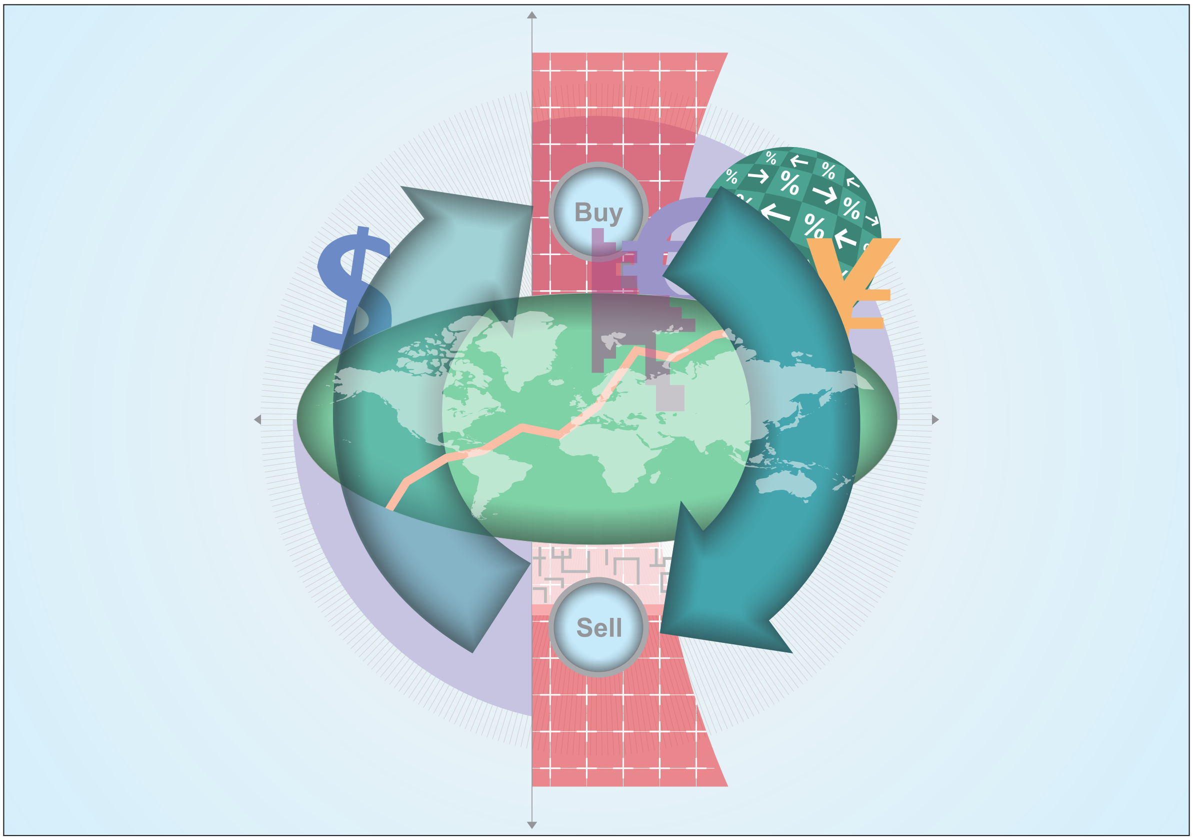

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The J-curve: Evidence from Commodity Trade Between Malaysia and Japan

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ABSTRACT

In an effort to distinguish the short-run response (the J-curve effect) of currency depreciation from its long-run response on trade balance, the current study employs a model which relates the trade balance to the exchange rate directly along with other variables. This study considers 67 industries (2-digit and 3-digit SITC classifications) and investigates the short-run (J-curve pattern) and the long-run effects of the real depreciation ringgit/yen on the trade balance of each industry. Using annual import and export data over the period of 1974-2009, this study employs the bounds testing approach to cointegration and error-correction modelling. The empirical results indicate that whilst depreciation of ringgit has short-run significant effects on the trade balance in majority of the industries, the short-run effects translate into the favorable long-run effects only in 24 of the 67 industries. However, in only 22 industries empirical support for the J-Curve is established.

Key words: J-curve, bounds testing approach, industry data, Malaysia, Japan

INTRODUCTION

The long run behavior of Japan's yen against U.S. dollar has been that of significant fluctuation and continuous appreciation during past four decades. Japanese yen has appreciated against the U.S. dollar from 303 yen per U.S. dollar in 1972 to 88 yen per U.S. dollar in 2010[1]. Does this strong appreciation imply that the Japanese trading partners may expect to improve their trade balances by currency depreciation?

After the advent of the floating exchange rate system in 1973, one of the interesting areas of international economics research is assessing of currency depreciation effect on trade volume[2]. If there is a significant impact of exchange rate depreciation on trade balance, this supports the hypothesis that devaluation will improve the net exports when the sum of demand elasticities of imports and exports exceed unity (Marshall-Lerner condition). Many empirical studies assessed the impact of currency depreciation on the trade balance. Earlier studies have followed the indirect approach, Marshall-Lerner condition (ML, hereafter) by estimating price elasticities of imports and exports to induct the effects of devaluation on the trade balance (Bahmani-Oskooee and Bolhasani, 2008). In an attempt to distinguish the short-run response of currency depreciation from its long- run response on trade balance, researchers passed on traditional way, ML condition which

[1]Source: World Bank World Development Indicators (WDI) online database
[2]Other studies which have assessed the effect of exchange rate on other macroeconomic variables are: Ali Khan *et al*. (2002), Gokalp Goktolga (2006) and Hadiwibowo (2010)

is considered as a long-run condition and tried to formulate a model which relates the trade balance to the exchange rate directly along with other variables. Indeed, this occurred when researchers tried to assess the validity of the J-curve hypothesis (Bahmani-Oskooee and Wang, 2008).

