Asian Economic and Financial Review, 2015, 5(1):12-32

Asian Economic and Financial Review
ISSN(e): 2222-6737/ISSN(p): 2305-2147

journal homepage: http://www.aessweb.com/journals/5002

KOREA'S INPAYMENTS AND OUTPAYMENTS WITH THE REST OF THE WORLD: IS THERE ROOM FOR CURRENCY MANIPULATION?

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ABSTRACT

In estimating the well-known Marshall-Lerner condition, researchers have used trade volume data between one country and rest of the world. To reduce aggregation bias in these studies, it is proposed to use trade data at commodity level. However, due to lack of import and export prices to obtain trade volume at commodity level, researchers have used trade values instead. These value models are used to assess the direct impact of currency depreciation on inpayments and outpayments of an industry. In this paper we assess the sensitivity of inpayments and outayments of 148 Korean industries that trade with the rest of the world. We were able to identify 20 Korean exporting industries and 38 importing industries that will benefit from won depreciation in the long run.

Keywords: Inpayments, Outpayments, Korean industries, Bounds testing.

JEL Classification: F31.

1. INTRODUCTION

There are now several methods by which one could investigate the impact of currency depreciation or devaluation on a country's trade balance. The first and the oldest method is an indirect approach of estimating import and export price elasticities and testing whether these elsticities add up to more than unity. If they do, the so called Marshall-Lerner condition is said to be satisfied and currency depreciation is predicted to have a favorable effect on the trade balance. Since import and export price indexes are available at the aggregate level between one country and rest of the world, almost all studies that have tested the Marshall-Lerner condition have used aggregate trade flows of

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DOI: 10.18488/journal.aefr/2015.5.1/102.1.12.32
ISSN(e): 2222-6737/ISSN(p): 2305-2147

one country with the rest of the world. The findings are mixed at best and have been reviewed and summarized by Bahmani-Oskooee *et al.* (2013).[1]

The Marshall-Lerner condition, however, is a long-run condition. There is now abundant evidence that due to adjustment lags, short-run effects of currency depreciation could be different than its long-run effects. The concept of the J-curve introduced by Magee (1973) and tested empirically using regression analysis by Bahmani-Oskooee (1985) basically provides justification and explanation as to why currency depreciation worsens the trade balance first and improves it later. Backus *et al.* (1994) support the same pattern using correlation rather than regression analysis. They postulate that while the correlation coefficients between current exchange rate and future trade balances tend to be positive, the same coefficients between current exchange rate and past values of the trade balance are negative. Since plot of these correlation coefficients against the lags and leads of the trade balance resembles the letter S, they label their finding the S-curve. Since testing either curve requires data on the trade flows and the exchange rates, they have been tested at aggregate, bilateral and industry levels. Bahmani-Oskooee and Hegerty (2010) provide the most comprehensive review of the literature.[2]

There is yet the fourth approach that could be used to assess the impact of currency depreciation on the trade balance. This direct approach is indeed a close substitute to estimating the Marshall-Lerner condition which is said to be an indirect approach. To estimate the Marshall-Lerner condition one has to specify import and export demand models in which real imports or real exports are regressed on relative import and export prices in addition to scale variables. Under this fourth method, real imports and exports are replaced by their nominal values and relative prices are replaced by the real exchange rate. Once such models are estimated, they are used to assess the impact of currency depreciation directly on a country's outpayments and inpayments. The literature on this fourth approach is very poor and includes only a limited number of studies that have estimated inpayments and outpayments schedules at bilateral level. Haynes *et al.* (1986) estimated the U.S.-Japan inpayments and outpayments schedules; (Cushman, 1990;1987) did the same between the U.S. and each of her seven partners; Bahmani-Oskooee and Goswami (2004) concentrated on Japan's inpayments and outpayments with each of her nine largest partners; Bahmani-Oskooee *et al.* (2005) carried out the same analysis between the U.K. and each of her 20 largest partners; Bahmani-Oskooee *et al.* (2005) engaged in the case of Canada with her 20 partners; and finally Bahmani-Oskooee and Ratha (2008) expanded Cushman (1987) sample and included the U.S. 19 trading partners.

The above studies were criticized by Bahmani-Oskooee and Ardalani (2006) on the ground that they all used aggregate bilateral trade flows between two countries. If different industries between two countries react differently to changes in the exchange rate, clearly response of aggregate bilateral trade

[1] Houthakker and Magee (1969), Warner and Kreinin (1983), Bahmani-Oskooee (1986) and Bahmani-Oskooee and Niroomand (1998) are some examples who estimate the Marshall-Lerner condition.

[2] One major difference between J-curve and S-curve approach is that while the former could be used to predict the % change in the trade balance due to depreciation, the later can only predict the direction of the change.

flows could suffer from aggregation bias. In order to identify industries that benefit from currency depreciation, they disaggregated the U.S. trade flows by industry and investigated the response of inpayments and outpayments of 66 American industries that traded with the rest of the world. They showed that while real depreciation of the dollar increases inpayments of most exporting industries, it does not have much effect on outpayments of most importing industries. Our purpose in this paper is to carry out the same analysis using Korean data. More precisely, we investigate the response of inpayments and outpayments of 148 Korean industries that trade with the rest of the world to real depreciation of Korean won. To that end, we introduce the models and estimation method in Section II. The results are reported in Section III with a summary and conclusion in Section IV. Finally, an Appendix provides sources of the data used.

2. THE MODELS AND THE METHOD

In formulating inpayments (value of exports) and outpayments (value of imports) of each industry j, we closely follow models used by Bahmani-Oskooee and Ardalani (2006). As such, we adopt the following specifications:

$$LnVX_{j,t} = a + bLnYW_t + cLnREX_t + \varepsilon_t \qquad (1)$$

$$LnVM_{j,t} = d + eLnYK_t + fLnREX_t + \mu_t \qquad (2)$$

Equation (1) basically identifies world income, YW, and the real effective exchange rate of Korean won, REX as two main determinants of exports value or inpayments of industry j denoted by $VX_{j.}$ Similarly, equation (2) identifies Korean income, YK, and again the real effective exchange value of the won as two main determinants of imports value or outpayments of industry j denoted by VM_j. Since an increase in world income is expected to boost exports and therefore, export earnings by industry j, we expect an estimate of b to be positive. Similarly, an estimate of e is also expected to be positive since an increase in the U.S. income is expected to increase industry j's imports and therefore, cost of imports or outpayments. Since these Korean industries trade with the rest of the world, the real exchange rate included in the models is the real effective rate of Korean won. By way of construction, a decline in REX reflects a real depreciation of won and if real won depreciation is to increase export earnings of an industry, we expect an estimate of c in equation (1) to be negative. However, an estimate of *f* in equation (2) is expected to be positive if depreciation of won is to reduce imports and eventually import costs or outpayments.

Next, following Bahmani-Oskooee and Ardalani (2006) in order to estimate the long-run models outlined by equations (1) and (2) we too incorporate the short-run dynamic adjustment process by following Pesaran *et al.* (2001) bounds testing approach to cointegration and error-correction modeling, hence, equations (3) and (4):

$$\Delta LnVX_{j,t} = a' + \sum_{k=1}^{n1} b'_k \Delta LnVX_{j,t-k} + \sum_{k=0}^{n2} c'_k \Delta LnYW_{t-k} + \sum_{k=0}^{n3} d'_k \Delta LnREX_{t-k} + bLnVX_{j,t-1} + cLnYW_{t-1} + dLnREX_{t-1} + \omega_t \qquad (3)$$

$$\Delta LnVM_{j,t} = e' + \sum_{k=1}^{n1} f'_k \Delta LnVM_{j,t-k} + \sum_{k=0}^{n2} g'_k \Delta LnYK_{t-k} + \sum_{k=0}^{n3} h'_k \Delta LnREX_{t-k} + fLnVM_{j,t-1} + gLnYK_{t-1} + hLnREX_{t-1} + \upsilon_t \qquad (4)$$

Equations (3) and (4) are error-correction models that once estimated, they yield short-run as well as long-run effects of income and the exchange rate on inpayments and outpayments of each industry. While short-run effects are judged by the estimates of coefficients attached to first-differenced variables, the long-run effects are judged by the estimates of c and d normalized on b in model (3) and g and h normalized on f in model (4). However, for the long-run estimates to be valid, Pesaran *et al.* (2001) recommend using the F test to establish joint significance of lagged level variables or coinegration. They provide new critical values that account for integrating properties of variables.[3]

3. THE RESULTS

We are now in a position to estimate error-correction models (3) and (4) for Korea using annual data over the 1971-2011 period for each of the 148 industries that trade between Korea and rest of the world. In order to learn about importance of disaggregation by commodity, we also estimate the models using aggregate trade flows between Korea and rest of the world. Following the literature, we impose a maximum of four lags on each first-differenced variable and use AIC criterion in selecting the optimum lags. We then carry out all tests at optimum lags. Concentrating on inpyments model (3) first, we report the results in Table 1.

