Malaysian Journal of Economic Studies 51(2): 141-150, 2014 ISSN 1511-4554

Assessing the Existence of the *J*-Curve Effect on Trade in Malaysian Forest Products

A.S. Abdul-Rahim*
H.O. Mohd-Shahwahid**
Universiti Putra Malaysia

Abstract: This paper examines the dynamic effect of the Malaysian exchange rate indices on bilateral trade of Malaysian forest products namely fibreboard, particle board and pulp for paper. Special attention is given to investigate the *J*-curve hypothesis: whether the trade balance for Malaysian forest products benefits from a decline in the value of Ringgit Malaysia (RM). We adopted the autoregressive distributed lag (ARDL) approach to cointegration to estimate the annual bilateral trade data of Malaysian forest products from 1970 to 2010 with various countries in the world. We found no evidence of the *J*-curve phenomenon for the trade in Malaysian forest products. The long-run analysis showed the exchange rate to be insignificant in influencing the trade balance of Malaysian forest products. This implies that there are no changes in the trade balance for fibreboard, particle board and pulp for paper trade, regardless of whether the Malaysian exchange rate depreciates or appreciates. However, income variables were found to be important factors in determining Malaysian trade, only in pulp for paper products.

Key words: Autoregressive distributed lag approach to cointegration, exchange rate, *J*-curve effect
JEL classification: C32, F14, L7

1. Introduction

The Malaysian fibreboard and particle board trade has been always experiencing a surplus (Table 1). Clearly, our exports of fibreboard and particle board have not been affected by the financial crisis. Table 1 reveals that the exports value of fibreboard and particle board experienced an increasing trend even after the financial crisis years. For example, the export value for fibreboard increased from USD152 million in year 1997 to USD229 billion in year 2000. Similarly, the export value for particle board increased from USD22 million in year 1997 to USD89 million in year 2000. However, Malaysia experienced a deficit in pulp for paper product trade.

From the 1980s till the present, the decreasing value of Ringgit Malaysia (RM) over time is shown in Figure 1. For example, from year 1980 to 1991, the real exchange rate indices depreciated gradually by approximately 3.84 per cent annually. Subsequently, it appreciated till year 1995 and then began to depreciate from 151.78 in year 1995 to

* Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia. Email: *abdrahim_as@upm.edu.my* or *abrahimabsamad@gmail.com* (Corresponding author)

** Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia. Email: *msho@upm.edu.my*

Table 1. Malaysian trade in forest products

Year	Fibreboard		Pulp for paper		Particle board	
1980	Export value (USD1,000)	Import value (USD1,000)	Export value (USD1,000)	Import value (USD1,000)	Export value (USD1,000)	Import value (USD1,000)
1970	16	783	0	338	0	0
1992	9,613	6,999	451	22,818	10,006	4,441
1997	152,761	7,442	0	30,774	22,255	11,031
2000	229,803	6,968	0	35,994	67,322	13,000
2005	284,667	23,549	6,532	105,065	61,426	26,511
2010	397,772	23,920	10,244	130,844	89,157	85,686

Source: FAOSTAT (2012)