The J-curve phenomenon which was introduced by Magee (1973) describes that in the short-run the effect on the trade balance of a devaluation or currency depreciation is due to time lags in the adjustment process; it first deteriorates the trade balance and then improves it later, resembling a J-curve pattern. Initially, due to the price effect, the increased value of imports would dominate the increased volume of exports but in the long run gradually the volume effect takes over and outweighs the effect of price resulting in an improvement in balance of trade. Bahmani-Oskooee and Ratha (2004) and Bahmani-Oskooee and Hegerty (2010) provided a comprehensive review of the literature and covered both groups of studies[3]. Since this study is about Malaysia we concentrate on the literatures that have tested the J-curve phenomenon in the case of Malaysia-Japan as follows.

Baharumshah (2001) and Onofowora (2003) relied on a cointegrating Vector Error Correction Model (VECM) and disaggregated data at a bilateral level. Contrary to Baharumshah (2001) who found no J-curve effect of the bilateral trade balances of Malaysia and Thailand with the United States (US) and Japan, Onofowora (2003) supported the J-curve effect for Malaysia's trade balance with Japan and with the US. In a similar study, Wilson (2001) disaggregated data to examine the relationship between real exchange rate and real trade balance for bilateral trade between Singapore, Korea and Malaysia with the US and Japan. Employing general Autoregressive Distributed Lag model, he found no persuasive evidence for J-curve in the case of Malaysia. Bahmani-Oskooee and Harvey (2010) applied bounds testing approach to cointegration and error-correction modelling and used bilateral disaggregated data. They examined the short-run and long-run effects of currency devaluation on trade balance with her 14 largest trading partners (including Japan). Their results also do not support the J-curve effect in the case of Malaysia-Japan.

The review mentioned above implies that there is not much support for a significant effect of currency depreciation or devaluation in the case of Malaysia-Japan trade. This may be due to the lack of significant relation between Malaysia-Japan bilateral trade balance and the real depreciation ringgit/yen in a number of industries but not all industries. To identify which industries react to currency depreciation, in this study we disaggregated the trade data between Malaysia and Japan by industries. More precisely, we considered 67 industries (2-digit and 3-digit SITC classifications) and tried to assess the short-run and the long-run effects of the real depreciation ringgit/yen on the trade balance of each industry over the period of 1974- 2009.

MATERIAL AND METHODS

The trade balance model employed in this study is adopted from Bahmani-Oskooee and Bolhasani (2008). The long-run model takes the following form:

$$\ln TB_{i,t} = \alpha + \beta \ln Y_{M,t} + \gamma \ln Y_{J,t} + \phi \ln REX_t + \upsilon_t \tag{1}$$

where, TB_i is a measure of the trade balance of commodity i defined as the ratio of Malaysia's exports of commodity i to Japan over her imports of the same commodity from Japan. Y_M is the real

[3]The recent example of the J-curve studies at industry level include Bahmani-Oskooee *et al.* (2005), Bahmani-Oskooee and Wang (2008), Bahmani-Oskooee and Hajilee (2009) and Bahmani-Oskooee and Mitra (2009)

income of Malaysia and since an increase in Malaysian economy growth is expected to increase Malaysia's imports of commodity i, an estimate of β is expected to be negative. In the same way, an estimate of γ is expected to be positive if an increase in the real income of Japan denoted by Y_J encourages an increase in Malaysia's export of commodity i to Japan. However, if the increase in real income is due to an increase in production of import substitute goods the coefficient of real income of Malaysia could be positive and the coefficient of real income of Japan could be negative in sign (Bahmani-Oskooee, 1986). Finally, REX is the real ringgit-yen rate and as the Appendix indicates, it is defined in a way that an increase reflects an appreciation of the yen or a depreciation of ringgit. If real depreciation of ringgit is to increase the Malaysia's export of commodity i, hence improve the trade balance of industry i, an estimate of φ is expected to be positive. Equation 1 basically estimates the long-run relationship among the variables. In order to infer the J-curve effect which occurs in the short-run, it is necessary to include the short-run dynamics into Eq. 1. To this end, following Pesaran *et al.* (2001) we express Eq. 1 in an error-correction modeling format as in Eq. 2:

$$\begin{aligned}\Delta \ln TB_{i,t} &= \alpha + \sum_{k=1}^{n_1}\eta_k \Delta \ln TB_{i,t-k} + \sum_{k=0}^{n_2}\beta_k \Delta \ln Y_{M,t-k} + \sum_{k=0}^{n_3}\gamma_k \Delta \ln Y_{J,t-k} + \sum_{k=0}^{n_4}\phi_k \Delta \ln REX_{t-k} + \delta_1 \ln TB_{i,t-1} \\ &+ \delta_2 \ln Y_{M,t-1} + \delta_3 \ln Y_{J,t-1} + \delta_4 \ln REX_{t-1} + \upsilon_t \end{aligned} \qquad (2)$$

One of the advantages of the bounds testing approach is assessing the short-run as well as the long-run effects of the independent variables on the dependent variable at the same time[4]. Specifically in Eq. 2, the short-run effect (the J-curve effect) of currency depreciation is inferred by the sign and significance of φ_k and the long-run effect is inferred by the size of whichδ_4 is normalized on δ_1[5].

