The Role of Exchange Rate on Export, Import and Trade Balance: Empirical Evidence

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ABSTRACT: *The major findings of this article are: (i) Effect of exchange rate on export, import and trade balance. Other significant factors that influence trade balance such as domestic income expresses a long run negative relationship between trade balances, and foreign income indicates a long run positive relationship (ii) the real exchange rate is a significant factor to the trade balance, and devaluation will enhance trade balance in the long run. Globalization has influenced the connection between the trade balance and the real exchange rate in two processes. On the one hand, the extension of trade taking place within industries assembles the balance of trade more reactive to real exchange rate development. On the other hand, a higher degree of upright specialization and more international supply chains act to minimize this responsiveness. According to the projection granted in this article, changes in the real exchange rate could play a substantial part on trade balance in the case of Chile, New Zealand and Argentina. This confirms that real exchange rate amendment is only part of the solution for worldwide rebalancing, and requires to be attended by other policy actions.*

Key Words: *Exchange Rate, Trade Balance, Export, Import*

INTRODUCTION

International trade is an exchange of capital, goods and services across global borders or countries without much barrier. It has twisted over the years due to the many gains it has offered to different countries across the world. In this case export means selling goods and services to another country. And when a commodity, article or services brought in from abroad for sale is import. Thus the trade balance is interchangeable to the difference between a country's production and its domestic requirement (the difference between what goods a country produces and how many goods if purchases from overseas).

When export is larger than import the country is to have a balance of trade surplus. On the other hand if imports are larger than exports, the nation is to have a balance of trade deficit.

Factors affecting trade balance: such as cost of production, exchange rate, trade agreements, and external pressure.

For countries with lowering exchange rate values, balance of trade remains objectionable. Aggressive market policies are needed to ensure that a country's trade balance remains favorable. A sound trade balance shows a significant yardstick as it reflex economic establishment between countries. It secures trade ties with other nations to stem job losses, inflation, and unemployment.

The rate of exchange plays a important rule in an open economy for policy making. After the constructive reforms, it can influence a number of factors like investment decision, trade flows, foreign direct investment, capital flows and international remittance and foreign currency reserve etc. of the economy. As the above defined reasons at this point, rate of exchange is the most compelling issue of the economic research.

Alfred Marshall and Abba Lerner and their followers are of the point of view that devaluation or depreciation of domestic currency causes the combative advantage in global market. When one

country devalues its currency as result domestic export becomes low-priced for foreign importers. On the other hand import for the same country becomes costly and cause to decline in import demand.

In this paper we will scrutinize (a) the effect of real exchange rate and foreign income on export. (b) Effect of real exchange rate and domestic income on import.

And in conclusion we will set a liaison among trade balance, real exchange rate, foreign income and domestic income.

LITERATURE REVIEW

There is no assent in the conceptual and experimental literature about any particular importance of rate of exchange polices on macroeconomics variable. For instance, Rose & Yellen (1989) and Rose (1990-1991) interpret the rate of exchange as an insignificant determinant of trade balance. On the contrary, Singh (2002) and Onafowora (2003) find the real exchange rate as a significant determinant of trade balance. The pragmatic studies on this issue is a field of the literature inspects whether the rate of exchange is a significant determinant for the trade balance in the long run .Some of them report an important impact of exchange rate movements of trade balance,(for instance ,Matesanz and fugarolas 2007, Musila and Newark 2003, singh 2002, vergil 2002) while some others find an insignificant result (for example Rose 1990, Rose 1991, Wilson 2001, Zhang 1996). Such Contrary and even adverse kind of experimental detections as the ones noted above clearly constrains any consensus and explicit prediction about the impact of rate of exchange on either balance of trade.

OBJECTIVE OF PAPER:

Our paper studies -

1) How import is affected by real exchange rate change,
2) How export is affected by real exchange rate change,
3) Role of real exchange rate on balance of trade.

DATA, VARIABLE & METHODOLOGY:

GDP (constant 2000), CPI (constant 2000), export, import, official exchange rate data for Australia, Denmark, New Zealand, Argentina, Chile are collected from the "World Development Indicators" (December 2012). Its value mentioning that annuary data is used because quarterly or monthly data of some suited variables are not accessible in the existing data sources. The annuary data used to model equation from year 1980 to 2010 obtained from databank.worldbank.org. Here we use GDP deflator as a substitute of CPI for Chile.

The study pursuits to empirically try the two country model or trade by Rose & Yellen (1991) which is applied by experimental literature in both the developing and developed nations context. The conceptual basis of the empirical model can be given as fellows:

The import basically depends on domestic income & real exchange rate.

$$M = f\,(RER,\,Y)$$

Where, M = Import, RER = Real exchange rate, Y = Domestic income.

Here, $RER = OER \times (CPI\ of\ USA \div Native\ CPI)$

OER= Official exchange rate.