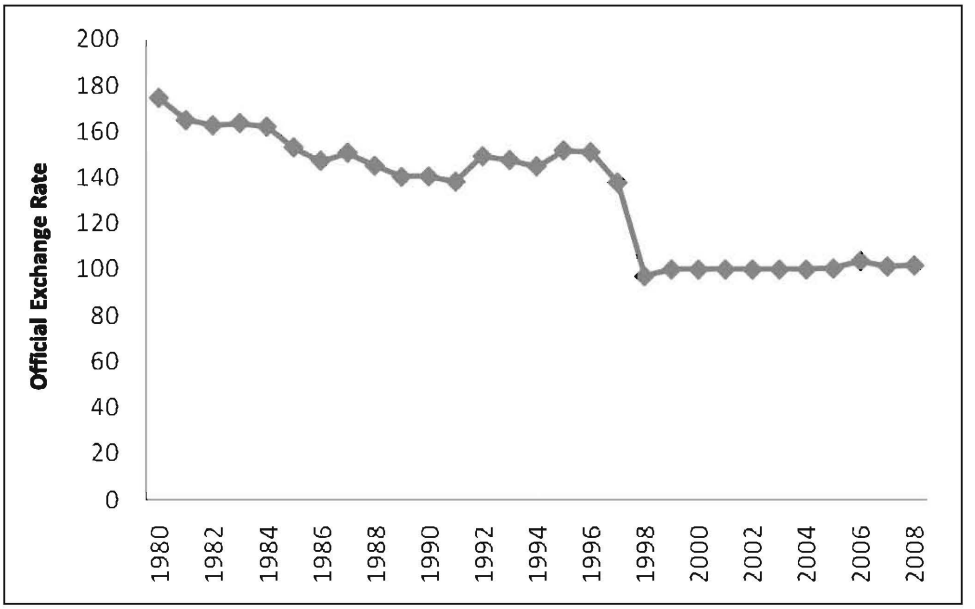

Figure 1. *Malaysian Official Exchange Rate, 1980-2008*
Source: International Financial Statistics

97.09 in year 1998. From year 1999 till the present, a stable pattern was seen till year 2004 as the exchange rate had been fixed (Figure 1). However, the highest rate of depreciation occurred from 1996 till 1998 due to the 97/98 Asian financial crisis.

The conventional wisdom of the effect of exchange rate changes on the trade balance is known as the *J*-curve effect. Assuming that the Marshall-Lerner (ML) condition – the sum of domestic and foreign price elasticity of demand (in absolute value) is greater than one – holds, it is possible that after depreciation, an initial deterioration in the trade balance occurs before an improvement is realised.

The hypothesis response of the trade balance over time resembles a titled *J* shape. The issue of the exchange rate devaluation on international trade has long been a major topic of study in international economics. According to Marshall (1923) and Lerner (1944), the demand elasticity for both exports and imports must exceed one, if the trade balance is to improve after a devaluation.

The *J*-curve effect is attributed to a lagged adjustment of quantities to changes in relative prices (Magee 1973). However Dorbusch and Krugman (1976) argue that there would be a temporal negative response of the trade balance to real depreciation in the short run, followed by larger export and import elasticity that would improve the trade balance. The *J*-curve phenomenon is mainly due to the price effect being overtaken by volume effect at an early stage.

The objective of this study is to examine the dynamic effects of exchange rate changes on the trade balance in Malaysian forest products. The empirical focus is on the characteristics of the short-run response (*J*-curve effect) and empirically determining whether the trade balance of the forest products benefits from a decline in value of the Malaysian Ringgit. For this purpose, we used trade data of forest products which were classified into three categories: fibreboard, particle board and pulp for paper. The ARDL model of short-run effects was used to examine the sign of the coefficients. The sign of the coefficients of the exchange rate determines the existence of the *J*-curve effect. That is, an initial negative sign followed by a positive one on the lag coefficients would be consistent with the *J*-curve phenomenon (Baek 2007).

2. Literature Review

International economics literature is replete with studies examining the *J*-curve effect. The evidence that emerges from the literature is rather mixed. Some studies have confirmed the presence of the *J*-curve phenomenon (for example, Bahmani-Oskooee 1985; Noland 1989), while others have completely denied its existence (for example, Rose and Yellen 1989; Rose 1991). However, the simultaneous occurrence of currency depreciation and recession during the Mexico crisis (1995) and the Asian Financial Crisis (1997/1998) appears to be contradicting the conventional view that devaluations are expansionary, as noted by Rajan and Shen (2001) and Ahmed *et al.* (2002).