RESULTS AND DISCUSSION

Annual data over the period 1974-2009 were used to estimate the basic model outlined by Eq. 2 for the trade balance of 67 industries that trade between Malaysia and Japan. Data definition and sources of variables are provided in the Appendix. Many empirical studies like Bahmani-Oskooee and Goswami (2004) and Bahmani-Oskooee and Ardalani (2006) have demonstrated that the F-test will be sensitive to the number of lags. Therefore, following Bahmani-Oskooee and Gelan (2006) a maximum of four lags are imposed on each of the first different variable and the optimum lags are selected by using the Akaike Information Criterion (AIC). The results of the optimum models are reported in Table 1. For brevity, this study reports only the short-run effects of the real exchange rate along with the long-run.

From the short-run results of coefficient estimates, for the real exchange rate variable there coefficient estimates in Table 1 are a total of 46 industries that there is at least one significant short-run coefficient at the 5% level of significance. This implies the real depreciation of ringgit as short-run effects in most of the industries[6]. These short-run effects subscribe to the traditional definition of the J-curve in nine industries in which initially negative coefficients for the real

[4]The main advantage of ARDL approach is that, it does not require establishing the order of integration of the variables (unit-root test)

[5]Note that various methods of cointegration also used by Penm *et al.* (2003) Javed and Sahinoz (2005), Krishnasamy *et al.* (2006), Gulzar *et al.* (2007), Ghorbani and Motallebi (2009) and Adeniyi *et al.* (2011)

[6]Industries 032, 231, 42, 655 and 892 are significant at the 10% level

Table 1: Estimated short-run and long-run coefficients of the bilateral trade balance models using AIC lag selection

