deviation. Asterisks ** and *** denote significance at the 5% and 1% levels, respectively. Normality refers to Jarque-Bera normality test, where rejection of hull hypothesis implies non-normal distribution. Test for stationarity test refers to Augmented Unit Root (ADF) test, where Unit Root 1 is the model with intercept only and Unit Root 2 is the model with intercept and time trend. Rejection of null hypothesis reflects stationarity.

Table 2: ARDL Bound Tests for Cointegration, 1990-2008

Panel A Export Demand	**Lag 1**	**Lag 2**	**Lag 3**	**Lag 4**	**Lag 5**	**Lag 6**	**Lag 7**	**Lag 8**	**Lag 9**	**Lag 10**	**Lag 11**	**Lag 12**
with intercept only	5.50***	4.04	3.20	2.30	2.14	2.28	2.20	2.27	1.90	1.82	2.21	1.80
with intercept and D97	6.05***	4.27	3.19	2.22	2.04	2.11	1.89	1.87	1.36	1.29	1.69	0.94
with intercept and DFix	6.77***	5.07	3.94	2.78	2.33	2.41	2.63	3.09	2.61	2.71	2.81	2.08
with intercept, D97 and DFix	8.57***	6.14***	4.21	3.00	2.39	2.39	2.55	2.95	2.38	2.42	2.52	1.66
with intercept and trend	13.14***	6.70***	4.21	3.12	3.09	2.46	2.22	2.11	2.41	1.67	1.74	1.58
with intercept, trend and D97	13.12***	6.70***	4.19	3.06	3.10	2.48	2.09	1.88	2.02	1.29	1.53	0.99
with intercept, trend and DFix	16.85***	9.29***	6.22***	4.63	4.42	3.59	3.47	3.53	4.16	2.95	2.44	2.35
with intercept, trend, D97 and DFix	18.22***	10.10***	6.37***	4.74	4.40	3.56	3.37	3.37	3.84	2.65	2.30	1.94
Panel B Import Demand	**Lag 1**	**Lag 2**	**Lag 3**	**Lag 4**	**Lag 5**	**Lag 6**	**Lag 7**	**Lag 8**	**Lag 9**	**Lag 10**	**Lag 11**	**Lag 12**
with intercept only	1.11	0.63	0.35	0.22	0.20	0.15	0.09	0.12	0.10	0.21	0.85	0.13
with intercept and D97	1.50	1.06	0.70	0.52	0.52	0.51	0.30	0.37	0.37	0.45	0.97	0.42
with intercept and DFix	1.46	1.02	0.85	0.82	0.64	0.85	0.77	0.95	0.87	1.21	4.34	2.04
with intercept, D97 and DFix	1.69	1.25	0.98	0.90	0.76	0.94	0.80	0.98	0.92	1.24	4.28	2.01
with intercept and trend	13.13***	6.82***	4.80	3.52	3.53	2.88	3.37	3.16	3.17	4.06	4.54	3.00
with intercept, trend and D97	14.72***	8.01***	5.64	4.18	4.10	3.36	3.56	3.29	3.29	4.16	4.75	3.12
with intercept, trend and DFix	12.82***	6.51***	4.53	3.35	3.24	2.77	3.21	3.13	3.12	4.16	7.04***	4.21
with intercept, trend, D97 and DFix	14.55***	7.76***	5.32	3.86	3.73	3.09	3.30	3.15	3.15	4.15	6.95***	4.08

Note: For model with intercept only with k=2, 95%, the bound is F(3.793, 4.855); for model with intercept and trend, the bound is F(4.903, 5.872). The asterisk *** denotes value exceeded upper bound.