[3] Note that under this method variables could be I(0) or I(1) or combination of the two. Since almost all time-series variables are either I(0) or I(1), there is no need for pre-unit rot testing. For other applications of this approach see Bahmani-Oskooee, Economidou and Goswami (2005), Bahmani-Oskooee and Hegerty (2007). Halicioglu (2007;2013). Narayan, Narayan, Prasad and Prasad (2007). Tang (2007). Mohammadi, Cak and Cak (2008), Wong and Tang (2008). De Vita (2008). Payne (2008). Bahmani-Oskooee and Gelan (2009), Dell'Anno and Halicioglu (2010). Chen and Chen (2012). Wong (2013). and Tayebi and Yazdani (2014).

Table-1. Long-run Coefficient Estimates of Export Value (Inpayments) Model

	Product Description	Constant	Ln YW	Ln REX	ECMt-1	Adj R2	F statistic
	Total Trade	0.27 (0.04)	4.78 (6.35)	-0.48 (0.48)	-0.12 (2.67)	0.64	2.22
1	Live animals	18.18 (1.72)	0.57 (0.61)	-3.22 (2.13)	-1.34 (6.25)	0.63	12.04
2	Meat, fresh, chilled or frozen	-25.62 (0.58)	3.10 (0.92)	4.71 (0.74)	-0.19 (3.02)	0.27	2.85
3	Meat in airtight containers n.e.s	1.15 (0.06)	6.16 (4.23)	-4.21 (1.54)	-0.40 (3.87)	0.58	4.64
4	Eggs	76.13 (4.5)	-11.16 (6.35)	-4.34 (1.88)	-0.63 (8.63)	0.71	23.44
5	Fish, fresh & simply preserved	18.89 (2.97)	0.22 (0.33)	-1.28 (1.5)	-0.33 (4.05)	0.52	5.22
6	Fish, in airtight containers, n.e.s	243.05 (0.49)	-27.14 (0.44)	-22.88 (0.49)	-0.03 (4.69)	0.39	6.84
7	Rice	-6.85 (0.27)	-0.26 (0.1)	3.22 (0.91)	-0.71 (4.5)	0.40	6.31
8	Cereals, unmilled excl. wheat, rice	7.83 (1.07)	1.03 (1.4)	-1.62 (1.59)	-1.29 (5.8)	0.52	10.69
9	Meal & flour of cereals	-54.36 (2.34)	10.27 (4.6)	3.39 (1.04)	-0.21 (1.49)	0.27	0.72
10	Cereal preps & preps of flour	-2.32 (0.11)	5.49 (2.9)	-2.17 (0.77)	-0.17 (1.76)	0.14	0.99
11	Fruit, fresh, and nuts excl. Oil nuts	30.56 (0.86)	-2.82 (0.5)	-1.26 (0.34)	-0.09 (3.56)	0.20	3.97
12	Dried fruit	-71.77 (1.65)	7.38 (2.2)	9.44 (1.51)	-0.40 (3.96)	0.38	4.88
13	Fruit, preserved and fruit preparations	-2.71 (0.13)	2.46 (1.11)	0.46 (0.16)	-0.15 (1.92)	0.19	1.17
14	Vegetables, roots & tubers, fresh	12.90 (1.64)	0.34 (0.42)	-0.66 (0.62)	-0.42 (3.95)	0.26	4.93
15	Vegetables, roots & tubers preserved	26.89 (1.57)	-0.23 (0.17)	-3.11 (1.29)	-0.26 (4.45)	0.36	6.19
16	Sugar and honey	-16.12 (1.56)	3.12 (3.8)	2.97 (2)	-0.80 (5.35)	0.45	8.87
17	Sugar confectionery	3.81 (0.35)	3.35 (3.32)	-1.63 (1.09)	-0.35 (5.27)	0.65	8.60
18	Coffee	7.05 (0.18)	6.39 (1.42)	-5.12 (1.1)	-0.34 (2.48)	0.47	1.97
19	Tea and mate	-2.97 (0.43)	3.81 (5.68)	-1.35 (1.45)	-0.72 (4.18)	0.56	5.41
20	Spices	-12.04 (1.29)	2.49 (2.67)	2.08 (1.51)	-0.38 (4.87)	0.44	7.43
21	Feed Stuff for animals	-14.78 (1.43)	6.16 (5.91)	-0.50 (0.36)	-0.45 (3.41)	0.49	3.64
22	Food preparations, n.e.s.	-7.42 (1.52)	5.22 (10.51)	-0.68 (1.02)	-0.43 (2.99)	0.26	2.77
23	Nonalcoholic beverages, n.e.s.	29.82 (0.7)	2.25 (0.44)	-5.98 (1.18)	-0.28 (4.66)	0.39	6.81
24	Alcoholic beverages	-20.47 (1.83)	6.93 (6.18)	0.17 (0.11)	-0.41 (3.99)	0.31	4.98
25	Tobacco, unmanufactured	8.09 (0.43)	-2.36 (1.45)	2.54 (0.96)	-0.45 (4.37)	0.47	5.93
26	Tobacco manufactures	-68.73 (2.01)	12.19 (3.8)	5.71 (1.17)	-0.23 (2.29)	0.21	1.63
27	Hides & skins excluding fur skins	302.33 (0.78)	13.97 (1.25)	-76.72 (0.86)	0.06 (6.03)	0.58	11.30
							Continue

28	Oil seeds, oil nuts and oil kernels	8.20 (0.8)	0.00 (0)	-0.40 (0.29)	-0.71 (5.33)	0.46	9.10
29	Crude rubber including synthetic	-122.14 (1.86)	11.94 (2.22)	18.04 (1.47)	-0.12 (4.91)	0.57	7.42
30	Wood in the rough or roughly square	-10.82 (1.2)	0.20 (0.23)	3.22 (2.59)	-0.92 (6.07)	0.57	11.96
31	Wood, shaped or simply worked	23.00 (1.81)	-3.09 (2.48)	0.01 (0.01)	-0.28 (3.64)	0.50	4.25
32	Silk	12.02 (0.73)	-6.49 (3.93)	4.72 (2.07)	-0.74 (5.71)	0.53	10.29
33	Wool and other animal hair	30.53 (1.48)	-2.78 (1.3)	-2.14 (0.77)	-0.37 (2.95)	0.18	2.80
34	Cotton	-7.78 (0.08)	6.78 (0.87)	-2.81 (0.2)	-0.28 (1.85)	0.53	1.05
35	Synthetic and regenerated artificial	48.64 (0.41)	-4.30 (0.22)	-3.03 (0.33)	-0.07 (3.14)	0.34	3.06
36	Waste materials from textile fabric	-36.75 (3.02)	9.51 (7.64)	1.13 (0.71)	-0.32 (2.81)	0.41	2.45
37	Stone, sand and gravel	-126.52 (1.08)	7.40 (0.94)	21.89 (1.23)	-0.10 (3.08)	0.39	2.98
38	Other crude minerals	1.75 (0.16)	1.46 (1.43)	0.64 (0.41)	-0.19 (1.73)	0.44	0.92
39	Iron and steel scrap	-59.80 (1.89)	9.70 (3.35)	5.99 (1.3)	-0.35 (4.01)	0.46	5.03
40	Ores & concentrates of non-ferrous metals	-294.47 (0.18)	-19.56 (0.14)	80.89 (0.18)	0.02 (2.56)	0.25	2.07
41	Nonferrous metal scrap	-82.16 (9.49)	12.59 (18.19)	7.85 (6.36)	0.00 (0.16)	-0.06	7.65
42	Crude animal materials, n.e.s.	-12.24 (0.76)	4.46 (3.01)	0.60 (0.26)	-0.18 (1.48)	0.51	0.68
43	Crude vegetable materials, n.e.s.	29.63 (1.6)	0.00 (0)	-3.64 (1.49)	-0.15 (3.6)	0.39	4.03
44	Petroleum products	-24.16 (2.47)	9.19 (10.25)	-0.26 (0.19)	-0.47 (5.46)	0.52	9.26
45	Animal oils and fats	14.74 (0.69)	5.44 (3.11)	-6.76 (2.17)	-0.55 (3.83)	0.51	4.61
46	Fixed vegetable oils, soft	-7.61 (0.26)	6.02 (2.06)	-2.19 (0.54)	-0.68 (3.9)	0.54	4.71
47	Other fixed vegetable oils	-70.65 (1.88)	6.26 (2.04)	10.66 (1.98)	-0.49 (3.93)	0.26	4.83
48	Organic chemicals	-35.01 (5.18)	9.43 (16.02)	1.78 (1.86)	-0.32 (3.87)	0.63	4.65
49	Inorganic chemicals	-190.54 (1.38)	19.02 (2.23)	25.77 (1.16)	-0.11 (3.31)	0.39	3.42
50	Other inorganic chemicals	-34.21 (3.36)	6.78 (7.46)	3.45 (2.51)	-0.25 (3.66)	0.69	4.12
51	Crude chemicals from coal, petroleum	-96.69 (3.04)	11.58 (4.84)	12.15 (2.6)	-0.36 (3.43)	0.62	3.62
52	Synth. organic dyestuffs, natural	-2.44 (0.13)	4.00 (1.53)	-0.66 (0.29)	-0.10 (2.93)	0.59	2.55
53	Dyeing & tanning extracts	-43.43 (1.62)	12.90 (4.69)	-1.34 (0.37)	-0.74 (3.54)	0.69	2.17
54	Pigments, paints, varnishes	-25.14 (3.5)	8.39 (11.43)	0.08 (0.09)	-0.37 (4.71)	0.59	6.85
55	Medicinal & pharmaceutical products	-45.07 (1.73)	7.90 (4.43)	5.07 (1.14)	-0.07 (3.37)	0.40	3.53
							Continue