On the other hand, in the literature on forest economics, most studies mainly focus on the impacts of exchange rate changes on trade volume or prices of forest products (Adams *et al*. 1986; Buongiorno and Uusivouri 1991; Sun and Zhang 2003; Bolkesjo and Buongiorno 2006). For example, Adams *et al.* (1986) used a structural econometric model (i.e., two-stage least squares) to analyse the role of exchange rate on the North American softwood lumber market. They concluded that an increase in exchange rate played a key role in the expansion of the Canadian share of the US market for the 1950-1983 period. Recently, Bolkesjo and Buongiorno (2006) adopted the vector autoregressive (VAR) model to examine the short and long run impacts of exchange rate changes on US trade in forest products. They found a change in the value of the USD to significantly affect forest products trade, both in the short and long runs.

Relatively little attention has been paid to investigate the impact of exchange rate changes on trade balance particularly on the trade of forest-based products. The earlier study by Kaiser (1984) investigated the effect of changes in exchange rate on the trade

balance of US forest products. He found the depreciation of the US dollar to be the most effective trade policy to increase US forest product exports and stabilise the US trade balance. A more recent study by Baek (2007) examined the dynamic effects of exchange rate changes on US trade balance in forest products. He found little evidence of the *J*-curve phenomenon for US forest products trade with Canada.

In the case of Malaysia, no study has been done to examine the *J*-curve effect particularly in the case of forest-based products. For example, Wilson (2001) examined total trade balance for Singapore and Malaysia and found no persuasive evidence for the *J*-curve effect. Later, Duasa (2007) examined the short- and long-run relationships between Malaysian total trade balance, real exchange rates, income and money supply. Nevertheless, no attention has been made to examine the *J*-curve effect on trade in Malaysian forest products. Hence, this is the first attempt to examine the existence of the *J*-curve effect on trade in Malaysian forest products with the rest of the world.

3. Methodology and Data

To construct the ARDL model, we adopted the trade balance model of forest products derived by Baek (2007) by relying on the theoretical framework developed by Rose and Yellen (1989). The demand for imported forest commodities at home and in a foreign country is specified as follows:

$$M^d = M^d (P_m, Y) \text{ and } M^{d*} = M^d (P^*_m, Y^*), \quad (1)$$

where M^d (M^{d*}) is the import quantity of the home (foreign) country; P_m (P^*_m) is the relative price of imported forest goods to domestically produced goods in the home (foreign) country; Y (Y^*) is the real income of the home (foreign) country. Similarly, the supply for exported forest commodities at home and in a foreign country is stated as follows:

$$X^s = X^s (P_x, Y^*) \text{ and } X^{s*} = (P^*_x, Y), \quad (2)$$

where X^s (X^{s*}) is the export volume of the home (foreign) country; and P_x (P) is the home (foreign) country's relative price of export goods. The market equilibrium conditions for exports and imports are then:

$$M^d = X^{s*} \text{ and } M^{d*} = X^s. \quad (3)$$

Assuming that the law of one price prevails in a perfectly competitive market, we can write $P = \text{ER}.P^*$, where ER is the exchange rate between the domestic and the foreign currency. Given Eqs. (1) – (3), the trade balance (TB) is defined as the difference between value of exports and value of imports and can be specified as follows:

$$\text{TB} = (X^s Y^*, \text{ER}) - M^d (Y, \text{ER}). \quad (4)$$

Finally, in the reduce form, Eq. (4) shows the following relationship:

$$\text{TB} = \text{TB}(Y, Y^*, \text{ER}). \quad (5)$$

To illustrate the ARDL modeling approach, we then expressed Eq. (6) in log-linear form as follows:

$$\ln \text{TB}_t = \alpha + \beta_1 \ln Y_t^M + \beta_2 \ln Y_t^W + \beta_3 \ln \text{ER}_t + \varepsilon_t \quad (6)$$

In this study, trade balance (*TB*) is defined as (X_t/M_t), where X_t is the value of exports and M_t is the value of imports. Hence, we examined these trade balance measurements to observe the *J*-curve effect.

With regard to the signs of the coefficients in Eq. (6), it is expected that $\beta_1 > 0$ *and* $\beta_2 < 0$, since a rise in Malaysian (world) income would lead to an increase in Malaysian imports (exports), thereby deteriorating (improving) the trade balance. As for the effect of exchange rate, it is expected that $\beta_3 > 0$, since the depreciation of the RM increases exports and decreases imports, thereby improving the trade balance.