In Table 2, the Bound test results up to lag 12 for the export and import models are reported in Panel A and Panel B, respectively. The critical value bounds of the F-statistics for different numbers of regressors (k) are tabulated in Pesaran *et al*. (1996). Two sets of critical values are provided, with an upper bound calculated on the basis that the variables are I*(0)* and , a lower bound on the basis that they are I*(1)*. The critical values for this bounds test are generated from an extensive set of stochastic simulations under differing assumptions regarding the appropriate inclusion of deterministic variables in the error correction model. Under the Bound test framework, the results confirm the existence of cointegrating relationship in both the export and import demand model for the lag length 1-2. The cointegration tie becomes less evident and indecisive when lag lengths are extended. However, too many lags tend to make the model less parsimonious and reduce the degrees of freedom and we hold by the lag 1-2 results. In addition, time trend play an important role in mitigating the cointegrating relationship, especially for the import demand model. Besides, we also cannot discount the exposure to the structural breaks dummy variables of the 1997 crisis and fixed exchange rate regime. In brief, the results imply that long run relationship exists among the variables in which the real exchange rates, domestic production and foreign incomes can be treated as the long run forcing variables for the explanation of the respective export and import demand model.

The MLC hypothesis can be testified based on the long-run elasticity estimation for both export and import demand models, as reported in Table 3. For the export demand model, a negative relationship between the bilateral China→Malaysia exports and the real exchange rates ($RFX_{CH/MY}$) is reported, with a long run elasticity of -0.8074. Though the result does not imply an export gain due to real devaluation, it neither supports the argument that Chinese undervalued exchange rate regime offers threat to the crowding out of other developing Asian economies at least for Malaysia.

Table 3: Estimates for long run elasticity

Panel A: Export Demand, $Log(EX_{CH})$			
	Coefficient	**Standard Error**	**P-value**
$Log(Y_{MY})$	1.8967*	1.1241	0.0930
RFX	-0.8074*	0.4514	0.0750
Intercept	-3.5657	4.0717	0.3820
Trend	0.0105*	0.0057	0.0670
*D*97	-0.1423	0.2007	0.4790
DFix	-0.3403***	0.0983	0.0010

Panel B: Import Demand, $Log(IM_{CH})$			
	Coefficient	**Standard Error**	**P- value**
$Log(Y_{CH})$	9.0327***	3.4113	0.0090
RFX	0.8498*	0.4601	0.0660
Intercept	-39.2570**	16.1978	0.0160
Trend	0.0169***	0.0016	0.0000
*D*97	0.0678	0.2390	0.7770
DFix	0.6033**	0.2648	0.0240

Note: Asterisks *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. The subsequent estimation of unrestricted error correction model (UECM) associated with the ARDL long run models is to conducted to gauge the extent of short run adjustments towards equilibrium. However, to conserve space, we do not report the UECM estimates but they are available upon request.

Next, the import demand model predicts that the $RFX_{CH/MY}$ positively related to IM_{CH} with a long run elasticity of 0.8498, contradicting the conventional view that depreciation of currency results in lesser import demand due to relative expensive import prices. In other words, currency devaluation ($RFX_{CH/MY}\uparrow$) will cause imports more expensive and hence deterioration in the Chinese terms of trade. As volume effects fail to be large enough to offset the price effect, it implies the loss of real national income and more units of exports have to be given to obtain a unit of imports. Additionally, devaluation could be inflationary as it raises the cost of imported intermediate inputs and this affects supply side of the economy.

On the other hand, the coefficients on domestic and foreign income show consistent signs to those predicted by economic theory where demand is the main determining factor of exports and imports. In our analysis, domestic ($Log(Y_{CH})$ =9.0327) and foreign incomes ($Log(Y_{MY})$ =1.8967) are positively related to both the import and export demand models. Hence, as far as domestic and foreign incomes are concerned, their influence on the China-Malaysia trading is demand driven. Nevertheless, the income effect of import demand is greater than that of export demand. In addition, the fixed exchange rate regime plays significant role in both models with expected signs.

If the absolute sum of the export and import elasticises that exceeds unity (1.6572) is considered, we cannot reject that MLC holds for the China-Malaysia trading linkage in the long run. This is consistent with the theory that real depreciation improves the trade expansion in the long run, with Malaysia cleaves to better gains. On the whole, the exchange rate regime and trading diversification within our analysis period have shown complementary than conflicting features to Malaysia, at least in the long run.