That is $M = f\,(RER,\,Y)$ .... *(1)*

Similarly, the export can be defined as:

$$X = f(RER, Y^*) \ldots\ldots\ldots\ldots\ldots (2)$$

Where, X=Export, RER= Real exchange rate, Y*= Foreign income.

Thus, Real balance of trade can be written as:

$$TB = X\text{-}M$$
$$= f(RER, Y^*) - f(RER, Y)$$
$$= f(RER, Y^*, Y) \ldots\ldots\ldots\ldots\ldots (3)$$

A log-linear time series specification of the model can be stated as fellows:

$$ln\, B_t = \beta_0 + \beta_1 lnRER_t + \beta_2 lnY^*_t + \beta_3 lnY_t + U_t$$

Where $ln\, B_t$, lnX_t, lnM_t, imply logarithm of balance of trade($ln\, X_t - lnM_t$), export and import at time t, respectively . $lnRER_t$, $ln\, Y^*$, $ln\, Y$ are the logarithms of the real exchange rate, foreign income and domestic income.

The conceptual notion suggests that exports and imports rise as the foreign income and the domestic income rises commonly. Hence, we could predict $\beta_2 > 0$ and $\beta_3 < 0$. On the opposite, imports may spurn as income rises if real income increases due to an rise in the production of import-substitute goods and in that case we would predict $\beta_3 > 0$. The enact of movement in the real exchange rate on the balance of trade (B_t) is enigmatic. B_1 is the focus this study and it could be positive or negative. If real depreciation takes place, exports increase, imports fall and thus it upgrades the balance of trade. So we can predict $\beta_1 > 0$.

Analysis and estimation:
In the previous section we discussed the model and variables as well as data sources. So our model is an autoregressive model which is a log function as follows:
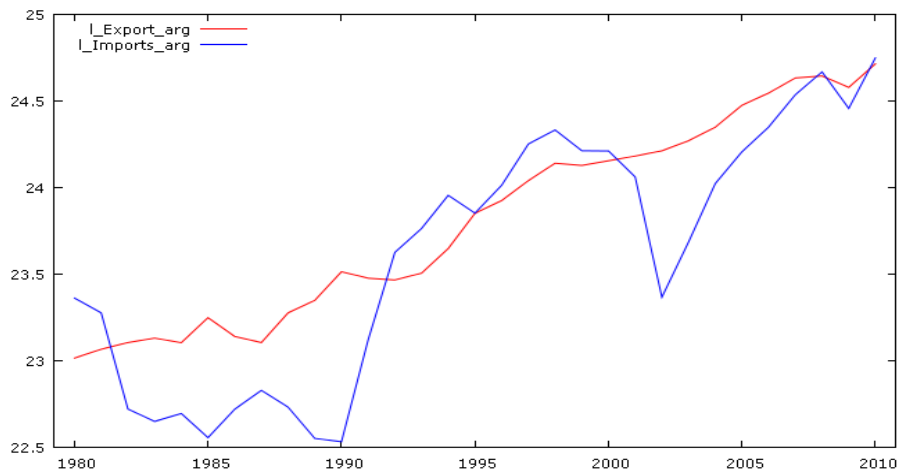
$$ln\, B_t = \beta_0 + \beta_1 lnRER_t + \beta_2 lnY^*_t + \beta_3 lnY_t + U_t$$