		Short-run coefficient estimates				Long-run coefficient estimates			
Code	Indnstry name	Δ $lnREX_t$	Δ $lnREX_{t-1}$	Δ lnREXt-2	Δ $lnREX_{t-3}$	Constant	ln Y_M	ln Y_J	ln REX
03	Fish and fish preparations	0.2 (0.42)	0.13 (0.22)	-0.73 (-1.35)		-16.42 (-0.20)	-2.37 (-1.11)	3.004 (.68)	2.63 (2.81)
031	Fish, fresh and simply preserved	0.08 (-1.67)	-0.75 (-1.67)	-1.67 (-4.1)	-0.59 (-1.5)	159.62 (5.78)	0.27 (0.57)	-5.42 (-4.64)	1.6 (2.98)
032	Fish, in airtight containers, nes and fish preptns	0.76 (.84)	0.12 (.08)	-1.95 (-1.79)		-258.6 (-0.52)	-20.96 (-.96)	30.03 (.85)	25.94 (1.42)
05	Fruit and vegetables	0.41 (1.26)				-249.70 (-1.87)	-5.04 (-2.12)	13.20 (2.08)	2.04 (1.30)
053	Fruit, preserved and frnit preparations	1.76 (2.3)	-1.73 (-1.95)			-103.65 (-4.83)	-4.39 (-12.58)	7.62 (8.03)	1.53 (4.15)
055	Vegetables, roots and tubers pres or prepared nes	1.64 (2.13)	-1.99 (-2.22)	-1.61 (-1.87)		161.17 (3.41)	.99 (1.69)	-5.74 (-3.11)	5.54 (6.19)
07	Coffee, tea, cocoa, spices and manufacs	1.44 (2.86)	0.88 (1.53)	0.25 (0.44)	1.11 (2.15)	15.53 (0.46)	0.57 (1.51)	-0.91 (-0.72)	-0.31 (-0.46)
075	Spices	2.30 (2.55)	-4.14 (-3.29)	-4.93 (-4.13)	-3.27 (-2.84)	98.12 (3.71)	-0.27 (-0.78)	-2.67 (-2.56)	2.22 (4.28)
231	Crude rubber iucl.synthetic and reclaimed	0.80 (1.64)	0.49 (0.95)	0.67 (1.25)	1.003 (2.00)	-87.99 (-2.07)	-4.16 (-5.27)	6.36 (3.55)	-1.95 (-2.05)
24	Wood, lumber and cork	0.22 (0.28)				15.52 (0.28)	-5.6 (-6.68)	4.55 (1.88)	0.22 (0.28)
26	Textile fibres, not manufactured and waste	1.26 (1.56)	2.59 (2.38)	2.57 (3.09)		84.38 (0.43)	5.82 (0.76)	-8.30 (-0.63)	-1.65 (-0.89)
27	Crude fertilizers and crude minerals, nes	0.21 (0.47)				-164.17 (-2.33)	-1.58 (-1.84)	6.66 (2.55)	-2.81 (-1.61)
28	Metalliferous ores and metal scrap	0.60 (0.55)	-0.78 (-0.64)	3.46 (2.78)		-78.35 (-0.52)	-2.08 (-1.18)	4.18 (0.76)	-2.85 (-0.87)
283	Ores and concentrates of non ferrons base metals	-0.12 (-0.10)	3.96 (3.12)	4.66 (3.4)	2.12 (1.74)	354.14 (.98)	7.40 (0.64)	-19.08 (-.86)	-3.15 (-1.03)
284	Non ferrons metal scrap	2.28 (2.47)				233.17 (2.02)	2.09 (1.19)	-9.29 (-1.81)	3.85 (2.29)
29	Crude animal and vegetable materials, nes	-0.28 (-0.29)	-1.98 (-1.07)			-138.12 (-0.97)	4.96 (2.83)	0.44 (0.08)	-0.47 (-0.20)
292	Crude vegetable materials, nes	-0.37 (-0.37)	2.06 (2.24)			-122.23 (-.98)	5.22 (3.41)	-0.33 (-0.07)	-0.56 (-0.27)
33	Petroleum and petroleum products	-0.26 (-0.80)				72.4 (2.34)	0.46 (0.93)	-2.94 (-2.13)	-1.40 (-3.06)
332	Petroleum products	0.70 (0.70)	3.46 (3.21)			-239.01 (-2.98)	-1.32 (-1.25)	9.15 (2.67)	-2.49 (-1.53)
42	Fixed vegetable oils and fats	0.58 (0.61)	1.84 (1.95)			-73.61 (-0.84)	0.40 (0.33)	2.11 (0.58)	-1.5 (-0.99)
422	Other fixed vegetable oils	0.01 (0.01)				-25.2 (-0.20)	-0.14 (-0.08)	1.11 (0.21)	0.02 (0.01)
51	Chemical elements and compounds	0.09 (0.19)	0.93 (1.57)			-398.91 (-7.98)	-3.34 (-4.54)	16.28 (7.37)	-2.58 (-2.8)
513	Inorg.chemicals elems,oxides,halogen salts	0.19 (0.20)	-2.37 (-2.28)	-1.26 (-1.28)		215.35 (2.75)	3.75 (3.96)	-10.30 (-3.35)	3.43 (2.26)
55	Perfume materials, toilet and cleansing preptions	1.64 (2.13)	-1.98 (-2.22)	-1.61 (-1.87)		161.15 (3.41)	0.99 (1.69)	-5.74 (-3.11)	5.54 (6.19)
599	Chemical materials and products, nes	0.82 (1.42)	1.71 (2.98)	0.72 (1.26)		-23.99 (-0.41)	0.75 (0.76)	0.03 (0.01)	-1.12 (-1.03)
62	Rubber manufactures, nes	0.89 (3.55)	0.79 (2.79)	0.78 (2.83)		-22.83 (-1.37)	-0.12 (-0.49)	0.93 (1.34)	0.71 (2.3)
621	Materials of rubber	0.44 (1.02)	0.51 (1.22)			-102.93 (-4.14)	-1.92 (-5.26)	5.16 (4.78)	-0.17 (-0.45)
629	Articles of rubber, nes	0.83 (2.99)	0.63 (2.01)	0.82 (2.69)		-17.73 (-0.96)	0.13 (0.48)	0.55 (0.72)	0.83 (2.45)
63	Wood and cork manufactures excluding furniture	1.76 (3.84)				185.48 (5.93)	4.36 (9.01)	-9.77 (-7.06)	1.76 (3.84)
631	Veneers, plywood boards and other wood,worked, nes	0.44 (0.45)				-34.84 (-.39)	0.54 (.45)	1.02 (0.27)	0.61 (0.46)
64	Paper, paperboard and manufactures thereof	1.06 (1.64)	-3.15 (-4.32)			110.06 (2.52)	3.46 (4.89)	-6.24 (-3.23)	5.11 (6.84)
642	Articles of paper, pulp, paperboard	0.43 (0.44)	-3.82 (-3.19)	-0.26 (-.26)	-1.32 (-1.43)	172.19 (1.71)	4.9 (4.43)	-9.76 (-2.39)	3.38 (1.90)
65	Textile yarn, fabrics, made up articles, etc.	0.68 (1.66)	-1.39 (-2.63)			106.39 (2.83)	3.79 (6.35)	-6.66 (-4.07)	2.4 (3.68)
652	Cotton fabrics,woven ex.narrow or spec.fabrics	1.14 (2.46)				181.20 (2.78)	2.34 (2.01)	-7.99 (-2.63)	2.72 (2.66)
655	Special textile fabrics and related products	1.71 (1.77)				336.34 (0.49)	9.1 (0.93)	-21.46 (-0.63)	-14.73 (-0.38)