Another major concern in this study involves the verification of the J-curve phenomenon in the short- and moderate-term. When there is currency devaluation, we generally expect that the trade balance deteriorates at first, because the price change occurs quickly while trade quantities (volume) change more slowly. After a moderate time period, the volume effects become large enough to offset the price effect that the trade balance improves to present the so-called. For such purpose, we proceed to the generalised impulse response function (IRF) analysis that provides sufficient information to draw a conclusion on the existence of J-curve. An IRF traces the effect of a one-time shock to one of the innovations (exports or imports) on current and future values of the real exchanges rates from an unrestricted vector autoregression (VAR).

Figure 1: Response of China Export Series to Real Exchange Rate Shocks up to 12 Months

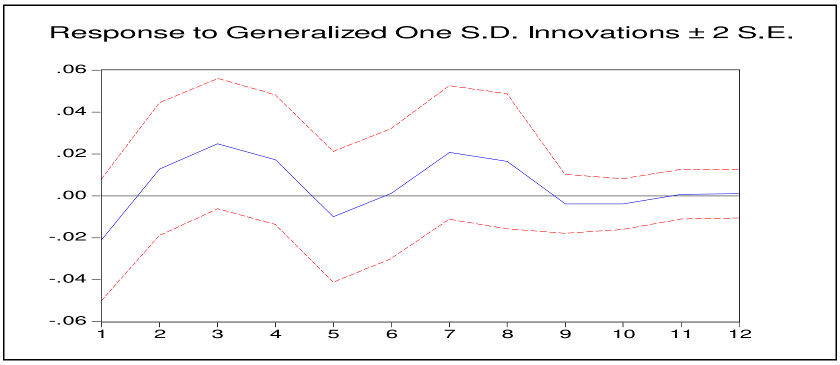
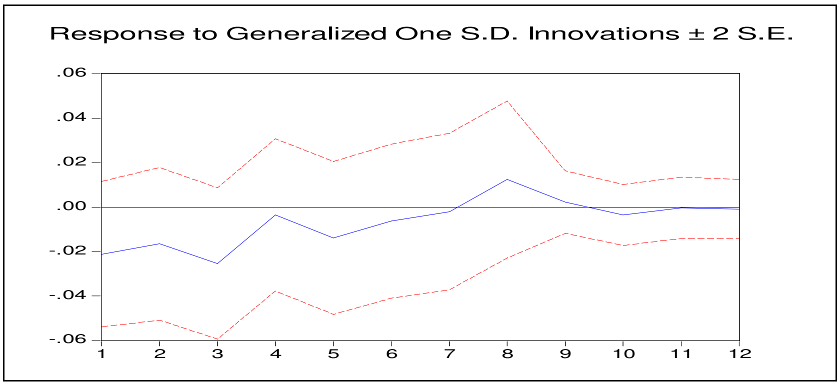


Figure 2: Response of China Import Series to Real Exchange Rate Shocks up to 12 Months



The generalised IRF of Chinese exports and imports series to unit shocks of real exchange rates (renminbi to ringgit) is shown in Figure 1 and Figure 2, respectively. Although the IRF reflect stationary response of both export and import series to generated unit shocks of real exchange rates, there is no clear pattern of J-curve for Chinese export series. The export series depicted a M-shape adjustment to real exchange shocks as 1% depreciation of renminbi brings to about 2% drop in China exports to Malaysia immediately, recovery after the second month, but further drop after the third month, pick up a little in the fifth month, but the impact die out slowly after ten months. As for the Chinese import series, the J-curve adjustment is more apparent but incomplete. A 1% real depreciation of renminbi leads to drop in China imports from Malaysia by a maximum of about 2.5% with a similar magnitude as the export initial adjustment, but the increase in China imports from Malaysia follows an increasing path thereafter and the impact also die out slowly after ten months. In other words, the volume effect fail to offset the price effect, implying that the unit value of imports has increased resulting in an increase in total value of imports against a constant or an insignificant change in the value of exports, over time.