56	Essential oils, perfume	-31.12 (3.01)	8.32 (8.01)	0.39 (0.27)	-0.69 (4.84)	0.36	7.33
57	Perfumery, cosmetics, dentifrices,	13.87 (0.39)	6.52 (1.78)	-6.58 (1.53)	-0.21 (3.11)	0.17	3.02
58	Soaps, cleansing & polishing	-17.63 (1.7)	6.12 (5.81)	0.47 (0.32)	-0.28 (2.96)	0.16	2.76
59	Fertilizers manufactured	-23.29 (2.51)	3.11 (3.93)	4.64 (3.62)	-0.61 (34.1)	0.98	356.68
60	Explosives and pyrotechnic products	-2.65 (0.12)	2.58 (1.36)	0.12 (0.04)	-0.48 (3.96)	0.46	4.89
61	Plastic materials, regenerated	-22.03 (0.78)	6.78 (1.57)	1.91 (0.37)	-0.08 (2.53)	0.33	2.19
62	Chemical materials and products.	18.48 (0.12)	3.06 (0.14)	-2.44 (0.23)	-0.03 (1.17)	0.21	0.44
63	Leather	14.20 (0.32)	4.55 (0.8)	-4.78 (0.93)	-0.09 (2.75)	0.40	2.34
64	Manufactures of leather	12.54 (0.76)	1.85 (0.8)	-1.72 (1.11)	-0.17 (4.19)	0.58	5.47
65	Fur skins, tanned or dressed	25.36 (1.62)	0.31 (0.19)	-3.90 (1.89)	-0.33 (3.34)	0.33	3.56
66	Materials of rubber	-25.39 (0.21)	0.43 (0.01)	9.31 (0.17)	-0.02 (1.55)	0.34	0.77
67	Articles of rubber, n.e.s.	-5.39 (0.9)	3.93 (6.34)	0.51 (0.6)	-0.23 (3.36)	0.29	3.60
68	Veneers, plywood boards & other wood	58.98 (1.69)	-7.17 (2.17)	-3.68 (0.78)	-0.18 (2.48)	0.08	2.03
69	Wood manufactures, n.e.s.	-0.81 (0.11)	1.84 (2.55)	0.85 (0.86)	-0.30 (2.31)	0.28	1.66
70	Cork manufactures	-11.79 (1.03)	1.76 (1.55)	1.85 (1.16)	-0.93 (4.84)	0.38	7.46
71	Paper and paperboard	-8.10 (1.52)	6.43 (12.67)	-1.47 (2.04)	-0.50 (3.91)	0.41	10.39
72	Articles of paper, pulp, paperboard	2.06 (0.66)	3.23 (9.61)	-0.84 (2.07)	-0.48 (4.49)	0.49	6.31
73	Textile yarn and thread	8.27 (2.59)	1.68 (4.19)	-0.37 (0.9)	-0.42 (5.28)	0.54	8.65
74	Cotton fabrics, woven	-452.72 (0.08)	69.70 (0.08)	32.36 (0.08)	0.01 (3.84)	0.37	4.56
75	Text fabrics woven	18.21 (1.2)	3.04 (1.78)	-3.43 (1.57)	-0.08 (2.24)	0.58	1.56
76	Tulle, lace, embroidery, ribbons	2.76 (0.41)	3.26 (4.62)	-0.96 (1.07)	-0.22 (3.31)	0.54	3.48
77	Special textile fabrics	3.54 (0.24)	4.12 (2.55)	-1.72 (0.93)	-0.13 (2.06)	0.32	1.34
78	Made up articles, wholly or chiefly	22.37 (2.85)	-0.47 (0.59)	-1.61 (1.62)	-0.27 (8.38)	0.82	21.53
79	Floor coverings, tapestries, etc.	15.32 (2.79)	-0.39 (0.7)	-0.68 (0.91)	-0.31 (4.48)	0.57	6.24
80	Lime, cement & fabricated building materials	-2.57 (0.13)	0.75 (0.44)	2.47 (0.86)	-0.19 (2.52)	0.42	1.98
81	Clay and refractory construction materials	3.43 (0.59)	0.68 (1.18)	0.77 (0.96)	-0.40 (2.89)	0.26	2.78
82	Mineral manufactures, n.e.s.	-12.02 (2.7)	5.10 (12.03)	0.30 (0.49)	-0.44 (4.97)	0.55	7.68
							Continue

83	Glass	5.81 (0.46)	4.54 (3.75)	-2.89 (1.74)	-0.19 (3.18)	0.41	3.17
84	Glassware	-21.84 (3.17)	5.00 (8.58)	2.35 (1.98)	-0.32 (3.91)	0.59	4.72
85	Pottery	9.22 (0.44)	-0.68 (0.37)	0.80 (0.27)	-0.13 (4.7)	0.82	6.81
86	Pearls and precious and semi-precious	-18.89 (0.75)	3.35 (1.64)	2.95 (0.8)	-0.24 (3.15)	0.38	3.09
87	Pig iron, Spiegeliesen, Sponge iron	-191.1(1.02)	21.79(1.2)	22.71(0.95)	-0.09(2.03)	0.30	1.65
88	Ingots & other primary forms of iron	-29.70 (1.98)	5.29 (3.95)	4.37 (1.76)	-0.27 (3.66)	0.53	4.15
89	Iron and steel bars, rods, angles,	-80.38 (3.66)	9.21 (6.02)	11.35 (3.36)	-0.32 (4.75)	0.52	6.95
90	Universals, plates and sheets of iron	-42.05 (2.82)	7.84 (7.28)	4.76 (2.13)	-0.36 (3.8)	0.64	4.43
91	Rails & rail way track materials	11.30 (0.34)	-0.68 (0.16)	0.53 (0.11)	-0.14 (3.45)	0.36	3.74
92	Iron and steel wire	-10.58 (1.26)	5.08 (5.02)	0.22 (0.19)	-0.19 (3.37)	0.65	3.63
93	Tubes, pipes and fittings of iron	-59.05 (0.51)	9.50 (0.81)	6.80 (0.47)	-0.06 (1.63)	0.38	0.92
94	Iron steel castings	-9.59 (0.68)	5.53 (3.8)	-0.69 (0.35)	-0.18 (2.19)	0.30	1.56
95	Silver and platinum group metals	-23.93 (0.61)	8.09 (2.05)	0.08 (0.01)	-0.18 (1.55)	-0.01	0.81
96	Copper	-26.57 (0.85)	7.87 (2.24)	1.33 (0.27)	-0.13 (2.03)	0.17	1.36
97	Nickel	-77.23 (3.21)	15.25 (6.35)	3.94 (1.18)	-0.52 (3.46)	0.26	3.78
98	Aluminium	-36.58 (4.41)	9.16 (13.26)	1.90 (1.61)	-0.69 (4.7)	0.57	6.83
99	Lead	-22.23 (1.62)	8.72 (6.58)	-1.43 (0.76)	-0.71 (4.22)	0.37	5.55
100	Zinc	-32.30 (1.79)	11.23 (6.53)	-1.26 (0.5)	-0.50 (3.93)	0.32	4.83
101	Tin	-61.32 (1.37)	12.62 (3.09)	3.03 (0.43)	-0.36 (1.67)	0.54	0.87
102	Miscellaneous non-ferrous base metals	-28.21 (1.02)	6.61 (2.33)	2.13 (0.57)	-0.10 (1.61)	0.53	0.87
103	Finished structural parts	-57.19 (3.61)	5.79 (4.44)	9.67 (4.14)	-0.59 (7)	0.67	14.98
104	Metal containers for storage and transport	-104.01 (3.6)	12.67 (6.63)	12.80 (2.83)	-0.38 (4.53)	0.33	6.35
105	Wire products	-14.97 (1.72)	3.77 (4.75)	2.37 (1.87)	-0.20 (3.2)	0.48	3.18
106	Nails, screws, nuts, bolts, rivets	-0.40 (0.08)	2.30 (5.22)	0.56 (0.82)	-0.55 (6.12)	0.74	11.49
107	Tools for use in the hand or in machine	-22.60 (4.2)	6.74 (12.58)	1.23 (1.59)	-0.22 (3.37)	0.49	3.54
108	Cutlery	43.13 (2.51)	-3.04 (1.46)	-3.78 (1.92)	-0.13 (3.75)	0.57	4.36
109	Household equipment of base metals	32.16 (2.63)	-1.79 (1.21)	-2.48 (1.71)	-0.17 (6.55)	0.57	13.53
110	Manufactures of metal, n.e.s.	-13.10 (1.3)	5.26 (5.09)	0.78 (0.55)	-0.15 (2.35)	0.14	1.73
							Continue