The ARDL approach involves estimating the error correction version of the ARDL model for variables under estimation (Pesaran *et al.* 2001). From Eq. (6), the ARDL model of interest then can be written as follows:

$$\begin{aligned}\Delta \ln \mathrm{TB}_t = {} & \alpha_0 + \sum_{i=1}^{p} \varepsilon_i \, \Delta \ln \mathrm{TB}_{t-i} + \sum_{i=1}^{p} \phi_i \, \Delta \ln Y^M_{t-1} \\ & + \sum_{i=1}^{p} \varphi_i \, \Delta \ln Y^W_{t-1} + \sum_{i-1}^{p} \gamma_i \, \Delta \ln \mathrm{ER}_{t-i} \\ & + \lambda_1 \ln \mathrm{TB}_{t-1} + \lambda_2 \ln Y^M_{t-1} + \lambda_2 \ln Y^W_{t-1} \\ & + \lambda_4 \ln \mathrm{ER}_{t-1} + \mu_t ,\end{aligned} \tag{7}$$

where Δ is the difference operator; p is lag order; and μ_t is assumed serially uncorrelated. Eq. (7) is the error correction version related to the ARDL, since the terms with the summation sign (Σ) represents the short run dynamics between the trade balance and its main determinants (i.e., *J*-curve effect) while the second part (term with λ 's) corresponds with the long run (cointegration) relationship. The null hypothesis in Eq. (7) is defined as H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$, indicating the non-existence of a long-run relationship.

The ARDL model has certain econometric advantages in comparison to the standard cointegration methods (for example, Engle and Granger 1987; Johansen 1995). First, the ARDL model is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually cointegrated. In other words, this approach does not require the same order of integration among variables and pre-testing for unit roots. Second, the ARDL model applies a sufficient number of lags to capture the data generating process in a dynamic framework of a general-to-specific modeling. Third, an error-correction model (ECM) can be derived from the ARDL model through a simple linear transformation. The ECM captures the short run dynamics while restricting the long run equilibrium. The ARDL thus estimates the short and long run parameters of the model simultaneously. Finally, for small sample size, the ARDL model is more robust and performs better compared to the standard cointegration methods (Pesaran and Shin 1999).

The total value of imports and exports for Malaysian plywood were obtained from the Food Agriculture Organisation (FAO) CD-ROM provided by the Forestry Department of Peninsular Malaysia (FDPM). All of the data are on an annual time series basis from 1970 to 2010. The Malaysian trade balance (TB_t) is then expressed as mentioned above.

The Malaysia real income and average world real income (Y^M_t *and* Y^W_t) are measured as real GDP index (2000 = 100) and are taken from the International Financial Statistics

(IFS) published by the International Monetary Fund (IMF). The Malaysia – United States (US) real exchange rate (ER_t) was gathered by the Economic Research Service (ERS) in the US Department of Agriculture (USDA) and ε_t is the error term. Since the exchange rate is expressed as Ringgit Malaysia (RM) per USD, a decline in exchange rate indicates a real depreciation of the USD. We have selected RM per USD exchange rate because all Malaysian imports and exports of forest products are typically quoted in USD. Finally, it is noted that since all variables are converted into natural logarithms, the estimated coefficients can be interpreted as elasticity.

4. Empirical Results

The ARDL approach in this analysis involved several steps (see Pesaran and Pesaran 1997) for more details), while the data analysis involved using econometric software, MICROFIT 4. We excluded the unit root test as the ARDL model is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually cointegrated. Hence, in the first step, the determinant of forest products trade balance in Malaysia namely fibreboard, particle board and pulp for paper was estimated. The second step estimated the long run coefficient of forest products trade balance and lastly the short run error correction representation for the selected ARDL model of Malaysian forest products trade balance was estimated.