5. Conclusion

The ARDL cointegration test confirms that the real exchange rates, domestic production and foreign incomes are significant in explaining the China-Malaysia bilateral export and import demands. Nevertheless, the real exchange reported inconsistent long run coefficients that devaluation may resulted in deteriorated terms of trade against Malaysia. Still, the sum of the price elasticity of demand for exports and imports is greater that unity to support for Marshall-Lerner condition that real depreciation accelerates trade expansion in the long run.

On the other hand, domestic and foreign incomes are significant and correctly signed, suggesting that the Chinese exports and imports are determined by demand side effects. Yet, the income effect of import demand is greater suggesting that import loses may be greater than export gains. Based on the generalized IRF analysis, there is no clear indication of J-curve phenomenon. Similar finding is observed that China's exports gains due to real devaluation against Malaysian ringgit are indecisive but import losses are more evident, and the impacts of depreciation gradually die out within a year. In brief, the shock adjustments are temporal and our study supports for the Chinese complementary role instead of conflicting (competing) features in the China-Malaysia bilateral trading.

References

Ahmed, S., C.J. Gust, S.B. Kamin, and J. Huntley. (2002) Are Depreciations as Contractionary as Devaluations? A Comparison of Selected Emerging and Industrial Economies. *International Finance Discussion Paper*, No. 737, Board of Governors of the Federal Reserve System, Washington, D.C.

Backus, D. K., Kehoe, P.J. and Kydland, F.E. (1994) Dynamics o f the Trade Balance and the Terms of Trade: the J-Curve? *American Economic Review*, 84, pp.84-103.

Bahmani-Oskooee, M. and H. Harvey (2006) How Sensitive Are Malaysia's Bilateral Trade Flows To Depreciation? *Applied Economics*, 38, pp.1279-1286.

Bahmani-Oskooee, M and Miteza (2003) Are Devaluations Expansionary or Contractionary? A Survey Article. *Economic Issues,* 8 (2), pp.1-28.

Bahmani-Oskooee, M and Y. Wang (2006) The J Curve: China Versus Her Trading Partners. *Bulletin of Economic Research*, 58 (4), pp.323-343.

Calvo, Guillermo A. and Carmen M. Reinhart (2001) When Capital Inflows Come to a Sudden Stop: Consequences and Policy Options. Working Paper

Dornbusch, R. and P. Krugman (1976) Flexible Exchange Rates in the Short Run. Brookings Papers on Economic Activity, 3.

Duarte, A and K. Holden (2001) The Business Cycle in the G7 Economies. Centre for International Banking, Economics and Finance, Working Paper, Liverpool John Moores University.

Eichengreen, B. and R. Hausmann (1999) Exchange Rates and Financial Fragility. NBER Working Papers 7418, National Bureau of Economic Research.

Marshall, A. (1923) Money, Credit and Commerce, London: Macmillan and Co.

Lerner, A. (1944) The Economics of Control, New York: Macmillan.

Marwah, K. and Klein, L.R. (1996) Estimation of J -curves: United States and Canada. *Canadian Journal of Economics*, 29, pp.523-539.

Pesaran, M.H., Y. Shin, and R.J. Smith (1996) Testing for the Existence of a Long-Run Relationship. DAE Working Paper No. 9622, Department of Applied Economics, University of Cambridge.

Pesaran, M.H., Shin, Y. and Smith, R. J. (2001) Bound Testing Approaches to the Analysis of Level Relationship. *Journal of Applied Econometrics*, 16, pp.289-326.

Rajan, R.S. and C-H Shen (2002) Are Crisis-Induced Devaluations Contractionary? Pacific Basin Working Paper Series 02-06, Federal Reserve Bank of San Francisco.

Stucka, T (2004) The Effects of Exchange Rate Change on the Trade Balance in Croatia. IMF Working Papers 04/65, International Monetary Fund.

Tang, T. C. (2004), A Reassessment of Aggregate Import Demand Function in the ASEAN-5: A Cointegration Analysis, *International Trade Journal*, 18(3), pp.239-268.

Tang, T. C. (2005) Are Malaysian Exports and Imports Cointegrated? A Comment. *Sunway Academic Journal* , 2, pp.101-107.