We took the logarithm values of all variables by using an econometric program, Gretle (2012), then we have run OLS method.
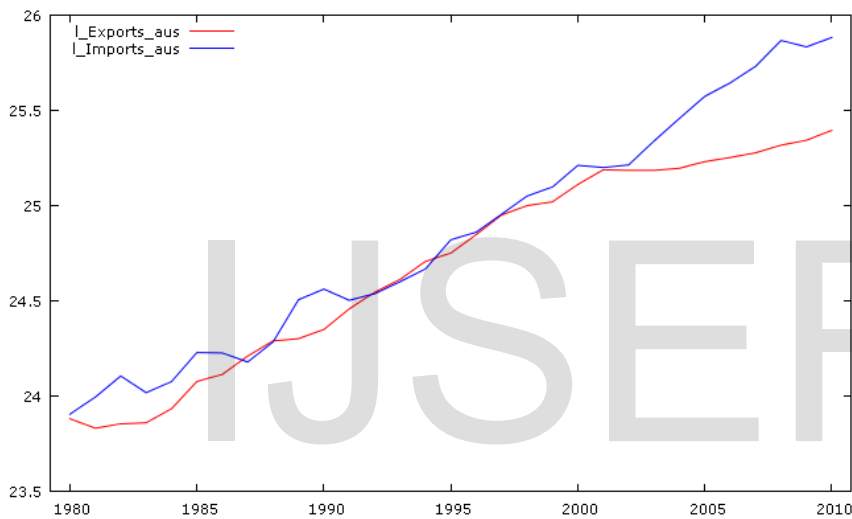
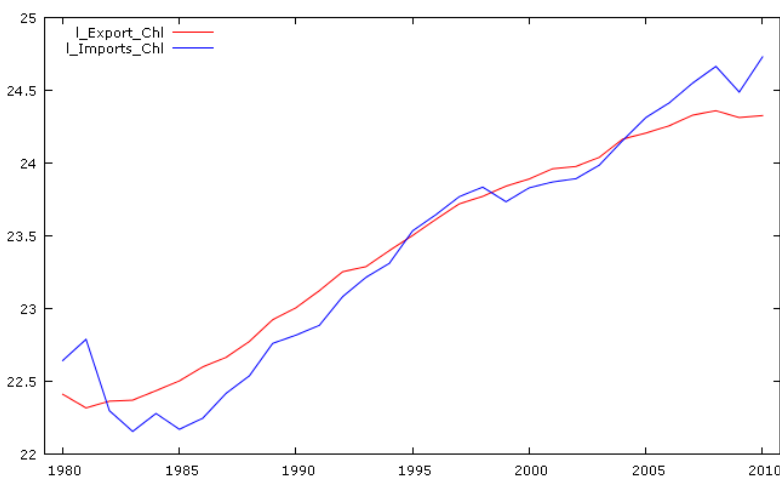**Figure -1: Export and Import of New Zealand at different periods**
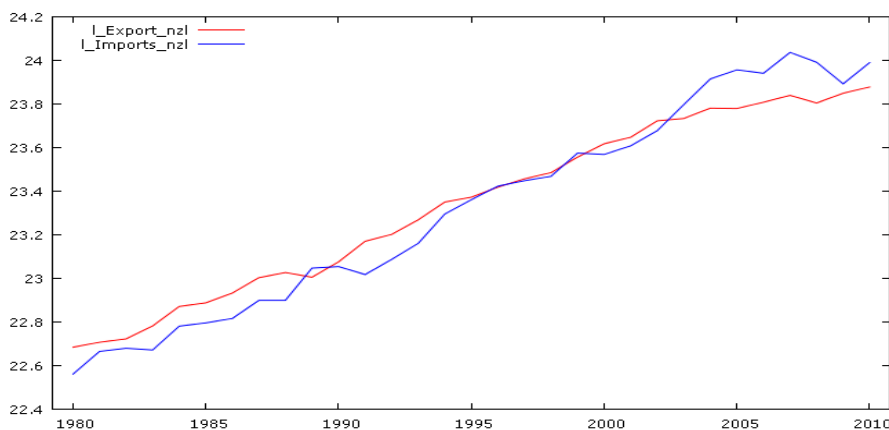
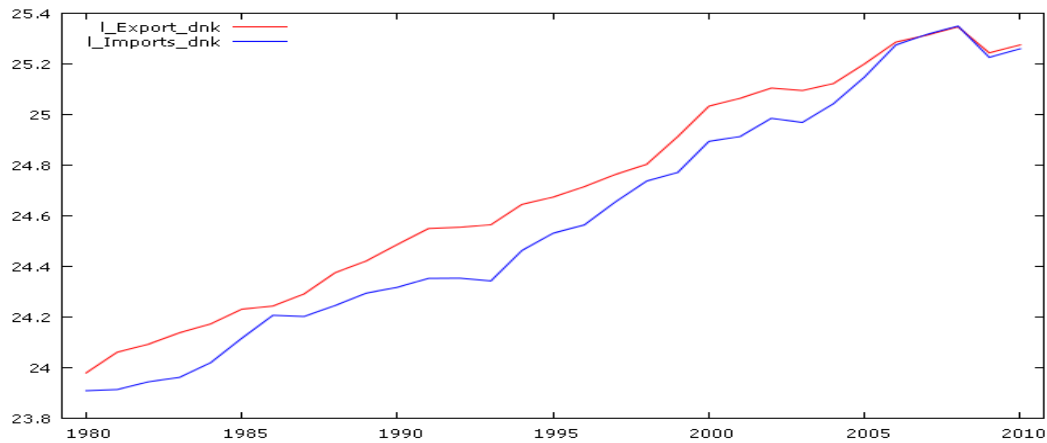**Figure -2 Export and Import of Argentina at different periods**