Table 1: Continued

Code	Indnstry name	Short-run coefficient estimates				Long-run coefficient estimates			
		Δ lnREX$_t$	Δ lnREX$_{t-1}$	Δ lnREX$_{t-2}$	Δ lnREX$_{t-3}$	Constant	ln Y$_M$	ln Y$_J$	ln REX
66	Non metallic mineral manufactures, nes	0.87 (1.24)	0.16 (0.20)	1.98 (2.72)		-147.17 (-2.01)	1.09 (0.94)	3.98 (1.26)	-0.94 (-0.74)
67	Iron and steel	1.9 (1.53)				-19.73 (-0.36)	0.89 (1.11)	-0.11 (-0.04)	1.31 (1.58)
68	Non ferrous metals	-0.06 (-0.14)	0.64 (1.63)			103.72 (2.18)	0.37 (0.40)	-4.18 (-1.85)	-2.2 (-2.95)
682	Copper	-0.48 (-0.54)	-1.44 (-1.37)	-2.77 (-2.86)		-45.07 (-1.47)	0.95 (1.83)	0.72 (0.53)	0.13 (0.24)
687	Tin	2.29 (2.61)	1.19 (1.51)			-333.23 (-2.01)	-14.03 (-2.82)	23.55 (2.36)	-1.34 (-1.07)
69	Manufactures of metal, nes	0.48 (0.65)	1.23 (2.22)			1138.2 (.28)	16.94 (.34)	-52.60 (-0.29)	11.21 (0.33)
692	Metal containers for storage and transport	3.67 (3.61)				176.80 (2.57)	5.43 (5.16)	-10.24 (-3.35)	4.56 (4.72)
695	Tools for use in the hand or in machines	1.49 (1.55)	1.75 (1.65)	1.20 (1.16)		-250.61 (-6.19)	-.81 (-1.36)	8.99 (5.34)	-1.75 (-2.32)
698	Manufactures of metal, nes	0.51 (1.29)				41.25 (.743)	3.48 (4.38)	-4.35 (-1.80)	0.96 (1.18)
71	Machinery, other than electric	-0.10 (-0.22)				-353.44 (-1.71)	-5.51 (-1.21)	16.92 (1.55)	-0.32 (-0.20)
718	Machines for special industries	-2.16 (-2.72)	3.06 (3.43)			-302.22 (-3.3)	-2.21 (-1.36)	11.56 (2.75)	-6.07 (-2.65)
719	Machinery and appliances non electrical parts	0.33 (0.40)				-157.45 (-0.74)	-1.91 (-0.5)	7.10 (0.68)	0.74 (0.53)
72	Electrical machinery, apparatus and appliances	0.28 (1.77)	-0.29 (-2.04)			-17.64 (-1.68)	0.52 (3.59)	0.18 (0.4)	0.41 (2.52)
722	Electric power machinery and switchgear	0.83 (1.84)	-1.65 (-3.08)			71.74 (1.55)	1.57 (2.56)	-3.58 (-1.77)	2.47 (4.87)
724	Telecommunications apparatus	3.26 (3.98)	-4.41 (-4.05)	-2.03 (-2.48)	-1.21 (-1.85)	202.31 (7.95)	4.24 (11.84)	-9.91 (-9.49)	5.96(12.83)
729	Other electrical machinery and apparatns	-0.27 (-1.67)				6.89 (0.61)	0.64 (3.08)	-.86 (-1.62)	-0.27 (-1.67)
73	Transport equipment	-1.60 (-2.24)	4.57 (4.51)	0.37 (0.4)	1.83 (2.12)	-318.96 (-12.43)	-1.21 (-3.48)	11.45 (11.27)	-3.67 (-7.18)
732	Road motor vehicles	-0.41 (-0.35)	4.28 (3.9)			-361.01 (-8.69)	-0.89 (-1.36)	12.64 (6.88)	-3.34 (-4.30)
734	Aircraft	-2.66 (-1.34)	7.07 (2.93)	3.5 (1.64)	3.42 (1.88)	-299.69 (-7.45)	-3.81 (-6.85)	13.14 (8.42)	-4.09 (-4.89)
821	Furniture	1.44 (1.44)				-261.55 (-0.41)	-7.87 (-.58)	17.08 (.51)	9.87 (1.45)
84	Clothing	2.31 (4.52)	-3.27 (-2.67)	-1.83 (-2.25)	-0.88 (-1.59)	67.93 (3.85)	1.30 (4.91)	-2.87 (-3.90)	3.99(11.86)
841	Clothing except fur clothing	2.35 (4.60)	-3.29 (-2.70)	-1.84 (-2.26)	-0.87 (-1.57)	69.91 (3.97)	1.33 (5.03)	-2.97 (-4.03)	4.01(11.91)
86	Scientif and control instrum, photogr gds, clocks	-0.11 (-0.37)				1108.7 (0.57)	12.22 (.66)	-48.44 (-0.59)	1.48 (0.38)
861	Scientific,medical,optical,meas./contr.instrum.	-0.49 (-1.42)	-0.73 (-1.87)	-0.65 (-1.75)	-0.73 (-2.19)	-72.80 (-0.31)	-1.19 (-0.31)	4.04 (0.36)	4.72 (1.77)
89	Miscellaneous manufactured articles, nes	1.50 (2.61)				170.3 (3.67)	3.38 (3.80)	-8.36 (-3.78)	3.70 (5.23)
891	Musical instruments,sound recorders and parts	-0.01 (-0.02)	4.04 (2.98)	-2.45 (-2.12)		-226.46 (-0.54)	-1.66 (-0.26)	9.35 (0.49)	1.17 (0.21)
892	Printed matter	-0.10 (-0.2)	0.19 (0.27)	0.99 (1.36)	1.19 (1.75)	26.35 (1.60)	2.48 (9.28)	-3.15 (-4.6)	0.04 (0.12)
893	Articles of artificial plastic materials nes	0.67 (1.27)	-2.40 (-2.81)	-2.51 (-3.55)	-1.66 (-2.63)	86.69 (3.32)	1.60 (5.39)	-4.05 (-4.08)	2.82 (5.63)
894	Perambulators, toys, games and sporting goods	0.1 (0.25)				-188.05 (-5.09)	-1.13 (-2.19)	7.45 (4.65)	0.12 (0.25)
897	Jewellery and gold/silver smiths wares	-2.85 (-2.70)				-26.95 (-0.37)	-1.18 (-1.07)	1.56 (0.49)	-2.85 (-2.7)
899	Manufactured articles, nes	-0.05 (-0.16)				-39.78(-1.48)	1.32 (4.15)	0.25 (0.22)	-0.06 (-0.16)
931	Special transactions not classd.accord.to kind	-0.33 (-0.46)	2.20 (2.54)	0.87 (1.09)		-1.23 (-.02)	1.16 (1.43)	-1.16 (-0.53)	-1.19 (-1.28)

