

EXCHANGE RATE, J CURVE AND DEBT BURDEN OF PAKISTAN

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Abstract. The exchange rate is used as a policy variable to control the balance of trade. The famous J curve theory states that depreciation of local currency will make the foreign goods expensive for the locals and local goods cheaper for the foreigners, which implies that the imports will decrease and the exports will increase, causing improvement in balance of trade. However, this study and many earlier studies found no evidence for existence of J curve for Pakistani trade data. The J curve theory will work only if the imports and exports are elastic enough to the movement of exchange rate. Major portion of Pakistani imports consists of necessities and shows no response to exchange rate movements. Therefore, the currency depreciation will cause a rise in the value of imports as well as increase the amount of external debt measured in local currency. Given the heavy amount of external debt payable, the currency depreciation will put heavy burden on economy of the country. Therefore, the net result of currency depreciation is simultaneous increase in import bill and the debt burden. We recommend that policy of stabilizing the exchange rate should be adopted in order to protect the country against the increase in debt burden.

Keywords: External debt, J curve, Exchange rate

JEL classification: F12, F13, F34

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I. INTRODUCTION

This research concerns the exchange rate which can increase average loan burden per individual by thousands rupees overnight. Consider a realistic example, according to official statistics on the State Bank of Pakistan (SBP) website, total external debt on Pakistan was over US \$ 61 billion by the end of 2011. Suppose the value of dollar goes up by one in exchange of Pakistani rupee, this means an increase in debt by 61 billion Pakistani rupees. If this burden is divided among 180 million citizens of Pakistan, the loan burden on every individual (including women and children) would increase by 338 rupees. Since 22.6% individuals in Pakistan have earning below 30 rupees a day,¹ this is a drastic burden to be faced by the individuals. The total amount of debt on Pakistan during 2007 was \$ 44 billion which is equal to PKR 2860 billion with the exchange rate prevailing in 2007. Excluding the incoming/repayment of debt during next years, this amount rose to PKR 4004 billion in 2012 due to change in the exchange rate. Hence, average burden per individual rose by 6350 rupees. Therefore, it is necessary to critically analyze the movements in exchange rate and its impact on economic indicators to protect the interest of the people of Pakistan.

II. WHAT IS THE BENEFIT OF EXCHANGE RATE DEPRECIATION?

Value of Pak rupee against US \$ has been on continuous decline since last three decades. Official exchange rate of PKR declined from PKR 10/\$ in 1980 to PKR 90/\$ in 2011. The exchange rate system adopted by Pakistan is floating depending on market conditions; however, it is frequently adjusted in hope of improving balance of trade. The following two arguments are presented to justify the currency depreciation:

1. Currency devaluation switches the consumption of goods from foreign goods to domestic goods. By currency devaluation, the foreign goods become expensive, therefore, the people switch from the consumption of foreign goods to the domestic goods. Similarly, the local goods will become cheaper for the foreigners and the export will rise. This will improve the trade balance and will promote the local production of goods.

¹The population below \$ 1 poverty line, as displayed in CIA World Fact Book, is 22.6% and 1 PPP \$ is equivalent to PKR 30.

2. The devaluation of money will reduce the real value of cash balance and will improve real price of the traded and non-traded goods, thus, the trade of goods and services will improve.

The strongest argument in favour of currency depreciation is so-called J curve phenomenon. The J curve phenomenon states that when value of local currency goes down as compared to foreign currency, the exports become cheaper and imports become expensive. This phenomenon causes trade deficit in the short-run since the import bill increases by expensiveness of foreign currency. However, eventually the domestic goods become more competitive in the international market due to which foreign demand of local goods increases, bringing an improvement in the trade balance.

III. EMPIRICAL STUDIES ON J CURVE

The existence of J curve has attracted reasonable amount of interest of the researchers. Many of the researchers have found evidence for the existence of J curve while many others have challenged the existence of J curve based on empirical evidence. For example, Chinn (1991) points out that the value of US \$ decreased by about 40% during 1985-1987 compared to G-7 countries, but the trade deficit of US remained increasing. US faced record trade deficit of \$ 110 billion in 1987. If the J curve was functional, 2-years gap was sufficient period to recover from the initial deficit hypothesized in J curve and US should have achieved a trade surplus but it does not happened. For the Pakistani trade data, several people have investigated existence of J curve between Pakistan and its trade partners and most of them found no evidence of the existence of J curve phenomenon

Zahra and Sajawal (2008) found no evidence of J curve. Also, Shahbaz, Jalil and Islam (2010) found the non-existence of the J curve phenomena in Pakistani exports. On the other hand, Abid and Shehla (2009) found presence of J curve phenomena from Pakistani data with its ten trading partners. They also argued that rapid impact of devaluation on the trade balance failed to identify the J curve. Sulaiman and Adnan (2010) showed that depreciation of exchange rate has positive impact on the balance of trade favouring the existence of J curve.