Figure -3 Export and Import of Australia at different periods

**Figure -4 Export and Import of Chile at different periods**

**Figure -5 Export and Import of Denmark at different periods**

Here, Fig: 1 to Fig: 5 illustrate the quantity of export and import in different periods. For New Zealand from 1980 to 2003 amount of export was greater than that of import. After 2003 import increased and export fell. For Argentina the difference between export and import was always high over time and export was greater than import. In figure-3 we see that the difference between export and import for Australia was moderate from 1980 up to 2002.But after that period imports increased significantly. Figure-4 explains that Chile made a significant change in their exports sector. From 1982 to 2004 amount of export was greater than that of import. Figure-5 illustrates that Denmark dominated in export sector at all periods.
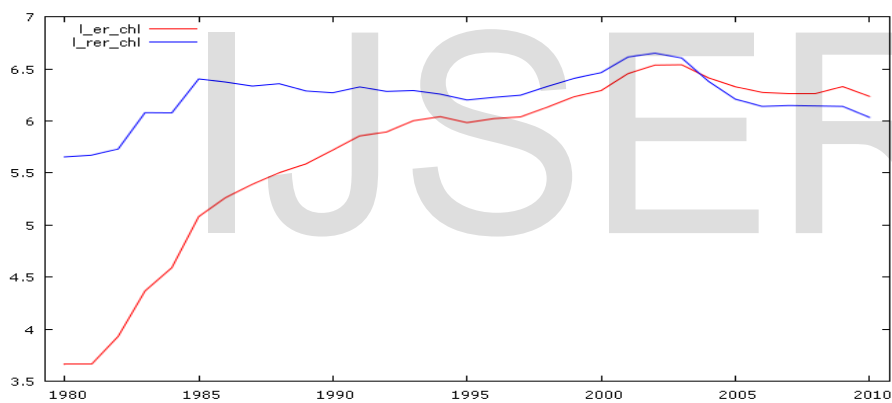
Figure -6 Official and Real exchange rate for Argentina at different periods
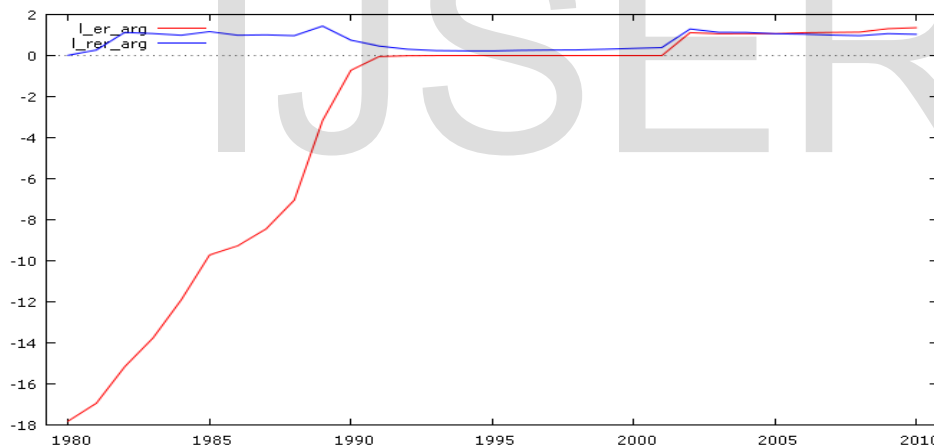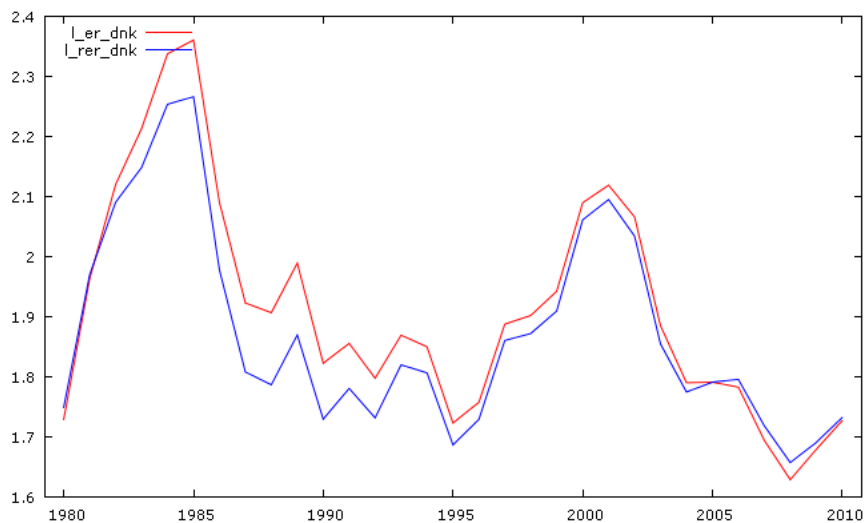