The methods adopted in the past literature mainly concentrated on the cases in which the underlying variables were integrated in order I(1) form (Pesaran *et al*. 2001). The ARDL approach has some advantages over the other approaches. First, the series used does not have to be I(1) (Pesaran and Pesaran 1997). Second, even with small samples, a more efficient cointegration relationship can be determined (Ghatak and Siddiki 2001). Finally, according to Laurenceson and Chai (2003) the ARDL approach overcomes the problems resulting from non-stationary time series data that lead to spurious regression coefficients that are biased towards zero.

The next step was to test the cointegration of this model using bounds test in ARDL model. The results indicate evidence of a cointegrating relationship for Malaysian forest products trade balance given that the computed *F*-statistic is greater than the upper bound critical value at 1, 5 and 10 per cent level of significance for particle board, fibreboard and pulp for paper respectively (Table 2).

Subsequently, we employed the model to estimate the coefficient of the long run relationships. More specifically, the long run model can be estimated from the reduced-form solution of Eq. (7), when the first-differenced variables jointly equal to zero. The lag lengths were determined by Schwartz Bayesian Criteria (SBC) criterion following the suggestion from Pesaran and Pesaran (1997). The long run test results (Table 3) reveal that the coefficient of exchange rate and the income variable signs of the Malaysian forest products trade balance model are as expected. Most are insignificant except for income variables (Malaysian income and average world income) in pulp for paper trade balance. More specifically, the Malaysian forest products trade balance has a positive long run relationship in real exchange rate with the various countries in the world. This implies that the depreciation of the RM indeed improves the trade balance in the long run. In addition, the Malaysian forest products trade balance has a positive long-run

Table 2. Cointegration results of bounds test for equation of trade balance in Malaysian forest products

Variables: lnTB lnY^M lnY^W lnER			
Trade balance		Computed *F*-statistic	
Fibreboard		4.47**	
Particle board		6.55***	
Pulp for paper		3.60*	
		Critical value	
		Lower-bound	Upper-bound
	10% significant level	2.618	3.532
	5% significant level	3.164	4.194
	1% significant level	4.428	5.816

Note: The bounds critical values are obtained from Narayan (2005); Appendix: Critical values for the bounds test; Case II: restricted intercept and no trend (k = 3), ** Significant at 5 %.

Table 3. Estimated long run coefficients equation for trade balance in Malaysian forest products

Trade balance (TB_t)	Exchange rate (ER)	Malaysian income (Y_t^M)	Average world income (Y_t^W)	Constant
Fibreboard	5.51(0.59)	29.61(0.32)	-74.01(0.41)	122.7(0.45)
Particle board	0.01(0.99)	1.36(0.82)	-5.96(0.74)	-12. 07(0.71)
Pulp for paper	0.42(0.12)	1.61**(0.03)	-6.92***(0.00)	14.36***(0.00)

Note: ***Significant at 1 %, **Significant at 5 %, *Significant at 10 %. Figures in parentheses are *p*-values.

relationship with real domestic income and a negative relationship with average world income. This suggests that a rise in real Malaysian (world) income leads to an increase in the domestic (world) demand for world import (domestic exports), thereby worsening (improving) the trade deficit.

Finally, the error correction model [denoted by ecm (-1) in Table 4] is estimated by the ARDL approach to capture the short-run dynamic effects of depreciation on the trade balance or the *J*-curve effect. The coefficient of the exchange rate sign determines the existence of the *J*-curve effect. Thus, an initially negative sign followed by a positive sign on the lag coefficients would be consistent with the *J*-curve phenomenon. However, the results show inconsistencies in signs to reflect the existence of the *J*-curve effect for forest products trade balance in the short-run analysis. Most of the signs show a positive relationship even at the current year exchange rate except for particle board (Table 4). It is statistically insignificant for most of the parameters used except for pulp for paper trade balance. This indicates that the exchange rate for the current year, lagged by one year and two years, are significant at 1, 10 and 5 per cent respectively in the pulp for

Table 4. Estimated short run coefficient of exchange rate and error correction term based on Autoregressive Distributed Lag (ARDL) Model.