111	Power generating machinery	-13.22 (0.82)	6.36 (3.76)	-0.18 (0.08)	-0.23 (2.87)	0.28	2.57
112	Agricultural machinery and implements	-23.46 (3.55)	7.98 (12.41)	-0.15 (0.16)	-0.79 (4.74)	0.37	7.22
113	Office machines	64.96 (0.21)	11.48 (0.6)	-21.60 (0.3)	0.03 (2.17)	0.46	1.46
114	Metalworking machinery	-37.91 (3.22)	10.06 (10.58)	1.28 (0.77)	-0.53 (5.48)	0.67	9.25
115	Textile and leather machinery	-22.52 (2.47)	7.81 (8.67)	0.27 (0.21)	-0.20 (2.76)	0.40	2.38
116	Machines for special industries	-28.12 (4.11)	9.92 (14.96)	-0.44 (0.46)	-0.50 (3.18)	0.37	3.12
117	Machinery and appliances non-electrical	-17.70 (1.18)	6.32 (2.78)	1.33 (0.58)	-0.13 (3.16)	0.32	3.10
118	Electric power machinery and switch	-45.46 (2.99)	9.00 (7.89)	4.40 (1.94)	-0.17 (3.11)	0.47	3.00
119	Equipment for distributing electricity	-41.15 (5.91)	7.96 (13.91)	4.13 (4.15)	-0.61 (4.79)	0.38	7.03
120	Telecommunications apparatus	-8.48 (0.83)	5.75 (5.1)	-0.10 (0.08)	-0.19 (3.48)	0.37	3.83
121	Domestic electrical equipment	34.69 (1.61)	-2.99 (0.79)	-1.27 (0.63)	-0.13 (5.39)	0.60	9.11
122	Electrical apparatus for medical purpose	-26.91 (3.65)	10.59 (15.16)	-1.83 (1.82)	-0.36 (4.82)	0.56	7.20
123	Other electrical machinery and apparatus	78.06 (0.13)	-6.10 (0.07)	-5.48 (0.15)	-0.01 (1.28)	0.49	0.51
124	Railway vehicles	-9.79 (0.32)	1.63 (0.56)	3.35 (0.73)	-0.19 (2.9)	0.16	2.65
125	Road motor vehicles	2.57 (0.15)	7.15 (3.47)	-3.73 (2)	-0.17 (5.13)	0.73	8.16
126	Road vehicles other than motor vehicle	32.96 (1.44)	-0.30 (0.13)	-4.39 (1.48)	-0.22 (3.23)	0.30	3.34
127	Aircraft	-15.18 (1.26)	4.49 (4.44)	1.68 (0.96)	-0.52 (4.53)	0.45	6.40
128	Ships and boats	-30.72 (3.39)	6.77 (8.98)	3.69 (2.74)	-0.41 (6.51)	0.54	13.15
129	Sanitary, plumbing, heating & light	69.32 (0.72)	-1.29 (0.15)	-10.39 (0.84)	-0.05 (1.69)	0.50	0.88
130	Furniture	2.79 (0.09)	3.30 (1.22)	-0.99 (0.22)	-0.14 (2.16)	0.33	1.44
131	Travel goods, handbags and similar	59.57 (2.89)	-6.31 (2.55)	-4.16 (1.57)	-0.10 (3.92)	0.63	4.93
132	Clothing except fur clothing	83.44 (4.26)	-7.64 (3.49)	-7.45 (3.32)	-0.10 (9.86)	0.76	30.44
133	Fur clothing	57.13 (1.32)	-6.46 (1.36)	-3.83 (0.69)	-0.31 (2.64)	0.51	2.17
134	Footwear	57.02 (2.14)	-4.88 (1.47)	-4.91 (1.35)	-0.07 (2.99)	0.64	2.79
135	Scientific, medical, optical, means.	-54.36 (3.67)	11.04 (9.08)	4.29 (2.02)	-0.30 (3.73)	0.30	4.30
136	Photographic and cinematographic supply	0.09 (0.01)	5.69 (3.67)	-2.91 (1.56)	-0.16 (1.95)	0.27	1.24
							Continue

137	Developed cinematographic film	65.16 (1.48)	6.90 (1.69)	-18.13 (2.65)	0.26 (5.36)	0.45	8.92
138	Watches and clocks	37.55 (2.68)	-3.07 (2.24)	-2.61 (1.41)	-0.21 (6.43)	0.61	12.82
139	Musical instruments, sound recorder	35.35 (0.9)	0.30 (0.07)	-4.68 (1.05)	-0.08 (2.43)	0.46	1.83
140	Printed matter	6.10 (0.23)	5.44 (2.71)	-3.68 (0.99)	-0.28 (2.52)	0.74	1.97
141	Articles of artificial plastic mate	-2.26 (0.32)	4.71 (7.5)	-1.11 (1.13)	-0.46 (3.88)	0.26	4.72
142	Perambulators ,toys, games	31.54 (1.87)	-3.18 (1.64)	-0.93 (0.42)	-0.14 (4.6)	0.51	6.60
143	Office and stationery supplies, n.e.s.	63.66 (0.74)	-2.03 (0.21)	-9.03 (0.95)	-0.07 (3.4)	0.43	3.64
144	Works of art and collectors pieces	-23.45 (1.29)	4.83 (2.73)	2.70 (1.05)	-0.42 (3.3)	0.26	3.54
145	Jewellery and gold/silver smiths watches	57.66 (1.38)	-2.29 (0.5)	-7.38 (1.58)	-0.13 (5.95)	0.50	11.32
146	Manufactured articles, n.e.s.	17.36 (1.27)	0.95 (0.69)	-1.82 (1.02)	-0.11 (2.07)	0.27	1.35
147	Animals, n.e.s. including .zoo animals	-24.75 (0.46)	-0.94 (0.2)	7.78 (1)	-0.07 (1.95)	0.23	1.26
148	Firearms of war and ammunition	-37.26 (1.63)	9.99 (4.35)	0.71 (0.23)	-0.61 (4.11)	0.28	5.33

Notes: n.e.s. = not specified elsewhere.

Due to volume of the results following Bahmani-Oskooee and Ardalani (2006) we too report only the long-run coefficient estimates and make the short-run estimates available upon request.[4] From the results reported for total trade between Korea and rest of the world it is clear that the main determinant of Korea's export earning or her inpayments is the world income and not the real effective exchange rate since the former carries a highly significant coefficient but the latter does not. Of course, this long-run analysis will only be valid if we establish cointegration among the three variables. The results of the F test applied to joint significance of lagged level variables, however, reveals that it is insignificant.[5] Hence, following Bahmani-Oskooee and Ardalani (2006) we rely upon an alternative test. In this alternative test, we use the long-run normalized coefficient estimates and equation (1) and generate the error term which is usually called error-correction term. Denoting this error by ECM, we then replace the linear combination of lagged level variables in (3) by ECM_{t-1} and estimate this new specification after imposing the same optimum lags. A significantly negative coefficient obtained for ECM_{t-1} will support convergence toward long-run equilibrium or cointegration. The size of the coefficient measures the speed of adjustment of variables. Clearly, cointegration is supported by this

[4]. Indeed, there was at least one significant short-run coefficient estimate in most optimum models.

[5] Note that the critical values tabulated by Pesaran, Shin and Smith (2001). are for large samples. Narayan (2005). provides a counterpart for small samples such as ours where we have almost 40 observations. At the 10% level of significance, the critical value with two exogenous variables (k=2) is 3.58.

criterion and it appears that 12% of adjustment takes place within one year since data are annual. Are there industries that will enjoy increased export earnings due to depreciation of won? To answer this question, we move to industry level estimates.

From the industry level estimates we gather that there are only 13 industries in which the real effective exchange rate carries its expected negative and significant coefficient, implying that these 13 industries will enjoy increased export earnings due to won depreciation. These industries are numbered as 1, 4, 45, 65, 71, 72, 83, 108, 109, 122, 125, 132, and 137. There are also 20 industries that experience a decline in their export earnings due to won depreciation. In these industries the real exchange rate carries a significantly positive coefficient. These industries are numbered as 16, 30, 32, 41, 47, 48, 50, 51, 59, 84, 88, 89, 90, 103, 104, 105, 118, 119, 128, and 135. These are indeed industries for which the demand by the rest of the world is inelastic. Thus, in total the real exchange rate has significant impact on inpayments of 33 out of 148 industries. However, the world income seems to be a significant determinant in a total of 91 industries. It carries a significantly positive coefficient in 83 cases and negative coefficient in eight industries.[6] Clearly economic activity in the world plays more important role than the exchange rate in promoting Korean exports and export earnings of most industries. Of course, the long-run effects of real depreciation or world income will be meaningful only if cointegration is established which is indeed the case by either the F test or by ECM_{t-1} criterion. Note that the size of adjusted R^2 also supports good fit in most industries.[7]

Next we turn to the estimates of outpayments schedule outlined by error-correction model (4) following the same steps as inpayments schedule. Like our previous approach we estimate this model using Korea’s aggregate imports from rest of the world as well as imports of each of the 148 industries and report the results in Table 2. From the total trade results reported in the first row of Table 2, it is clear that Korean income (YK) and the real effective exchange rate (REX) both carry their expected positive and significant coefficients. The implication is that economic growth in Korea increases Korean total imports and hence, aggregate import values or Korean outpayments. A real depreciation of Korean won lowers Korean imports and hence, Korean outpayments. These long-run estimates are meaningful due to the fact that all three variables are cointegrated either by the F test or by ECM_{t-1} criterion. In order to identify industries that benefit from won depreciation, we shift to industry level estimates.