Numbers inside parentheses are the t-ratios

Table 2: Diagnostic statistics for trade balance models

Code	Industry name	Optimal lag[a]	F-stat.	ECM	R-Bar-Squared	LM	Reset	CUSUM	CUSUMQ
03	Fish and fish preparations	(3,0,4,3)	9.72	-.52 (-2.02)	0.90	8.04	2.85	S	S
031	Fish, fresh and simply preserved	(2,2,4,4)	10.75	-.94 (-5.73)	0.90	7.83	0.60	S	S
032	Fish,in airtight containers,nes and fish preptns.	(3,1,4,3)	2.83	-1.95 (-1.79)	0.98	0.98	1.20	S	S
05	Fruit and vegetables	(1,0,0,0)	1.76	-.20 (-2.86)	0.93	1.96	7.36	S	S
053	Fruit,preserved and fruit preparations	(3,4,4,2)	2.53	-2.25 (-5.19)	0.80	1.30	0.19	S	S
055	Vegetables, roots and tubers pres or prepared nes	(0,4,0,3)	5.16	-1.00 (-)	0.86	1.24	0.26	S	S
07	Coffee, tea, cocoa, spices and manufacs.	(0,0,0,4)	4.92	-1.00 (-)	0.23	0.34	0.19	S	S
075	Spices	(4,4,4,4)	2.72	-2.67 (-4.87)	0.48	6.92	0.03	S	S
231	Crude rubber incl.synthetic and reclaimed	(3,0,1,4)	1.75	-.74 (-2.54)	0.98	0.74	1.10	S	S
24	Wood, lumber and cork	(0,1,1,0)	8.43	-1.00 (-)	0.91	0.82	2.37	S	S
26	Textile fibres, not manufactured, and waste	(4,3,3,3)	2.93	-.39 (-1.75)	0.86	0.29	3.45	S	S
27	Crude fertilizers and crude minerals, nes	(2,4,0,1)	3.10	-.41 (-2.32)	0.77	0.75	1.46	S	S
28	Metalliferous ores and metal scrap	(1,4,0,3)	2.21	-.48 (-2.57)	0.82	0.02	0.55	S	S
283	Ores and concentrates of non ferrons base metals	(4,4,3,4)	4.64	-.46 (-1.40)	0.95	3.78	6.36	S	S
284	Non ferrons metal scrap	1,0,1,0)	2.18	-.6 (-3.95)	0.43	5.25	0.07	S	S
29	Crude animal and vegetable materials, nes	(1,0,1,2)	2.71	-.43 (-3.30)	0.93	0.005	0.003	S	S
292	Crude vegetable materials, nes	(1,0,1,2)	2.44	-.51 (-3.65)	0.93	0.01	0.03	S	S
33	Petroleum and petroleum products	(1,0,1,1)	5.05	-.65 (-5.70)	0.97	1.32	0.08	S	S
332	Petroleum products	(4,4,4,2)	1.69	-1.28 (-2.67)	0.80	0.80	9.10	S	S
42	Fixed vegetable oils and fats	(3,2,0,2)	3.36	-.61 (-3.82)	0.56	0.97	1.43	S	S
422	Other fixed vegetable oils	(1,2,0,0)	2.74	-.55 (-3.42)	0.43	3.04	2.87	S	S
51	Chemical elements and compounds	(4,4,2,2)	1.21	-.87 (-3.01)	0.97	0.06	8.83	S	S
513	Inorg.chemicals elems.,oxides,halogen salts	(2,3,2,3)	2.68	-.88 (-3.57)	0.75	0.08	0.17	S	S
55	Perfume materials, toilet and cleansing preptions	(0,4,0,3)	5.16	-1.00 (-)	0.85	1.24	0.26	S	S
599	Chemical materials and products,nes	(2,0,4,3)	2.13	-.65 (-3.32)	0.68	0.11	1.52	S	S
62	Rubber manufactures, nes	(0,4,2,3)	2.28	-1.00 (-)	0.82	0.11	6.21	S	S
621	Materials of rubber	(4,0,3,2)	4.05	-1.23 (-4.98)	0.70	0.0008	2.40	S	S
629	Articles of rubber,nes	(0,4,2,3)	2.81	-1.00 (-)	0.82	0.23	0.92	S	S
63	Wood and cork manufactures excluding furniture	(0,1,1,0)	4.24	-1.00 (-)	0.81	0.028	1.74	S	S
631	Veneers,plywood boards and other wood,worked,nes	(1,0,0,0)	1.88	-0.72 (-3.99)	0.39	0.35	0.04	S	S
64	Paper, paperboard and manufactures thereof	(0,4,4,2)	2.80	-1.00 (-)	0.96	0.009	6.31	S	S
642	Articles of paper, pulp, paperboard	(4,1,4,4)	2.88	-1.12 (-5.15)	0.90	0.25	9.53	U	U
65	Textile yarn, fabrics, made up articles, etc.	(3,3,4,2)	3.10	-0.72 (-4.31)	0.97	0.79	1.64	S	S
652	Cotton fabrics,woven ex.narrow or spec.fabrics	(1,4,3,0)	4.05	-0.42 (-2.93)	0.83	1.46	0.06	S	S
655	Special textile fabrics and related products	(4,1,1,0)	5.35	0.12 (0.39)	0.88	1.68	1.30	U	U
66	Non metallic mineral manufactures, nes	(2,3,2,3)	5.18	-0.65 (-5.06)	0.89	0.14	0.002	S	S
67	Iron and steel	(4,3,3,0)	8.59	-1.45 (-5.12)	0.63	7.47	2.84	S	S
68	Non ferrons metals	(1,4,0,2)	3.62	-0.50 (-2.83)	0.98	0.77	0.85	S	S