Using the simple descriptive analysis to latest and sophisticated econometric techniques, this study attempts to establish that the J curve does not exist in Pakistan trade data. However, even if we assume that the J curve exists, we show that the currency depreciation is not in favour of Pakistan because the increase in debt burden, due to depreciation, is much more than any possible improvement in trade. Improvements in exports cannot offset

the loss in years by increase in external debt overnight. Therefore, there is a need of policies to stabilize the local currency against the foreigner currencies to protect against the increase in debt burden.

IV. DATA

The data used in this empirical analysis is extracted form the WDI 2010 database. The data contain following variables:

E	Exchange rate (PKR/\$)
X	Exports (LCU current)
M	Imports (LCU current)
BOT	Exports – Imports = X – M

The exports and imports are taken in nominal terms.

V. STATIONARITY TESTING

Before we proceed toward empirical analysis, it is important to investigate the stationarity properties of the data series used in the investigation. The properties of most of statistical estimators and tests crucially depend on the assumption of stationarity. Following the recommendation of Rehman (2011) we apply Phillips Perron test to this data set. The results are given in Table 1.

TABLE 1
Testing Stationarity

Variable	Exogenous	Phillips Perron Test Statistic	P-Value	Decision
BoT	Intercept	-1.91	0.32	BoT~I(1)
D(BoT)	None	-6.08	0.00**	
X	Intercept	2.10	0.99	X~I(1)
D(X)	None	-6.13	0.00**	
M	Intercept	-0.33	0.51	M~I(1)
D(M)	None	-5.12	0.00**	
E	Intercept	1.16	0.99	M~I(1)
D(E)	None	-3.28	0.00**	

**Significance at 1% level. Lag length has been selected by MAIC. Based on the recommendations of Rehman (2011) and Elder and Kennedy (2011), the intercept is included for level series but not included for the difference series.

The results show that the variables are unit root, therefore, either the first difference of these variables should be used or there should be cointegration that is necessary to have a valid regression. The following analysis has been carried out keeping in view these properties of the data.

VI. J CURVE FOR PAKISTAN RE-EXAMINED

We have investigated the relationship between the exchange rate and the exports, imports and the balance of trade using several methods from simple descriptive analysis to sophisticated econometric techniques and none of them was able to find the relationship between these variables.

Evidence for the Absence of J Curve in Pakistan Trade

The first evidence we present is the correlation matrix for exchange rate, exports, imports and balance of trade. The growth rate (% change rate of each variable) is used to construct the matrix. As we have presented evidences that difference of all variables is stationary, the correlation is meaningful for these variables. The results are given in Table 2.

TABLE 2
Correlation Matrix

	Xg	Mg	$BOTg$	Eg
Xg	1			
Mg	0.180	1		
$BOTg$	-0.005	0.002	1	
Eg	-0.316	-0.392	-0.154	1

Xg : Export growth rate; Mg : Import growth rate; $BOTg$: Balance of trade growth rate; Eg : Exchange rate growth

The correlation matrix shows that there is negative relation between exchange rate and balance of trade which means that the currency depreciation further destroys the balance of trade instead of improving it. However, there are two possible explanations for this observation:

- (a) This observation is consistent with the standard J curve because the J curve phenomenon says that the balance of trade will deteriorate for some time and then it will start improving.

- (b) The exports and/or imports are inelastic and do not respond to changes in exchange rate.

To further distinguish between the two reasons mentioned above, we can inspect lag value of currency depreciation and can see its impact on the balance of trade. The result of this exercise is given in Table 3.

TABLE 3
Correlation Matrix with Lags

Matrix of Correlation between Trade and Lag(1) Exchange Rate				
	Xg	Mg	BOTg	Eg(-1)
Xg	1			
Mg	0.181	1		
Bg	-0.006	0.002	1	
Eg(-1)	-0.047	-0.163	0.048	1
Matrix of Correlation between Trade and Lag(2) Exchange Rate				
	Xg	Mg	BOTg	Eg(-2)
X	1			
Mg	0.180	1		
BOTg	-0.007	0.001	1	
Eg(-2)	-0.238	0.055	0.068	1

These results show that the effect of lag terms of currency depreciation is insignificant. No improvement in balance of trade is observed for next three years.

Granger Causality Testing

We also use Granger Causality test for finding the relation between exchange rate and trade. The procedure for Granger Causality is described as follows: Regress the BoT on lag values of BoT and the lag values of Exchange Rate. Test the exclusion restriction on all lags of exchange rate, if the joint exclusion restriction on all lags of exchange rate is valid, than exchange rate will have no effect on trade, and exchange rate will not be Granger Causing BoT. The data in growth terms is used in order to avoid the incidence of spurious regression.