[6] The negative coefficient of the world income implies that as world grows it produces more of substitute goods and hence cuts back its imports from Korea Bahmani-Oskooee (1986). These industries are numbered as 4, 31, 32, 68, 131, 133, 138, and 142.

[7] Following Bahmani-Oskooee, Economidou and Goswami (2005). we also applied the Lagrange Multiplier and Ramsey’s RESET tests to check for serial correlation and misspecification. Most optimum models were free from autocorrelation and were correctly specified. Furthermore, application of CUSUM and CUSUMSQ tests supported stability of coefficient estimates in almost all models.

Table-2. Long-run Coefficient Estimates of Import Value (outpayments) Model

	Product Description	Constant	LnYK	LnREX	ECM_{t-1}	Adj R^2	F statistic
	Total Trade	**1.02 (0.27)**	**1.91 (14.49)**	**2.09 (2.89)**	**-0.38 (4.53)**	**0.62**	**6.67**
1	Live animals	-14.12 (1.86)	1.00 (3.44)	4.34 (3.1)	-0.64 (5.31)	0.63	8.90
2	Meat, fresh, chilled or frozen	-10.45 (1.12)	2.66 (6.56)	2.72 (1.6)	-0.49 (3.36)	0.43	3.54
3	Meat in airtight containers n.e.s	-17.72 (2.11)	4.38 (8.19)	1.55 (1.11)	-0.45 (4.49)	0.62	6.23
4	Eggs	-25.92 (1.56)	2.13 (3.05)	5.45 (1.73)	-0.41 (6.64)	0.57	13.88
5	Fish, fresh & simply preserved	1.36 (0.42)	2.60 (18.6)	0.21 (0.34)	-0.66 (11.09)	0.80	38.80
6	Fish, in airtight containers, n.e.s	-22.71 (1.86)	4.38 (9.14)	3.18 (1.41)	-0.46 (3.59)	0.41	4.24
7	Rice	-44.01 (1.21)	1.88 (1.17)	10.92 (1.61)	-0.28 (2.81)	0.17	2.60
8	Cereals, excluding wheat, rice	-46.30 (0.94)	2.30 (1.47)	9.98 (1.08)	-0.59 (4.91)	0.47	9.59
9	Meal & flour of cereals	-2.76 (0.13)	2.92 (2.9)	0.12 (0.03)	-0.65 (4.55)	0.35	6.46
10	Cereal preparations	-15.09 (1.61)	3.25 (8.21)	2.76 (1.58)	-0.71 (4.18)	0.31	5.69
11	Fruit, fresh, and nuts excl. Oil nuts	-7.39 (1.41)	3.26 (13.06)	1.09 (1.13)	-0.55 (4.07)	0.43	5.20
12	Dried fruit including artificially	-46.75 (0.69)	1.47 (1.32)	11.33 (0.75)	-0.10 (3.07)	0.33	2.93
13	Fruit, preserved and fruit preparations	-6.51 (0.43)	2.85 (4.78)	1.08 (0.39)	-0.19 (2.13)	0.37	1.41
14	Vegetables, roots & tubers, fresh	-32.34 (1.94)	2.78 (6.24)	7.03 (2.14)	-0.52 (3.83)	0.72	4.50
15	Vegetables, roots & tubers preserved	-8.14 (1.69)	2.44 (13.49)	1.98 (2.13)	-0.64 (4.52)	0.45	6.40
16	Sugar and honey	-1.13 (0.21)	0.90 (5.12)	2.28 (2.3)	-0.63 (4.41)	0.38	6.03
17	Sugar confectionery	-4.85 (0.42)	3.98 (8.66)	-0.76 (0.36)	-0.48 (4.07)	0.46	5.12
18	Coffee	-16.59 (1.48)	2.30 (6.07)	3.83 (1.85)	-0.35 (4.16)	0.37	5.32
19	Tea and mate	-5.07 (2.57)	2.61 (29.19)	0.31 (0.86)	-1.77 (6.08)	0.62	11.50
20	Spices	-3.24 (0.31)	1.24 (3.02)	1.80 (0.91)	-0.37 (2.64)	0.32	2.18
21	Feed stuff for animals	-21.39 (1.51)	3.53 (6.76)	3.96 (1.53)	-0.45 (4.16)	0.48	5.42
22	Food preparations, n.e.s.	-1.50 (0.33)	2.97 (16.99)	0.25 (0.3)	-0.30 (4.15)	0.59	5.46
23	Non- alcoholic beverages, n.e.s.	24.12 (0.63)	4.50 (3.27)	-7.78 (1.07)	-0.31 (2.7)	0.41	2.25
24	Alcoholic beverages	4.12 (0.61)	2.67 (10.25)	-0.89 (0.7)	-0.55 (4.16)	0.48	5.39
25	Tobacco, unmanufactured	-3.30 (0.31)	1.38 (3.08)	1.90 (0.95)	-0.43 (2.86)	0.15	2.63
							Continue

26	Tobacco manufactures	27.88 (0.74)	3.33 (2.18)	-7.13 (0.99)	-0.25 (2.6)	0.21	2.19
27	Hides & skins, excluding fur skins	22.56 (3.86)	0.12 (0.44)	-2.46 (2.29)	-0.20 (6.16)	0.72	12.05
28	Oil seeds, oil nuts and oil kernels	4.01 (0.62)	1.00 (3.87)	1.04 (0.83)	-0.28 (4.35)	0.48	5.89
29	Crude rubber including synthetic	-5.84 (0.42)	1.74 (2.6)	2.47 (1.02)	-0.20 (2.35)	0.21	1.85
30	Wood in the rough or roughly square	4.88 (0.53)	0.52 (1.51)	1.17 (0.67)	-0.18 (2.25)	0.64	1.58
31	Wood, shaped or simply worked	-14.54 (0.85)	2.80 (4.51)	2.82 (0.85)	-0.13 (3.11)	0.51	3.01
32	Silk	13.64 (0.16)	-2.84 (0.35)	2.88 (0.15)	-0.05 (2.08)	0.22	1.36
33	Wool and other animal hair	9.40 (0.92)	0.44 (1.18)	0.05 (0.03)	-0.19 (3.82)	0.60	4.54
34	Cotton	25.24 (2.39)	-0.27 (0.7)	-2.36 (1.18)	-0.21 (3.13)	0.43	3.04
35	Synthetic and regenerated artificial	9.14 (2.16)	1.00 (5.25)	-0.36 (0.46)	-0.43 (3.75)	0.24	4.40
36	Waste materials from textile fabric	132.07 (0.26)	-3.81 (0.23)	-19.00 (0.24)	-0.02 (0.8)	0.37	0.20
37	Stone, sand and gravel	-25.33 (1.35)	3.17 (4.51)	4.73 (1.37)	-0.26 (2.98)	0.31	2.78
38	Other crude minerals	3.93 (0.99)	1.44 (8.63)	0.48 (0.64)	-0.26 (2.52)	0.32	2.03
39	Iron and steel scrap	-1.90 (0.39)	1.81 (9.39)	1.78 (1.96)	-0.46 (3.72)	0.31	4.35
40	Ores & concentrates of non-ferrous metals	-10.17 (0.82)	2.42 (5.08)	3.15 (1.32)	-0.23 (2.54)	0.10	2.04
41	Non-ferrous metal scrap	-13.39 (0.97)	3.07 (3.31)	2.62 (1.16)	-0.12 (2.07)	0.38	2.65
42	Crude animal materials, n.e.s.	12.08 (1.15)	1.04 (2.71)	-1.24 (0.61)	-0.23 (4.29)	0.63	5.71
43	Crude vegetable materials, n.e.s.	0.05 (0.01)	1.82 (8.2)	0.83 (0.8)	-0.18 (2.21)	0.56	1.53
44	Petroleum products	-9.72 (1.49)	2.58 (11.23)	3.03 (2.44)	-0.47 (4.57)	0.35	6.56
45	Animal oils and fats	-20.91 (0.9)	1.18 (1.28)	5.76 (1.39)	-0.18 (2.93)	0.43	2.65
46	Fixed vegetable oils, soft	-6.57 (1.49)	3.07 (16.5)	1.05 (1.28)	-0.47 (3.07)	0.20	2.98
47	Other fixed vegetable oils	-18.12 (1.26)	2.06 (4.23)	4.55 (1.62)	-0.22 (4.01)	0.42	4.98
48	Organic chemicals	4.35 (0.95)	1.68 (8.15)	0.77 (0.9)	-0.27 (2.72)	0.39	2.32
49	Inorganic chemicals	-21.86 (1.48)	2.42 (6.98)	5.51 (1.86)	-0.22 (3.18)	0.49	3.21
50	Other inorganic chemicals	-7.66 (0.24)	2.95 (0.98)	1.48 (0.34)	-0.05 (2.07)	0.45	1.49
51	Crude chemicals from coal & petroleum	-7.75 (0.68)	2.27 (4.42)	2.73 (1.21)	-0.21 (3.16)	0.71	3.08
							Continue