Table 2: Continued

Code	Industry name	Optimal lag[a]	F-stat.	ECM	R-Bar-Squared	LM	Reset	CUSUM	CUSUMQ
682	Copper	(2,4,4,3)	0.90	-1.97 (-6.99)	0.91	0.27	13.81	S	S
s687	Tin	(4,3,3,2)	3.76	0.65 (1.26)	0.98	3.45	7.02	S	S
69	Manufactures of metal, nes	(4,4,3,2)	2.06	0.11 (0.25)	0.97	0.55	11.74	S	S
692	Metal containers for storage and transport	(2,1,1,0)	3.14	-0.80 (-5.67)	0.90	2.26	10.15	S	S
695	Tools for use in the hand or in machines	(2,4,2,3)	7.51	-1.48 (-6.38)	0.82	6.70	18.02	S	S
698	Manufactures of metal, nes	(1,1,1,0)	7.29	-0.53 (-3.56)	0.93	2.58	5.44	S	S
71	Machinery, other than electric	(4,2,3,0)	1.64	-0.32 (-2.21)	0.97	0.12	1.92	S	S
718	Machines for special industries	(4,4,4,2)	3.17	-0.65 (-2.41)	0.92	6.27	0.01	S	U
719	Machinery and appliances non electrical parts	(4,2,3,0)	3.25	-0.44 (-1.14)	0.80	0.07	3.09	S	S
72	Electrical machinery, apparatus and appliances	(4,2,2,2)	2.86	-0.9 (-4.35)	0.96	1.35	11.05	S	U
722	Electric power machinery and switchgear	(4,4,0,2)	3.27	-0.83 (-4.10)	0.94	2.53	7.96	S	S
724	Telecommunications apparatus	(3,4,1,4)	1.62	-1.64 (-6.82)	0.97	0.04	13.62	S	S
729	Other electrical machinery and apparatus	(0,2,4,0)	3.38	-1.00 (-)	0.63	2.53	3.09	S	S
73	Transport equipment	(3,4,1,4)	2.99	-1.59 (-5.92)	0.92	3.18	3.18	S	S
732	Road motor vehicles	(4,4,3,2)	1.43	-1.65 (-6.80)	0.91	1.64	3.59	S	S
734	Aircraft	(4,4,1,4)	2.38	-2.76 (-5.11)	0.46	0.04	1.50	S	S
821	Furniture	(1,1,0,0)	2.44	-0.15 (-1.26)	0.89	0.82	0.34	S	U
84	Clothing	(3,4,4,4)	3.59	-1.78 (-5.02)	0.97	0.69	13.38	S	S
841	Clothing except fur clothing	(3,4,4,4)	3.70	-1.79 (-5.07)	0.97	0.68	13.59	S	S
86	Scientif and control instrum, photogr gds, clocks	(3,0,4,0)	6.10	0.07 (0.51)	0.94	1.60	0.13	S	U
861	Scientific,medical,optical,meas./contr.iustrum.	(2,4,2,4)	3.84	-0.19 (-1.54)	0.95	1.44	0.005	S	S
89	Miscellaneous manufactured articles, nes	(1,4,4,1)	3.12	-0.71 (-3.48)	0.94	0.74	6.70	S	S
891	Musical instruments,sound recorders and parts	(1,4,4,3)	3.22	-0.34 (-2.15)	0.94	2.51	9.33	S	S
892	Printed matter	(3,4,4,4)	1.79	-2.39 (-4.82)	0.76	2.26	3.82	S	S
893	Articles of artificial plastic materials nes	(4,0,0,4)	4.85	-1.4 (-4.63)	0.91	2.03	8.06	S	S
894	Perambulators,toys,games and sporting goods	(2,0,1,0)	4.59	-0.78 (-7.76)	0.95	0.44	1.41	S	S
897	Jewellery and gold/silver smiths wares	(0,1,1,0)	7.94	-1.00 (-)	0.55	1.40	0.41	S	S
899	Manufactured articles, nes	(4,1,0,0)	12.34	-0.91 (-8.45)	0.93	7.04	0.32	S	S
931	Special transactions not classd.accord.to kind	(0,4,4,3)	6.13	-1.00 (-)	0.86	0.79	0.006	S	U

