An Empirical Analysis of Industrial Exports and Exchange Rates in Sri Lanka

E.M.G.P. Ekenayake and Anuruddha Kankanamge
Department of Economics and Statistics, University of Peradeniya, Sri Lanka

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Introduction

Industrial exports have earned 74.2% from total exports in 2014 with the consistence of textiles and garments, diamonds, gems and jewelry, petroleum products (Central Bank of Sri Lanka (CBSL) Annual Report, 2014). One of the major policy which is implemented by Sri Lankan government is devaluation of rupee against US dollar to increase competitiveness of exports in international markets (CBSL Annual Report, 2011). International agencies like World Bank and IMF also recommended devaluation of local currency to promote exports in developing countries related to the theory (Fischer, 1998). For example, Marshall Lerner condition supports devaluation of currency under some specific conditions[1] (Kulkarni and Clarke, 2009). Empirical research also supports this view (Aziz, 2012; Boy and Caporale, 2001). The existing literature provides evidence of not only the mean exchange rate but also the volatility of exchange rate creates adverse effects on exports of developing countries like Sri Lanka (Arize, Osang and Slottje 2000).

[1] The *Marshall-Lerner condition*, which states that a currency devaluation will only lead to an improvement in the balance of payments if the sum of demand elasticity for imports and exports is greater than one.

However, there is no sufficient empirical evidence that examines the impact of exchange rate in Sri Lanka particularly on industrial exports. Also the previous studies (Ekanayake and Chatrna ,2010; Hooy and Choong, 2010) identified inconsistent results. Thus, this paper attempts to fulfill the above research gap by empirically investigating the effect of exchange rate on real industrial exports in Sri Lanka.

Objective

This study examines the effect of nominal and real exchange rates and other variables such as industrial production and bilateral trade relations with six largest export partners on real industrial exports in Sri Lanka.

Methodology

This study uses panel data analysis following ordinary least squared (OLS) method to achieve research objectives with annual data for the period of 2003 to 2013 related to six major export partners i.e. USA, UK, India, Italy, Germany and Belgium. All the data were obtained from annual reports of CBSL and Export Development Board as well as web sites of OECD and World Bank. All the variables are converted in to natural logarithm during the estimation process.

The model used in this study was motivated by Marshall-Lerner condition which states devaluation is good to reduce trade deficit in the long run. Thus the variable of industrial exports was taken as a function of exchange rate (both nominal and real) and other related variables.

$$\mathbf{logY_t = \alpha_0 + \alpha_1 logIPI_t^f + \alpha_2 log\ RER_t + \alpha_3 logV_t + \alpha_4 logVOL_t + \alpha_5 D_1 + \alpha_6 D_2} \\ \mathbf{\alpha_7 D_3 + \alpha_8 D_4 + \alpha_9 D_5 + u_t} \qquad \mathbf{(01)}$$

Where, Y_t is the dependent variable which indicates real value of the bilateral industrial exports between Sri Lanka and the relevant country. IPI_t^f is industrial production index which was taken as a measure of the industrial production of our major export partners. RER_t is real exchange rate. V_t is nominal exchange rate and VOL_t is the volatility of nominal exchange rate of Sri Lankan rupee with foreign currencies of the six trading partners considered in the study. It was computed by moving average standard deviation method.

Dummy variables of D_i identify following bilateral trade relations with the six major trading partners where *i = 1,2,3,4,5 and 6* (*1= USA, 2=UK, 3= India, 4 = Italy, 5= Germany and 6= Belgium* which is the omitted group) where $D_i = 1$ for a given country and otherwise $D_i = 0$.

Both real and nominal exchange rate variables are included in two specifications separately to identify nominal and real effects. The study uses both nominal exchange rate and its volatility to identify the effectiveness of government intervention to control exchange rate and the impact of its volatility on industrial exports. However theory does not provide the nature of relationship of V_t and VOL_t variables with Y_t. So these relationships will be observed in the analysis.

We tested models with Breusch-Pagan, Ramsey's RESET and Durbin Watson tests to verify whether there is heteroscedasticity, specification error and autocorrelation respectively (See Annexure). Accordingly all models estimated using Newey-West standard errors as a correction for heteroscedasticity and autocorrelation.

Results and Discussion

Table 1 presents summary results of the estimated models. For columns 1 and 2 dependent variable is real industrial exports. The difference in the two columns is column 1 includes RER and column 2 includes V. These two variables regressed separately to avoid Multicollnearity problem as seen in Equations 2-5 (See Annexure).

Table 1: OLS Results for Real Industrial Exports

Variable	Industrial Exports	
	(1)	**(2)**
	Coefficient	**Coefficient**
Real Foreign Income (IPI)	-0.7652* (0.3289)	-0.7238* (0.3287)
Real Exchange Rate (RER)	0.5667* (0.1841)	
Nominal Exchange Rate (V)		-0.0879 (0.2503)
Nominal Exchange Rate Volatility (VOL)	-0.1145 (0.0907)	-0.1509 (0.1014)
United States of America (D_1)	1.872* (0.1529)	1.6232* (0.1532)
United Kingdom (D_2)	-0.6273* (0.0974)	-0.4467* (0.1110)
India (D_3)	2.0270* (0.7858)	-0.7259 (1.0259)
Italy (D_4)	-0.9698* (0.1186)	-0.9732* (0.1003)
Germany (D_5)	-0.8141* (0.1139)	-0.8119* (0.1164)
Constant	12.2330* (1.7689)	15.2583* (1.9154)
N	66	66
Heteroscedasticity	No	No
Autocorrelation	Yes (Positive)	Yes (Positive)
Specification Error	No	Yes

Note: *denotes the significant at 5%. Standard errors are in parenthesis.