Figure -7 Official and Real exchange rate for Australia at different periods
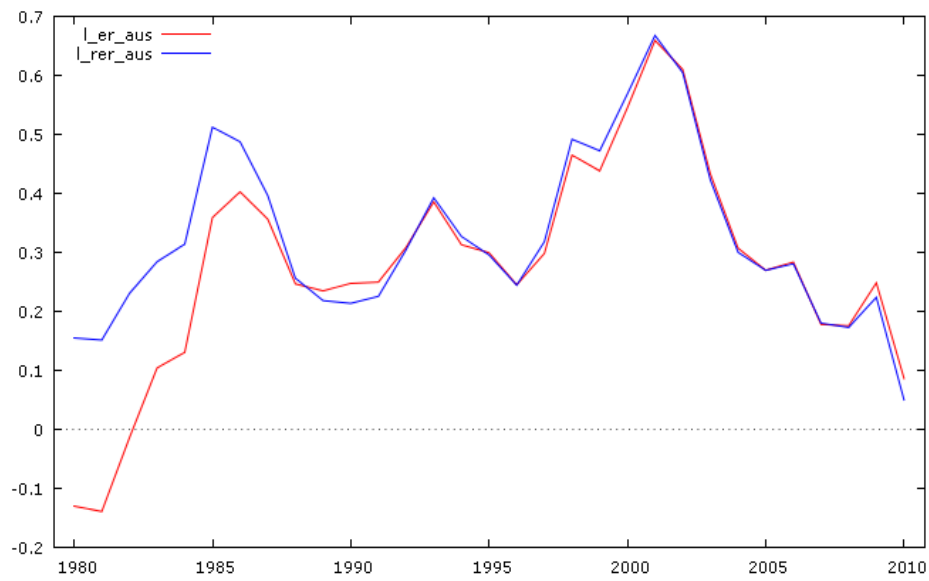
Figure -8 Official and Real exchange rate for Chile at different periods

Figure -9 Official and Real exchange rate for Denmark at different periods

Figure -10 Official and Real exchange rate for New zealand at different periods
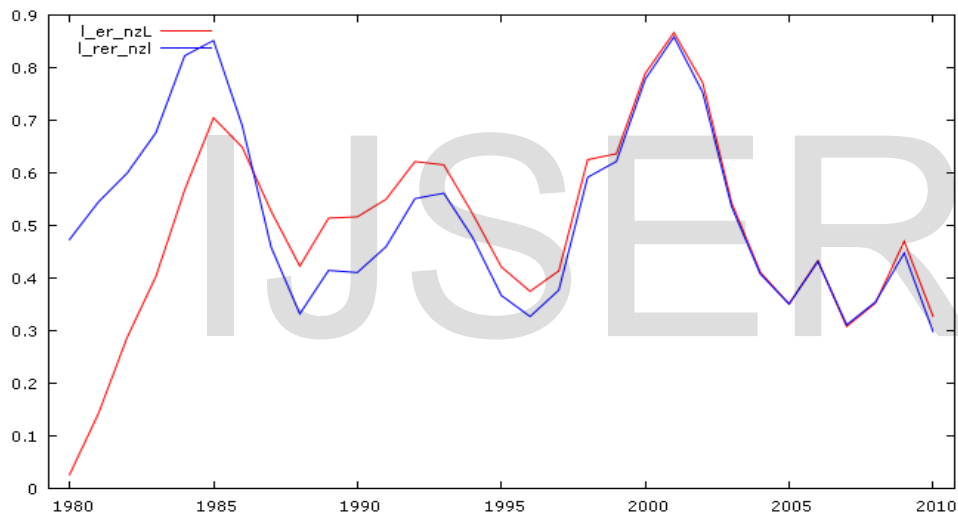

Fig: 6 to Fig: 10 illustrate the Nominal and Real Exchange Rate in different periods.

From figure-6, we find real exchange rate higher than official exchange rate till 1990 in Argentina. It could happen because of faster domestic inflation rate than trading partners in that period. After 1990 it was moderate. Figure-7 explains that the difference between real and official exchange rate for Australia tend to minimum level after 1985. In figure-8, we see that real exchange rate was higher than official exchange rate till 2004 due to high inflation. But after that period whether they could slow down inflation rate or the inflation rate of trading partners was faster than that of their one's. From figure-9, we find official exchange rate for Denmark remains higher than real exchange rate till 2005. Figure-10 shows there were ups and downs of real exchange rate and official exchange rate till 1999. But after 1999 the difference became at minimum level.