52	Synth. organic dyestuffs, natural	12.75 (1.97)	1.07 (3.7)	-1.02 (0.81)	-0.12 (1.99)	0.51	1.25
53	Dyeing & tanning extracts	21.69 (2.6)	0.08 (0.15)	-2.56 (1.77)	-0.19 (4.68)	0.50	6.82
54	Pigments, paints, varnishes	5.81 (3.01)	1.68 (17.36)	0.06 (0.17)	-0.46 (3.48)	0.48	3.83
55	Medicinal & pharmaceutical products	-18.38 (0.98)	2.97 (3.87)	4.27 (1.25)	-0.10 (2.96)	0.66	2.71
56	Essential oils, perfume	8.85 (2.7)	0.99 (6.45)	-0.41 (0.68)	-0.19 (4.65)	0.72	6.78
57	Perfumery, cosmetics, dentifrices,	-19.32 (1.75)	4.22 (8.94)	2.75 (1.42)	-0.20 (2.14)	0.58	1.47
58	Soaps, cleansing & polishing preparations	-5.04 (0.65)	1.99 (5.8)	1.77 (1.31)	-0.20 (3.25)	0.63	3.37
59	Fertilizers manufactured	2.38 (0.43)	1.45 (6.13)	0.79 (0.77)	-0.57 (4.04)	0.28	5.27
60	Explosives and pyrotechnic products	9.20 (0.37)	0.80 (0.71)	-0.53 (0.12)	-0.30 (2.61)	0.19	2.19
61	Plastic materials, regenerated	-1.77 (0.28)	2.17 (8.91)	1.42 (1.24)	-0.26 (3.04)	0.66	2.85
62	Chemical materials and products	-5.48 (1.15)	2.54 (13.42)	1.85 (2.19)	-0.24 (4.18)	0.70	5.49
63	Leather	17.58 (4.94)	0.00 (0.02)	-1.10 (1.71)	-0.40 (7.15)	0.83	15.75
64	Manufactures of leather	-13.90 (0.25)	1.52 (0.72)	3.70 (0.32)	-0.05 (1.58)	0.28	0.78
65	Fur skins, tanned or dressed	-81.57 (1.35)	3.42 (1.88)	16.25 (1.46)	-0.11 (3.95)	0.47	4.88
66	Materials of rubber	-7.41 (0.72)	2.13 (5.35)	1.96 (1.02)	-0.26 (2.87)	0.35	2.57
67	Articles of rubber, n.e.s.	-3.55 (0.48)	2.06 (5.6)	1.48 (1.01)	-0.22 (3.48)	0.57	3.78
68	Veneers, plywood boards & other wood	-29.27 (0.86)	2.74 (2.29)	6.32 (0.94)	-0.12 (2.56)	0.27	2.10
69	Wood manufactures, n.e.s.	-35.95 (1.78)	4.08 (5.33)	5.85 (1.65)	-0.20 (3.85)	0.53	4.60
70	Cork manufactures	-44.80 (1.51)	3.34 (3.17)	7.75 (1.45)	-0.29 (4.05)	0.39	5.12
71	Paper and paperboard	-0.91 (0.15)	2.19 (9.36)	0.79 (0.71)	-0.21 (2.58)	0.73	2.06
72	Articles of paper, pulp, paperboard	-9.65 (1.76)	2.07 (10.57)	2.77 (2.67)	-0.28 (2.38)	0.50	1.84
73	Textile yarn and thread	9.21 (2.14)	1.70 (8.52)	-0.70 (0.88)	-0.30 (2.75)	0.56	2.35
74	Cotton fabrics, woven	7.70 (1.54)	1.49 (7.85)	-0.59 (0.62)	-0.31 (3.26)	0.71	3.28
75	Text fabrics woven	-7.11 (0.55)	1.76 (3.83)	2.47 (1.08)	-0.14 (3.52)	0.71	3.82
76	Tulle, lace, embroidery, ribbons	3.29 (0.88)	0.96 (5.94)	0.55 (0.78)	-0.31 (2.93)	0.60	2.76
							Continue

77	Special textile fabrics and related	6.75 (2.81)	1.45 (13.21)	-0.15 (0.33)	-0.32 (3.36)	0.63	3.50
78	Made up articles, wholly or chiefly	-15.70 (3.27)	3.14 (18.12)	2.88 (3.16)	-0.76 (5.15)	0.54	8.36
79	Floor coverings, tapestries, etc.	-3.62 (0.29)	1.81 (3.35)	1.25 (0.54)	-0.19 (4.8)	0.68	7.20
80	Lime, cement & fabricated building materials	-19.16 (0.89)	3.67 (5.29)	3.19 (0.78)	-0.43 (3.5)	0.52	3.80
81	Clay and refractory construction materials	-10.97 (1.34)	2.19 (5.87)	2.89 (1.98)	-0.19 (2.31)	0.68	1.66
82	Mineral manufactures, n.e.s.	-11.38 (1.37)	2.32 (7.86)	2.91 (1.92)	-0.24 (4.07)	0.65	5.20
83	Glass	-3.13 (0.32)	2.20 (5.93)	1.58 (0.85)	-0.15 (2.37)	0.57	1.78
84	Glassware	-7.88 (0.81)	2.63 (6.77)	1.69 (0.94)	-0.20 (2.17)	0.48	1.49
85	Pottery	5.22 (0.28)	2.80 (4.33)	-1.67 (0.49)	-0.47 (3.92)	0.54	4.74
86	Pearls, precious and semi-precious	2.26 (0.41)	1.78 (7.69)	0.17 (0.17)	-0.38 (3.69)	0.44	4.30
87	Pig iron, spiegeleisen, sponge iron	0.35 (0.06)	3.02 (10.97)	0.00 (0)	-0.45 (3.72)	0.33	4.33
88	Ingots & other primary forms of iron	-12.23 (1.72)	2.42 (7.55)	3.46 (2.73)	-0.42 (4.37)	0.58	5.99
89	Iron and steel bars, rods, angles,	-14.71 (2)	2.25 (7.82)	3.99 (2.91)	-0.43 (4.15)	0.57	5.36
90	Universals, plates and sheets of iron	-6.17 (0.7)	2.26 (6.57)	2.23 (1.36)	-0.32 (2.96)	0.33	2.73
91	Rails & railway track materials	-59.30 (1.36)	3.55 (1.81)	11.32 (1.5)	-0.23 (4.25)	0.49	5.64
92	Iron and steel wire	-24.00 (2.01)	2.10 (5.02)	5.53 (2.51)	-0.34 (3.44)	0.48	3.64
93	Tubes, pipes and fittings of iron ore	-19.06 (2.35)	2.35 (8.78)	4.67 (3.09)	-0.39 (4.64)	0.56	6.70
94	Iron steel castings	-8.14 (0.68)	3.27 (6.53)	0.75 (0.36)	-0.33 (3.51)	0.65	3.80
95	Silver and platinum group metals	23.83 (1.25)	2.23 (3.6)	-4.40 (1.24)	-0.29 (3.15)	0.49	3.15
96	Copper	-5.23 (1)	2.74 (10.6)	1.49 (1.65)	-0.39 (3.7)	0.44	4.26
97	Nickel	-6.00 (1.62)	2.48 (14.4)	1.69 (2.53)	-0.74 (4.59)	0.48	6.63
98	Aluminum	0.88 (0.18)	2.04 (9.76)	0.92 (1)	-0.30 (3.15)	0.53	3.13
99	Lead	-8.55 (0.67)	2.09 (3.77)	2.35 (1)	-0.24 (2.35)	0.19	1.77
100	Zinc	6.88 (1.38)	2.01 (8.9)	-1.00 (1.08)	-0.66 (5.88)	0.52	10.87
101	Tin	-4.87 (0.62)	1.66 (5.26)	2.05 (1.37)	-0.25 (2.1)	0.10	1.42
102	Miscellaneous non-ferrous base metals	-0.05 (0.01)	2.51 (10.63)	0.43 (0.42)	-0.41 (3.04)	0.21	2.96
103	Finished structural parts	-50.87 (1.1)	3.39 (2.3)	10.81 (1.21)	-0.17 (3.14)	0.36	3.06
							Continue