According to the above results, even though there is no any significant impact of nominal exchange rate and its volatility on real industrial exports, real exchange rate creates positive and significant impact at 5% level which is consistent with theory and policy. IPI which was a proxy for industrial production of major export partner has negative and significant impact. In column (1) Sri Lanka's bilateral trade with all 5 trading partners are significantly different from Belgium. USA and India has more bilateral trade than UK, Italy and Germany. Column (2) results reflects that USA is still has more trade while only three other countries has less trade compared to Belgium. Bilateral trade with India shows the highest difference with Belgium in column (1) when we estimate the model with RER while the difference is not significant when estimate the model with nominal exchange rate.

Conclusion

According to results, the study found that depreciation efforts by the government to help exports have positive impact. This was evident in the analysis with significant effect of real exchange rate variable on industrial exports which had the largest effect among all variables. This real effect wasn't reflected with nominal exchange rate. Further nominal exchange rate volatility has no significant impact on real industrial exports. Increase in the industrial production volume of the exporting country of major export partners has significant adverse effects for real industrial exports in Sri Lanka. And also the study finds that it is more favorable to improve trade relations with U.S.A and Belgium relative to other export partners. Therefore overall results indicate depreciation favors industrial exports. Further, in order to increase the competitiveness of industrial exports, other alternative options such as reducing the cost of production and improving the quality of products can also be considered.

References

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Appendix

Method of calculating variables

- Real industrial exports = $\frac{nominal\ industrial\ exports}{export\ \ price\ index}$

- Industrial price index = $\frac{current\ price\ of\ industry\ \ value\ added}{constant\ price\ of\ industry\ value\ added}$

Since there is no Industrial Price Index it was computed according to the above equation.

- Real ex. rate = $(nominal\ exchnage\ rate) \cdot \left(\frac{foreign\ concumer\ price\ index}{domestic\ consumerpriceindex}\right)$

$$\log IPI_t^f = \alpha_0 + \alpha_1 \log RER_t + \alpha_2 \log V_t + \alpha_3 VOL_t + \sum_{i=1}^{5} \beta_i D_j + u_{1t} \quad (02)$$

$$\log RER_t = \alpha_0 + \alpha_1 \log IPI_t^f + \alpha_2 \log V_t + \alpha_3 VOL_t + \sum_{i=1}^{5} \beta_i D_j + u_{2t} \quad (03)$$

$$\log V_t = \alpha_0 + \alpha_1 \log IPI_t^f + \alpha_2 \log RER_t + \alpha_3 VOL_t + \sum_{i=1}^{5} \beta_i D_j + u_{3t} \quad (04)$$

$$\log VOL_t = \alpha_0 + \alpha_1 \log IPI_t^f + \alpha_2 \log RER_t + \alpha_3 V_t + \sum_{i=1}^{5} \beta_i D_j + u_{4t} \quad (05)$$

Table 1: Results of Auxiliary Regressions

equation	F_{cal}	F_{cri}		result	conclusion
(02)	6.73	2.10	6.73>2.10	reject H_0	Multicollnearity exists
(03)	743.1	2.10	743.1>2.10	reject H_0	Multicollnearity exists
(04)	1181.66	2.10	1181.6>2.10	reject H_0	Multicollnearity exists
(05)	10.73	2.10	10.73>2.10	reject H_0	Multicollnearity exists

Note: H_0 = No Multicollnearity in the model

Table 2: Results of Pair wise Correlation Matrix

	y_ log	ipi_log	rer_log	v_log	vol_log
y_ log	1.0000				
ipi_log	-0.0770	1.0000			
rer_log	-0.0164	0.5072	1.0000		
v_log	-0.0312	0.5208	0.9914	1.0000	
vol_log	-0.6969	0.1282	0.0875	-0.6968	1.0000

$$\log Y_t = \alpha_0 + \alpha_1 \log IPI_t^f + \alpha_2 \log RER_t + \alpha_3 VOL_t + \sum_{i=1}^{5} \beta_i D_j + u_{2t} \quad (06)$$

$$\log Y_t = \alpha_0 + \alpha_1 \log IPI_t^f + \alpha_2 \log V_t + \alpha_3 VOL_t + \sum_{i=1}^{5} \beta_i D_j + u_{2t} \quad (07)$$

Table 3: Results of Breusch – Pagan test

Equation	Probability Value		Result	Conclusion
(06)	0.84	0.84> 0.05	Can't reject H_0	no heteroscedasticity
(07)	0.48	0.48> 0.05	Can't reject H_0	no heteroscedasticity

Not : H_0 = No heteroscedasticity in the model

Table 4: Results of Ramsey's RESET test

Equation	Probability Value		Result	Conclusion
(06)	0.13	0.13> 0.05	Can't reject H_0	No omitted variables
(07)	0.03	0.03< 0.05	reject H_0	Exist omitted variables

Note : H_0 = No omitted variables in the model

Table 5: Results of Durbin Watson test

Equation	Durbin Watson Statistics
(06)	0.91
(07)	0.72

d values

upper	lower
1.882	1.336