Figure-11 Gross Domestic Product for New Zealand and USA
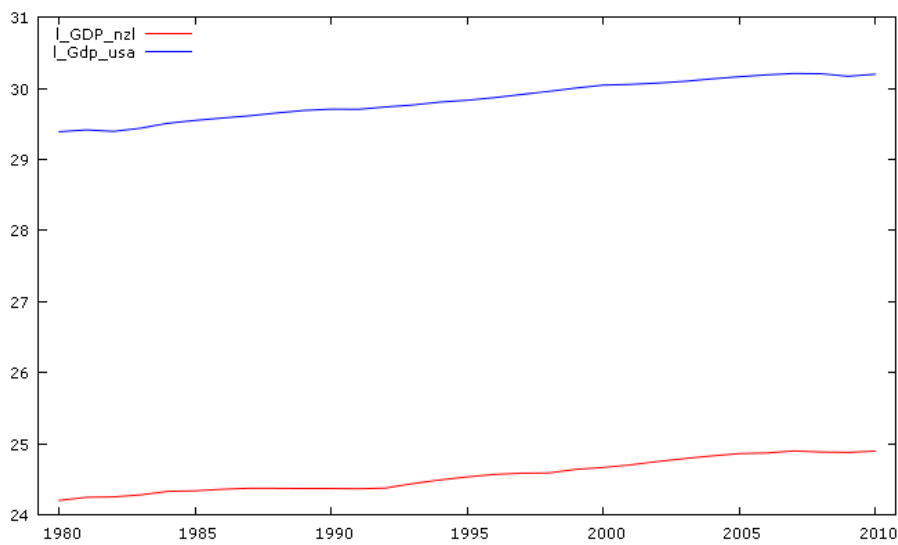
Figure-12 Gross Domestic Product for Argentina and USA
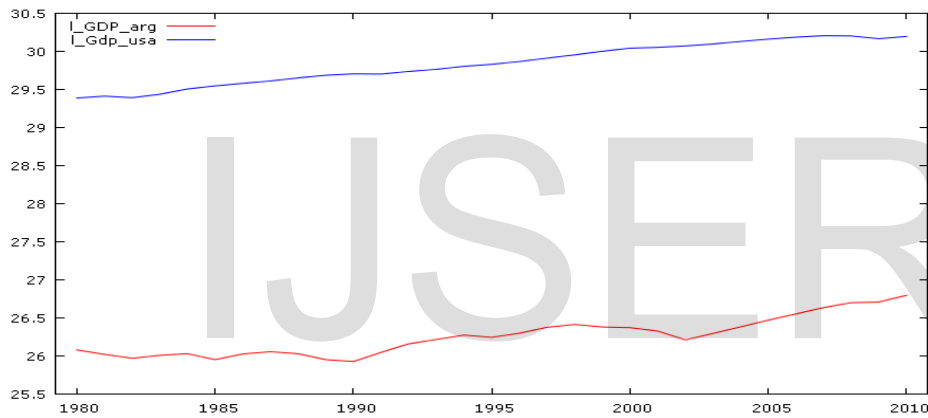
Figure-13 Gross Domestic Product for Australia and USA
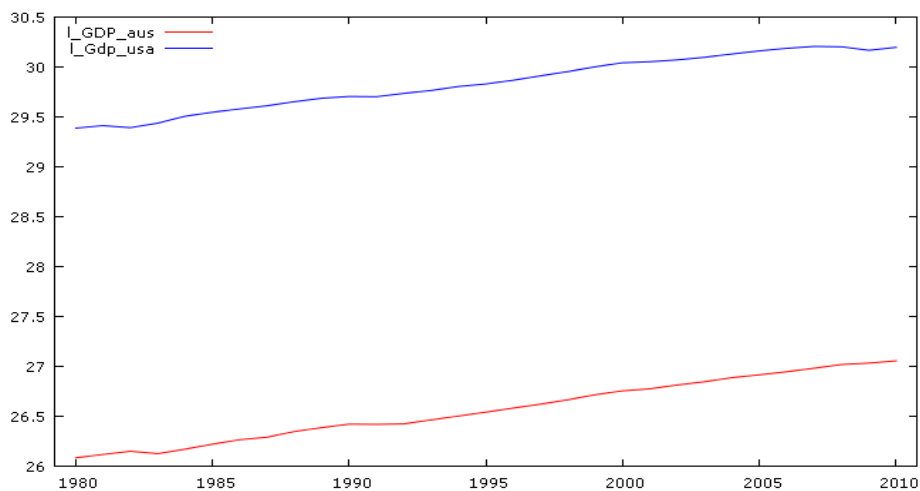
Figure-14 Gross Domestic Product for Chile and USA
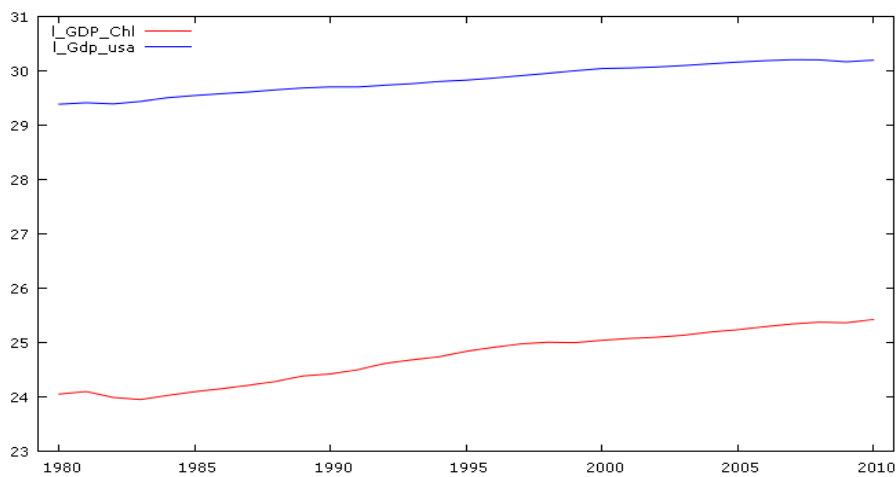
Figure-15 Gross Domestic Product for Denmark and USA
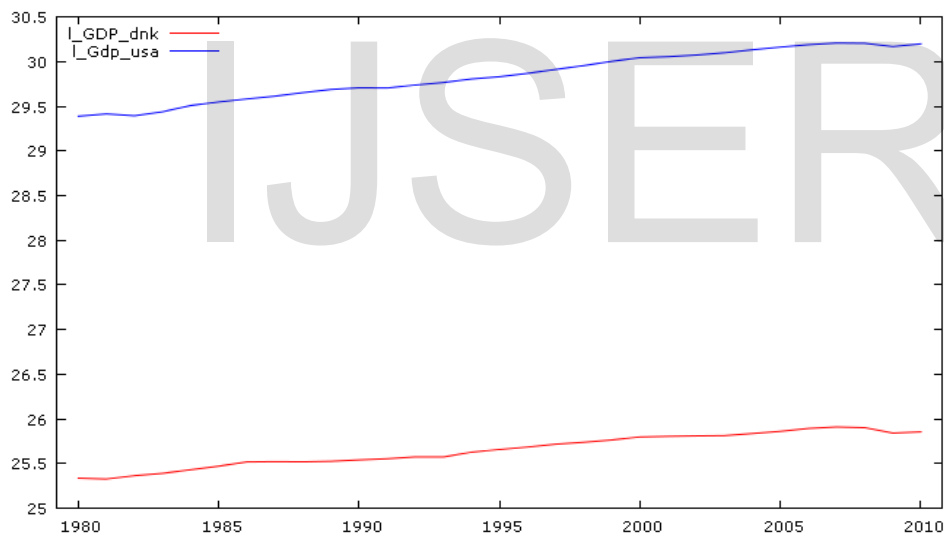
Fig: 11 to Fig: 15 illustrate the Domestic and Foreign Income (USA). US Gross Domestic product was always higher than that of countries we worked on.