Trade balance	ΔER_t	ΔER_{t-1}	ΔER_{t-2}	ΔER_{t-3}	ΔER_{t-4}	ecm(-1)
Fibreboard	6.01	-7.41	8.74	2.74	1.61	-0.50***
	(0.86)	(0.75)	(0.76)	(0.92)	(0.93)	(0.00)
Particle board	-0.19	-1.36	-0.13	0.49	0.40	-0.30**
	(0.91)	(0.58)	(0.91)	(0.72)	(0.66)	(0.02)
Pulp for paper	2.45***	-2.63*	1.32**	0.26	-0.64	-0.41***
	(0.00)	(0.01)	(0.03)	(0.65)	(0.12)	(0.00)

Note: ER_t is the Malaysian official exchange rate. ecm(-1) refers to the error correction term. Δ indicates the first difference of a variable. ** denotes significance at 5%. Figures in parentheses are *p*-values.

paper trade balance. The results therefore indicate that there is no *J*-curve effect for the Malaysian forest products trade balance with the world market.

Notice that the error correction term is found to be negative and statistically significant for fibreboard, particle board and pulp for paper at the 1, 5 and 10 per cent level respectively. These confirm the existence of a long run relationship between dependent and independent variables. The finding further justifies the cointegration of the ARDL model of the Malaysian forest products trade with the world market.

5. Conclusions

This paper examines the hypothesis of the *J*-curve for the Malaysia-world trade in Malaysian forest products trade for fibreboard, particle board and pulp for paper. For this purpose, the ARDL approach of cointegration was used to estimate annual Malaysian trade balance of forest products from year 1970 to 2010. We did not find any evidence of the *J*-curve phenomenon for trade balance in forest products. However, there was a significant cointegration of exchange rate and trade balance in pulp for paper in the short-run analysis. This implies that in the short run, Malaysia will increase (decrease) the trade balance for its pulp for paper trade, if the exchange rate depreciates (appreciates). Similarly, our results showed that the nation's real income and average world real income are significant factors influencing the Malaysian pulp for paper trade in the long run. It is also found that an insignificant causality between exchange rate and the remaining forest products trade (fibreboard and particle board) in the short run as well as in the long run exists. This implies that the exchange rate does not play an important role in determining fibreboard and particle board trade balance for both the short and long runs.

The results for fibreboard and particle board trade were consistent with the those of Buongiorno *et al.* (1998) and Baek (2007). For example, Baek (2007) showed that a real depreciation of the USD may not be useful in increasing exports of forest products in the short run. However, this result is in contrast with Bolkesjo and Buongiorno (2006) who found a substantial short-run effect of exchange rate on forest products trade. This finding further reveals that the increasing Malaysian forest products (fibreboard and

particle board) trade surplus and pulp for paper trade deficit with the decline in the value of the RM during the period of study cannot be explained by the *J*-curve effect. This is because the sign of the estimated coefficient of the exchange rate failed to determine the existence of the *J*-curve effect. As mentioned in the introduction part, for the *J*-curve to exist, it should start with the negative sign followed by a positive one on the lag coefficients. However, we found no persuasive evidence of the *J*-curve. Hence, we failed to accept the assumption of Marshall-Lerner (ML) condition that after a depreciation, an initial deterioration in the trade balance occurs before an improvement is realised.

On the other hand, the results in this study found that the exchange rate plays a vital role in determining the short-run behaviour of Malaysian forest products trade balance with the world market in the case of pulp for paper only. This suggests that any fluctuation of the exchange rate of the RM against the USD would affect the international trade of pulp for paper products.

Acknowledgement

This research was supported by the Research University Grant Schemes (RUGS) Session 5 2011, (UPM/700-1/2/RUGS) provided by Universiti Putra Malaysia (UPM). The authors take this opportunity to acknowledge support received from Noraida bt Wahob for field assistance. Cooperation from the Forestry Department of Peninsular Malaysia and Malaysian Timber Industry Board (MTIB) is highly appreciated.