104	Metal containers for storage and transport	-9.50 (1.69)	2.07 (10.27)	2.57 (2.49)	-0.48 (4.78)	0.50	7.09
105	Wire products	-11.79 (1.34)	2.14 (6.77)	2.91 (1.8)	-0.39 (3.53)	0.51	3.84
106	Nails, screws, nuts, bolts, rivets	-7.87 (0.89)	2.16 (5.61)	2.12 (1.33)	-0.26 (2.82)	0.42	2.53
107	Tools for use in the hand or in machine	-1.48 (0.28)	1.73 (8.36)	1.31 (1.33)	-0.31 (3.89)	0.64	4.74
108	Cutlery	-7.66 (1.08)	2.85 (9.18)	1.11 (0.83)	-0.35 (3.25)	0.45	3.30
109	Household equipment of base metals	-21.23 (1.81)	2.84 (6.97)	4.16 (1.91)	-0.31 (3.99)	0.49	4.98
110	Manufactures of metal, n.e.s.	-9.08 (0.96)	2.02 (6.06)	3.02 (1.75)	-0.24 (1.78)	0.47	0.98
111	Power generating machinery	-6.83 (1.18)	2.04 (8.8)	2.56 (2.38)	-0.32 (5.01)	0.63	7.78
112	Agricultural machinery and implements	-14.76 (1.17)	2.48 (5.03)	3.30 (1.4)	-0.27 (2.94)	0.38	2.70
113	Office machines	-6.35 (0.24)	2.05 (2.27)	2.66 (0.51)	-0.09 (2.68)	0.73	2.23
114	Metalworking machinery	1.72 (0.35)	1.64 (7.13)	0.85 (0.97)	-0.49 (3.93)	0.44	4.81
115	Textile and leather machinery	6.65 (0.8)	0.95 (2.36)	0.04 (0.02)	-0.22 (2.84)	0.59	2.61
116	Machines for special industries	-7.46 (0.95)	2.20 (6.31)	2.23 (1.61)	-0.26 (4.68)	0.72	6.86
117	Machinery and appliances non electrical	-0.70 (0.16)	2.20 (11.59)	1.39 (1.81)	-0.30 (4.61)	0.77	6.63
118	Electric power machinery and switch	2.89 (0.62)	2.07 (11.37)	0.66 (0.76)	-0.27 (3.14)	0.66	3.04
119	Equipment for distributing electricity	-21.46 (0.57)	3.40 (1.57)	4.16 (0.7)	-0.10 (2.62)	0.36	2.19
120	Telecommunicati ons apparatus	2.65 (0.62)	1.84 (11.99)	1.05 (1.34)	-0.40 (4.28)	0.75	5.64
121	Domestic electrical equipment	-5.58 (0.84)	2.08 (7.83)	1.94 (1.53)	-0.35 (4.99)	0.62	7.70
122	Electrical apparatus for medical purposes	-24.51 (1.93)	2.48 (8.05)	5.66 (2.22)	-0.25 (5.2)	0.58	8.42
123	Other electrical machinery and apparatus	8.52 (2.89)	2.24 (16.07)	-0.42 (0.78)	-0.32 (2.46)	0.57	1.88
124	Railway vehicles	3.18 (0.35)	1.02 (2.44)	0.97 (0.59)	-0.35 (2.82)	0.42	2.50
125	Road motor vehicles	1.84 (0.19)	2.48 (4.3)	0.17 (0.09)	-0.19 (2.78)	0.53	2.45
126	Road vehicles other than motor vehicles	9.17 (0.78)	1.95 (4.3)	-1.54 (0.62)	-0.17 (2.82)	0.47	2.50
127	Aircraft	-34.52 (2.04)	3.01 (4.86)	7.25 (2.38)	-0.50 (4.75)	0.44	6.97
128	Ships and boats	-48.68 (3.05)	2.21 (4.21)	11.33 (3.79)	-0.48 (4.37)	0.41	6.00
							Continue

129	Sanitary, plumbing, heating & light	-5.01 (1.07)	2.18 (11.24)	1.51 (1.73)	-0.38 (4.65)	0.60	6.90
130	Furniture	-17.69 (3.72)	3.59 (18.76)	3.12 (3.66)	-0.43 (6.37)	0.77	12.71
131	Travel goods, handbags and similar	-13.59 (4.33)	4.86 (31.53)	0.86 (1.53)	-0.63 (10.67)	0.84	35.52
132	Clothing except fur clothing	-70.02 (0.66)	9.86 (1.02)	6.97 (0.58)	-0.06 (4.07)	0.73	5.11
133	Fur clothing	-23.85 (2.04)	3.45 (8.36)	4.17 (1.89)	-0.42 (3.1)	0.47	3.01
134	Footwear	-17.31 (2.96)	4.94 (22.61)	1.72 (1.57)	-0.75 (6.13)	0.55	11.78
135	Scientific, medical, optical, means	10.39 (1.36)	2.26 (8.14)	-1.14 (0.8)	-0.25 (3.71)	0.68	4.30
136	Photographic and cinematographic supplies	5.15 (0.7)	1.81 (6.04)	-0.13 (0.1)	-0.15 (3.21)	0.69	3.19
137	Developed cinematographic film	2.32 (0.35)	1.53 (5.41)	0.27 (0.21)	-0.30 (2.79)	0.33	2.60
138	Watches and clocks	-7.64 (0.84)	1.12 (3.81)	3.18 (1.88)	-0.31 (3.45)	0.34	3.70
139	Musical instruments, sound recorder	4.85 (2.09)	1.82 (18.22)	0.25 (0.59)	-0.37 (4.05)	0.70	5.14
140	Printed matter	-0.84 (0.31)	1.98 (18.68)	1.07 (2.06)	-0.47 (4.38)	0.50	5.98
141	Articles of artificial plastic mate	-1.54 (0.46)	2.44 (15.05)	0.82 (1.36)	-0.34 (3.46)	0.61	3.92
142	Perambulators ,toys, games and sporting goods	-14.72 (2.2)	3.03 (14.2)	2.94 (2.39)	-0.47 (4.8)	0.74	7.12
143	Office and stationery supplies, n.e.s.	-2.50 (0.51)	2.86 (12.87)	0.09 (0.1)	-0.19 (4.17)	0.81	5.42
144	Works of art, collectors pieces	-48.09 (3.4)	3.20 (7.54)	9.78 (3.57)	-0.81 (5.47)	0.72	9.41
145	Jewellery and gold/silver smith watches	-6.50 (0.82)	2.64 (7.98)	1.33 (0.89)	-0.26 (3.26)	0.42	3.44
146	Manufactured articles, n.e.s.	-1.49 (0.51)	1.68 (14.35)	1.54 (2.79)	-0.49 (3.17)	0.45	3.13
147	Animals, n.e.s. including .zoo animals	5.26 (1.09)	2.27 (11.15)	-1.41 (1.56)	-0.79 (5.67)	0.45	10.05
148	Firearms of war and ammunition	4.00 (0.22)	3.02 (3.57)	-1.78 (0.51)	-0.34 (2.44)	0.44	1.84

Notes: n.e.s. = not elsewhere specified.

From the industry estimates we gather that the real effective exchange rate carries its expected positive and significant (at the 10% level) coefficient in 38 industries. These industries are numbered as 1, 4, 14, 15, 16, 18, 39, 44, 49, 62, 69, 72, 78, 81, 82, 88, 89, 92, 93, 96, 97, 104, 105, 109, 110, 111, 117, 122, 127, 128, 129, 130, 133, 138, 140, 142, 144, and 146. There also three industries (#27, 53, and 63) in which the exchange rate carries significantly negative coefficient, implying that outpayments of these industries will increase due to won depreciation. Again, these are industries for which Korean import demand is inelastic. Once again, the income effect seems to be more present than the exchange rate effect. As the results reveal, Korean income (YK) carries its expected positive and significant coefficient in almost all industries signifying Korean income as the main long-run determinant of every industry's imports and imports cost. As Korea grows, each industry imports more and therefore pays more. Once again, these long-run coefficient estimates are not spurious since there is evidence of cointegration in every case by the F or ECM_{t-1} test. Like table 1, we have also reported the size of adjusted R^2 which reflect reasonable fit in most cases.[8]

4. SUMMARY AND CONCLUSION

The traditional way of assessing the long-run effects of devaluation or depreciation on a country's trade balance has been to estimate the so called Marshall-Lerner condition to ensure that the sum of price elasticities of import and export demands add up to more than one. The findings have been mixed at best depending on study period, estimation method, etc. As far as the Korea's experience is concerned, while Bahmani-Oskooee (1986) finds that the Marshall-Lerner condition does not hold, Gylfason and Risager (1984), Bahmani-Oskooee and Niroomand (1998) and Bahmani-Oskooee and Kara (2005) find that it does.[9]

The above studies have been criticized by Bahmani-Oskooee and Ardalani (2006) because of using aggregate trade flows of one country with the rest of the world. In an attempt to reduce aggregation bias, they advocated disaggregating trade flows by industry. However, since import and export price data are not available at commodity level to estimate the Marshall-Lerner condition, they introduced an alternative approach. In their alternative specification of import and export demand models, they replaced the import and export *volumes* by import and export *values* and relative prices by the real exchange rate. The method was argued to be a direct method of investigating the impact of currency depreciation on inpayments and outpayments of a country.