Analysis and Result:

Estimated results with ordinary least square method (OLS) have been reported in the following tables:

Table 01: Regression Results Coefficients

Model 1: OLS, using observations 1980-2010 (T = 31)					
Dependent variable: Trade balance of Chile					
	Coefficient	Std. Error	t-ratio	p-value	
const	-2.47571	6.48048	-0.3820	0.70543	
l_RER_CHL	0.674676	0.0840662	8.0255	<0.00001	***
l_GDP_USA	0.386031	0.401101	0.9624	0.34438	
l_GDP_CHL	-0.534973	0.214698	-2.4918	0.01915	**

From the table 01, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.674676 implying that a one percent increase in RER increases balance of trade by 67%. Similarly a 1% increase in domestic income for Chile decreases balance of trade by approximately 54%. But coefficient of GDP of USA is 0.386031 that is a one percent increase in US GDP increases balance of trade of Chile by approximately 39 %.

Here, the 't' ratio of the coefficient of RER is 8.0255 which is significant, that is clear that RER increase, increases Trade Balance.

Similarly, the 't' ratio of the coefficient of domestic income for Chile is -2.4918 which is also significant. But 't' ratio of the coefficient GDP of USA is 0.9624. That is it is insignificant and GDP of USA has insignificant influence on Chile's trade balance.

If all other variables remaining constant the estimated regression equations is as follows :
OLS equation for Chile-

$$ln\ B_t = -2.47571 + 0.674676\ \ lnRER_t + 0.386031\ \ lnY^{*}_t - 0.534973\ lnY_t + U_t$$

Table 02: Regression results' Coefficients

01,   Table: Regression Results Coefficients

Model 2: OLS, using observations 1980-2010 (T = 31)					
Dependent variable: Trade balance of Denmark					
	Coefficient	Std. Error	t-ratio	p-value	
const	7.08177	3.43642	2.0608	0.04908	**
l_RER_DNK	0.0661338	0.0699257	0.9458	0.35265	
l_GDP_DNK	-0.701862	0.587779	-1.1941	0.24283	
l_GDP_USA	0.36563	0.399106	0.9161	0.36771	

 From the table 02, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.0661338 implying that a one percent increase in RER increases balance of trade by 6%. Similarly a 1% increase in domestic income for Denmark decreases balance of trade by approximately 70%. Coefficient of GDP of USA is 0.36563 that is a one percent increase in US GDP increases balance of trade of Chile by approximately 37 %.

 Here, the 't' ratio of the coefficient of RER is 0.9458 which is insignificant. Similarly, the 't' ratio of the coefficient of domestic income for Denmark is -1.1941 which is also insignificant. 't' ratio of the coefficient GDP of USA is 0.9624. That is it is insignificant and GDP of USA has insignificant influence on Denmark's trade balance.