References

Adams, D.M., B.A. McCarl and L.H. Homayounfarrakh. 1986. The role of exchange rates in Canadian-US lumber trade. *Forest Science* **32(4):** 973-988.

Ahmed, S., C.J. Gust, S.B. Kamin and J. Huntley. 2002. Are depreciations as contractionary as devaluation? 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.

Baek, J. 2007. The J-curve effect and the US-Canada forest products trade. *Journal of Forest Economics* **13**: 245-258.

Bahmani-Oskooee, M. 1985. Devaluation and the J-curve: some evidence from LDCs. *Review of Economics and Statistics* **67**: 500-504.

Bolkesjo, T.F. and J. Buongiorno. 2006. Short- and long-run exchange rate effects on forest product trade: evidence from panel data. *Journal of Forest Economics* **11**: 205-221.

Buongiorno, J. and J. Uusivouri. 1991. Pass-through of exchange rate on prices of forest product exports from the United States to Europe and Japan. *Forest Science* **37(3):** 931-948.

Buongiorno, J., J.P. Chavas and J. Uusivouri. 1998. Exchange rates, Canadian lumber imports and US prices: a time series analysis. *Canadian Journal of Forest Research* **18**: 1587-1594.

Dornbusch, R., P. Krugman and R.N. Cooper. 1976. Flexible exchange rates in the short run. *Brookings Papers on Economics Activity*, 537-584.

Duasa, J. 2007. Determinants of Malaysian trade balance: An ARDL bound testing approach. *Global Economics Review* **36(1):** 89-102.

Engle, R.F. and C.W.J. Granger. 1987. Cointegration and error correction representation: estimation and testing. *Econometrica* **55**: 251-276.

FAOSTAT. 2012. The Food and Agricultural Organisation Corporate Statistical Database. Retrieved 15 July from *http://faostat.fao.org*.

Ghatak, S. and J. Siddiki. 2001. The use of ARDL approach in estimating virtual exchange rates in India. *Journal of Applied Statistics* **28**: 573-583.

Johansen, S. 1995. *Likelihood-based Inference in Cointegrated Vector Autoregressive Models*. Oxford: Oxford University Press.

Kaiser, H.F. 1984. Floating exchange rate and the US forest product trade balance. *Forest Product Journal* **34**: 55-58.

Laurenceson, J. and J.C.H. Chai. 2003. *Financial Reform and Economic Development in China*. UK: Edward Elgar, Cheltenham.

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

Magee, S.P. 1973. Currency contracts, pass-through and J-curve. *Brooking Papers of Economic Activity* **1**: 303-323.

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

Narayan, P.K. 2005. The saving and investment nexus for China: evidence from cointegration tests. *Applied Economics* **37(17):** 1979-1990.

Noland, M. 1989. Japanese trade elasticities and the J-curve. *Review of Economics and Statistics* **71**: 175-179.

Pesaran, M.H. and B. Pesaran. 1997. *Working with Microfit* 4.0. Cambridge: Camfit Data Ltd.

Pesaran, M.H. and Y. Shin. 1999. An autoregressive distributed lag modeling approach to cointegration analysis. In *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*, ed. S. Strom. Cambridge, UK (Chapter 11): Cambridge University Press.

Pesaran, M.H., Y. Shin and R.J. Smith. 2001. Bound testing approaches to the analysis of level relationships. *Journal of Applied Econometrics* **16**: 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.

Rose, A.K. 1991. The role of exchange rate in a popular model of international trade: Does the Marshall-Lerner condition hold? *Journal of International Economics* **30**: 301-316.

Rose, A.K. and J.L. Yellen. 1989. Is there a J-curve? *Journal of Monetary Economics* **24**: 53-68.

Sun, C. and D. Zhang. 2003. The effects of exchange rate volatility on US forest commodities exports. *Forest Science* **49(5):** 807-814.

Wilson, P. 2001. Exchange rates and the trade balance for dynamic Asian economies-Does the J-curve exist for Singapore, Malaysia and Korea? *Open Economies Review* **12**: 389-413.