[a]3,0,4,3 indicates that the AIC selected 3 lags for $\Delta\ln TB$, 0 lag for $\Delta\ln Y_M$, 4 lags for $\Delta\ln Y_J$ and 3 lags for $\Delta\ln REX$. Numbers inside the parentheses are the t-ratios. The upper bound critical value of the F-test for cointegration is 3.52 at the 10% level of significance (Pesaran *et al*., 2001, Table CI, p. 300). LM is the Lagrange multiplier test of residual serial correlation and RESET is Ramsey's test for function form. It is distributed as χ^2 (1). Both statistics are distributed as χ^2 (1) and the critical value is 3.84 at the 5% level of significance. Stable: "S" and unstable: "U"

exchange rate are followed by positive ones. These industries are coded 283, 292, 68, 718, 73, 732,734, 892 and 931. However, following Rose and Yellen (1989) this study relies on the new definition of the J-curve and defines it as a negative short-run effect combined with a positive long-run effect. The long-run estimates indicate that the real exchange rate carries a positive and significant coefficient in 24 industries that are coded 03, 031, 053, 055, 075, 284, 513, 55, 62, 629, 63, 64, 642, 65, 652, 692, 72, 722, 724, 84, 841, 861, 89 and 893. In 22 of these industries there is at least one negative short-run coefficient attached to the exchange rate; comparing with old definition of the J-curve, the advanced one receives more support. So, disaggregation of the trade data by industries at least identifies 24 industries which benefit from real depreciation of the ringgit. The majority of these 24 industries are non-durable goods and this is not in line with Burda and Gerlach (1992) who argued that durable goods are relatively more sensitive to exchange rate changes than nondurable commodities. Concentrating on the long-run results, it is clear that the real exchange rate carries a significant coefficient in 34 industries.

The long-run results will only be meaningful if variables are cointegrated. To this end we shift to Table 2 and the results of the F-test along with other diagnostics. From the F-test results we collect that in 27 cases the calculated F statistic at optimum lags is greater than its upper bound critical value of 3.52 (reported at the bottom of Table 2), supporting cointegration. Kramers *et al.* (1992) argued that the significant ECM_{t-1} is a more efficient way of establishing cointegration. Concentrating on those industries in which the cointegration is not supported by the F-test, there is a strong support of cointegration in almost all cases based on a negative and significant coefficient of ECM_{t-1}.

The Lagrange Multiplier (LM) test for serial correlation and Ramsey's RESET test for functional misspecification are also reported in Table 2. Both statistics are distributed as χ^2 with one degree of freedom. Given the critical value of 3.84 at the 5% level of significance for LM and RESET test, it appears that our models pass these tests in majority of the cases. To establish the stability of short-run and long-run coefficient estimates we apply the CUSUM and CUSUMSQ tests for the residuals of each optimal model (Bahmani-Oskooee and Bolhasani, 2008). Stable coefficients are identified by "S" and unstable ones by "U". As can be seen, estimated coefficients are stable in majority of trade balance models. Finally, the size of the adjusted R^2 indicates a good fit in most models.

CONCLUSION

From the previous studies that tested the short-run and the long-run effects of real depreciation of ringgit on Malaysian trade balance, there is not much support for a significant effect of currency depreciation in the case of Malaysia-Japan trade. The lack of a significant relationship between two variables could be due to aggregation bias. In order to eliminate this problem, this study considered 67 industries (2-digit and 3-digit SITC classifications) and investigated the short-run (J-curve pattern) and the long-run effects of the real depreciation ringgit/yen on the trade balance of each industry. Using annual import and export data over the period of 1974-2009, this study employs the bounds testing approach to cointegration and error-correction modeling. The empirical results indicate that whilst depreciation of ringgit has short-run significant effects on the trade balance in majority of the industries, the short-run effects last into the favorable long-run affects only in 24 of 67 industries. However, only in 22 industries empirical support for the J-Curve was established.

APPENDIX

Data Definition and Sources

Annually data over the 1974- 2009 period are used to carry out the empirical analysis. The data come from the following sources:

- World Bank
- International Financial Statistics of the IMF

TB_i : It is a measure of the trade balance of commodity i defined as the ratio of Malaysia's exports of commodity i to Japan over her imports of the same commodity from Japan. The exports and imports data come from source (a)

Y_M : The real GDP of Malaysia, source (a)

Y_J : The real GDP of Japan, source (a)

REX Real bilateral exchange rate defined as:

$$REX = \frac{P_J \times NEX}{P_M}$$

where, NEX is the nominal bilateral exchange rate (end of period) defined as the number of Malaysian ringgit per Japan's yen (from source b). P_J is the Japan's price level measured by CPI (from source b) and P_M is the Malaysia's price level, also measured by CPI, again from source (b).

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