If all other variables remaining constant the estimated regression equations is as follows;
OLS equation for Denmark-

$$ln\ B_t = 7.08177 + 0.0661338\ lnRER_t + 0.36563\ lnY^*_t - 0.701862\ lnY_t + U_t$$

Table 03: Regression results' Coefficients

Table: Regression Results Coefficients

Model 3: OLS, using observations 1980-2010 (T = 31)					
Dependent variable: Trade balance of New Zealand					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	7.4228	0.990228	7.4961	<0.00001	***
l_GDP_USA	0.405744	0.158706	2.5566	0.01651	**
l_RER_NZL	0.168771	0.0537291	3.1411	0.00405	***
l_GDP_NZL	-0.798525	0.188555	-4.2350	0.00024	***

From the table 03, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.168771implying that a one percent increases in RER increases balance of trade by 16%.

Similarly a 1% increase in domestic income for New Zealand decreases balance of trade by approximately 79%. But coefficient of GDP of USA is 0.405744 that is a one percent increase in US GDP increases balance of trade of New Zealand by approximately 41%

Here, the 't' ratio of the coefficient of RER is 3.1411 which is significant, that is clear that RER increase, increases Trade Balance.

Similarly, the 't' ratio of the coefficient of domestic income for New Zealand is -4.2350 which is also significant. 't' ratio of the coefficient GDP of USA is 2.5566. That is it is significant and GDP of USA has significant influence on New Zealand's trade balance.

If all other variables remaining constant the estimated regression equations is as follows;
OLS equation for New Zealand -

$$ln\ B_t = 7.4228 + 0.168771\ lnRER_t + 0.405744\ lnY^*_t - 0.798525\ lnY_t + U_t$$

Table 04: Regression results' Coefficients

Table: Regression Results Coefficients

Model 4: OLS, using observations 1980-2010 (T = 31)					
Dependent variable: Trade balance of Australia					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	-7.76227	5.10344	-1.5210	0.13989	
l_RER_AUS	0.270395	0.161065	1.6788	0.10473	
l_GDP_AUS	-2.46379	0.658592	-3.7410	0.00087	***
l_GDP_USA	2.44554	0.748049	3.2692	0.00294	***

From the table 04, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.270395 implying that a one percent increase in RER increases balance of trade by 27%. Similarly a 1% increase in domestic income for Australia decreases balance of trade by approximately

246%. Coefficient of GDP of USA is 2.44554 that is a one percent increase in US GDP increases balance of trade of Australia by approximately 244 %.

Here, the 't' ratio of the coefficient of RER is 1.6788 which is insignificant, that is clear that RER has less influence on Trade Balance.

Similarly, the 't' ratio of the coefficient of domestic income for Australia is -3.7410 which is also significant. But 't' ratio of the coefficient GDP of USA is 3.2692. That is it is significant and GDP of USA has significant influence on Australia's trade balance.

If all other variables remaining constant the estimated regression equations is as follows ;

OLS equation for Australia -

$$ln\ B_t = -7.76227 + 0.270395\ lnRER_t + 2.44554\ lnY^*_t - 2.46379 lnY_t + U_t$$

Table 05: Regression results' Coefficients

Table: Regression Results Coefficients

Model 5 :OLS, using observations 1980-2010 (T = 31)					
Dependent variable: Trade balance of Argentina					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	12.4864	2.47519	5.0446	0.00003	***
l_RER_ARG	0.577404	0.0555314	10.3978	<0.00001	***
l_GDP_ARG	-1.6144	0.196065	-8.2340	<0.00001	***
l_GDP_USA	0.994167	0.179549	5.5370	<0.00001	***

From the table 05, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.577404 implying that a one percent increase in RER increases balance of trade by 57%.

Similarly a 1% increase in domestic income for Argentina decreases balance of trade by approximately 161%. But coefficient of GDP of USA is 0.994167 that is a one percent increase in US GDP increases balance of trade of Argentina by approximately 99 %.

Here, the 't' ratio of the coefficient of RER is 10.3978 which is significant, that is clear that RER increase, increases Trade Balance. Similarly, the 't' ratio of the coefficient of domestic income for Argentina is -8.2340 which is also significant. But 't' ratio of the coefficient GDP of USA is 5.5370. That is it is significant and GDP of USA has significant influence on Argentina's trade balance.

If all other variables remaining constant the estimated regression equations is as follows;
OLS equation for Argentina -

$$ln\ B_t = 12.4864 + 0.577404 lnRER_t + 0.994167 lnY^*_t - 1.6144 lnY_t + U_t$$

CONCLUSION

The findings of this Paper shows that real depreciation/appreciation of rate of exchange has positive/negative impact on trade balance. But the policy makers and economists are hesitant to depreciate local currency because it can negatively affect other macroeconomic factors such monetary aggregate, rate of interest and inflation etc. Moreover complete integrity of trading nation is also the key element to determine the trade flows. This paper finds significant role of rate of exchange on balance of trade of Chile, New Zealand and Argentina. On the other hand the role is insignificant in the case of Denmark and Australia.

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Appendixes