They then estimated the models using trade flows of 66 industries that trade between the U.S. and rest of the world.

In this paper we followed Bahmani-Oskooee and Ardalani (2006) and estimated inpayments and outpayments schedules for each of the 148 industries that trade between Korea and rest of the world. While in the short run majority of the industries responded to changes in the real effective value of Korean won, the short-run effects lasted into the long run in inpayments of 33 and outpayments of 41

[8] One again, the results of the Lagrange Multiplier and RESET tests revealed that most optimum models do not suffer from autocorrelation and they are not misspecified. Stability of coefficients were also supported by the CUSUM and CUSUMSQ tests.

[9] For estimates of import and export demand functions for some other countries see King (1993). Alse and Bahmani-Oskooee (1995). Charos, Simos and Thompson (1996). Truett and Truett (2000). Du and Zhu (2001). Love and Chandra (2005). Agbola and Damoense (2005). Narayan and Narayan (2005). and Narayan, Narayan, Prasad and Prasad (2007).

industries. However, not all long-run effects were favorable. While only 20 industries enjoyed an increase in their export earnings in the long run, only 38 industries enjoyed long run decline in their outpayments. Thus, by disaggregating trade flows by commodity we were able to identify industries that will benefit from a real depreciation of won. Furthermore, we found that in most models income effect is a more dominant factor than the exchange rate.

APPENDIX

Data Definition and Sources

Annual data over the period 1971-2011 are used to estimate the models. The data come from the following sources:

a. The World Bank.

b. International Financial Statistics of the IMF.

c. Bank for International Settlements.

Variables:

VX_j = Export value (inpayments) of Korean industry j in US dollars that exports to the rest of the world. Source (a).

VM_j = Import value (outpayments) of Korean industry j in US dollars that imports from rest of the world. Source (a).

YK = Index of Korean real GDP (2005=100), Source (b).

YW = World income proxied by the index of Industrial production in advanced economies (2005=100), source (b).

REX = The Real Effective Exchange Rate of Korean won. A decline reflects a real depreciation of the won. Source (c).

REFERENCES

Agbola, F.W. and M.Y. Damoense, 2005. Time-Series estimation of import demand functions for in India. Journal of Economic Studies, 32: 146-157.

Alse, J. and M. Bahmani-Oskooee, 1995. Do devaluations improve or worsen the terms of trade? Journal of Economic Studies, 22: 16-25.

Backus, D.K., P.J. Kehoe and F.E. Kydland, 1994. Dynamics of the trade balance and the terms of trade: The J-curve? American Economic Review, 84: 84-103.

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

Bahmani-Oskooee, M., 1986. Determinants of international trade flows: The case of developing countries. Journal of Development Economics, 20: 107-123.

Bahmani-Oskooee, M. and Z. Ardalani, 2006. Exchange rate sensitivity of US trade flows: Evidence from industry data. Southern Economic Journal, 72: 542-559.

Bahmani-Oskooee, M., C. Economidou and G.G. Goswami, 2005. How sensitive are Britain's inpayments and outpayments to the value of the British pound? Journal of Economic Studies, 32: 455-467.

Bahmani-Oskooee, M. and A. Gelan, 2009. How stable is the demand for money in African countries. Journal of Economic Studies, 36: 216-235.

Bahmani-Oskooee, M. and G. Goswami, 2004. Exchange rate sensitivity of Japan's bilateral trade flows. Japan and the World Economy, 16: 1-15.

Bahmani-Oskooee, M., G. Goswami and B. Talukdar, 2005. The bilateral J-curve: Australia versus her 23 trading partners. Australian Economic Papers, 44: 110-120.

Bahmani-Oskooee, M., H. Harvey and S. Hegerty, 2013. Empirical tests of the marshall-lerner condition: A literature review. Journal of Economic Studies, 40: 411-443.

Bahmani-Oskooee, M. and S. Hegerty, 2010. The J- and S-curves: A survey of the recent literature. Journal of Economic Studies, 37: 580-596.

Bahmani-Oskooee, M. and S.W. Hegerty, 2007. Exchange rate volatility and trade flows: A review article. Journal of Economic Studies, 34: 211-255.

Bahmani-Oskooee, M. and O. Kara, 2005. Income and price elasticities of trade: Some new estimates. International Trade Journal, 19: 165-178.

Bahmani-Oskooee, M. and F. Niroomand, 1998. Long-run price elasticities and the marshall-lerner condition revisited. Economics Letters, 61: 101-109.

Bahmani-Oskooee, M. and A. Ratha, 2008. Exchange rate sensitivity of US bilateral trade flows. Economic Systems, 32: 129-141.

Charos, E.N., E.O. Simos and A.R. Thompson, 1996. Exports and industrial growth: A new framework and evidence. Journal of Economic Studies, 23: 18-31.

Chen, S.W. and T.C. Chen, 2012. Untangling the non-linear causal nexus between exchange rates and stock prices: New evidence from the OECD countries. Journal of Economic Studies, 39: 231-259.

Cushman, D.O., 1987. US bilateral trade balances and the dollar. Economics Letters, 24: 363-367.

Cushman, D.O., 1990;1987. US bilateral trade equations: Forecasts and structural stability. Applied Economics, 22: 1093-1102.

De Vita, G.K., K.S., 2008. Determinants of capital flows to developing countries: A structural VAR analysis. Journal of Economic Studies, 35: 304-322.

Dell'Anno, R. and F. Halicioglu, 2010. An ARDL model of recorded and unrecorded economies in Turkey. Journal of Economic Studies, 37: 627-646.

Du, H. and Z. Zhu, 2001. The effect of exchange-rate risk on exports: Some additional empirical evidence. Journal of Economic Studies, 28: 106-121.

Gylfason, T. and O. Risager, 1984. Does devaluation improve the current account? European Economic Review, 25: 37-64.

Halicioglu, F., 2007;2013. The J-curve dynamics of Turkish bilateral trade: A cointegration approach. Journal of Economic Studies, 34: 103-119.

Haynes, S.E., M.M. Hutchison and R.F. Mikesell, 1986. US-Japanese bilateral trade and the yen-dollar exchange rate: An empirical analysis. Southern Economic Journal, 52: 923-932.

Houthakker, H.S. and S.P. Magee, 1969. Income and price elasticities in world trade. Review of Economics and Statistics, 51: 111-125.

King, A., 1993. The functional form of import demand: The case of UK motor vehicle imports, 1980-90. Journal of Economic Studies, 20: 36-50.

Love, J. and R. Chandra, 2005. Testing export-led growth in South Asia. Journal of Economic Studies, 32: 132-145.

Magee, S.P., 1973. Currency contracts, pass through and devaluation. Brookings Papers on Economic Activity, 1: 303-325.

Mohammadi, H., M. Cak and D. Cak, 2008. Wagner's hypothesis: New evidence from Turkey using the bounds testing approach. Journal of Economic Studies, 35: 94-106.

Narayan, P.K., 2005. The saving and investment nexus for China: Evidence from cointegration tests. Applied Economics, 37: 1979-1990.

Narayan, P.K., S. Narayan, B.C. Prasad and A. Prasad, 2007. Export-led growth hypothesis: Evidence from Papua New Guinea and Fiji. Journal of Economic Studies, 34: 341-351.

Narayan, S. and P.K. Narayan, 2005. An empirical analysis of Fiji's import demand function. Journal of Economic Studies, 32: 158-168.

Payne, J.E., 2008. Inflation and inflation uncertainty: Evidence from the Caribbean region. Journal of Economic Studies, 35: 501-511.

Pesaran, M.H., Y. Shin and R.J. Smith, 2001. Bound testing approaches to the analysis of level relationship. Journal of Applied Econometrics, 16: 289-326.

Tang, T.C., 2007. Money demand function for Southeast Asian countries: An empirical view from expenditure components. Journal of Economic Studies, 34: 476-496.

Tayebi, S.K. and M. Yazdani, 2014. Financial crisis, oil shock and trade in Asia. Journal of Economic Studies, 41: 601-614.

Truett, L.J. and D.B. Truett, 2000. The demand for imports and economic reform in Spain. Journal of Economic Studies, 27: 182-199.

Warner, D. and M.E. Kreinin, 1983. Determinants of international trade flows. Review of Economics and Statistics, 65: 96-104.

Wong, H.T., 2013. Real exchange rate misalignment and economic growth in Malaysia. Journal of Economics Studies, 40: 298-313.

Wong, K.N. and T.C. Tang, 2008. The effects of exchange rate variability on Malaysia's disaggregated electrical exports. Journal of Economic Studies, 35: 154-169.