TABLE 4
Causality Testing

Pairwise Granger Causality Tests; Sample: 1961 2005; Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
Mg does not Granger Cause Xg	43	0.087	0.92
Xg does not Granger Cause Mg		0.978	0.39
Eg does not Granger Cause Xg	43	1.847	0.17
Xg does not Granger Cause Eg		0.554	0.58
Eg does not Granger Cause Mg	43	4.164	0.02
Mg does not Granger Cause Eg		5.234	0.01

Table 4 shows that none of these variables granger causes each other except Eg and Mg which are causing each other. In particular these results do not support the J curve phenomenon.

TABLE 5
Cointegration Testing

Series: EXPORTS IMPORTS EXCHANGE RATE				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.360	39.145	42.915	0.113
At most 1	0.254	19.971	25.872	0.227
At most 2	0.157	7.3658	12.518	0.308
Trace test indicates no cointegration at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigen value)				
Hypothesized No of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.360	19.174	25.823	0.294
At most 1	0.254	12.605	19.387	0.361
At most 2	0.157	7.366	12.518	0.308

Cointegration Testing

The data we used for testing Granger Causality was in difference form, since testing the causality requires data. However, this type of analysis will give information about the short-run only. We saw that there is no relation

between exchange rate and BoT in the short-run. For testing the long-run relationship, we apply the Johansen cointegration test.

The results of both Trace test and Max-eigen test indicate that the null hypothesis of no cointegration is not rejected by the data. These results clearly show that there is no long-run relationship between the exchange rate and exports/imports, therefore, no evidence for existence of J curve. The results of Johansen cointegration are summarized below given Table 5.

VII. WHY J CURVE DOES NOT EXIST?

The ineffectiveness of J curve is explained by so-called Marshal-Lerner condition. The Marshal Lerner condition states that both imports and exports should be elastic enough in order to improve the trade balance. If the imports are inelastic, the devaluation of local currency will cause an increase in the import bill.

TABLE 5

Composition of Pakistani Imports in 2010-11

Petroleum Products	840,919	28.89%
Chemicals	327,567	11.25%
Drugs & Medicine	60,056	2.06%
Dyes and Colors	25,061	0.86%
Chemical Fertilizers	79,541	2.73%
Electrical Goods	56,204	1.93%
Machinery non electrical	397,682	13.66%
Transport Equipment	163,006	5.60%
Paper and Stationary	31,797	1.09%
Tea	22,712	0.78%
Sugar Refined	24,731	0.85%
Art Silk Yarn	31,315	1.08%
Iron and Steel	135,023	4.64%
No-Ferrous Metals	30,477	1.05%
Oil and Vegetable	114,255	3.92%
Grains and Pulses	34,321	1.18%
Other	536,300	18.42%
Total	2910,975	100%

Source: Federal Bureau of Statistics

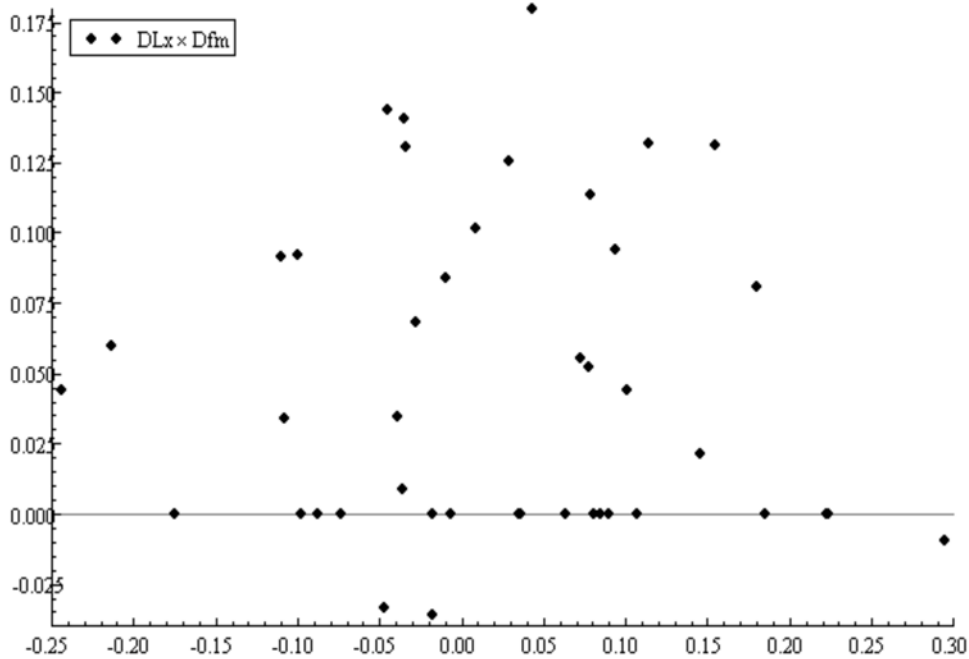
Similarly, if the exports are inelastic, the devaluation will not increase the currency value of exported good. The cure will become worse than disease in the absence of enough elasticity of the exports/imports. Therefore, it becomes very important to examine the export and import portfolio of Pakistan. Table 5 gives composition of Pakistani imports during financial year 2010-11.

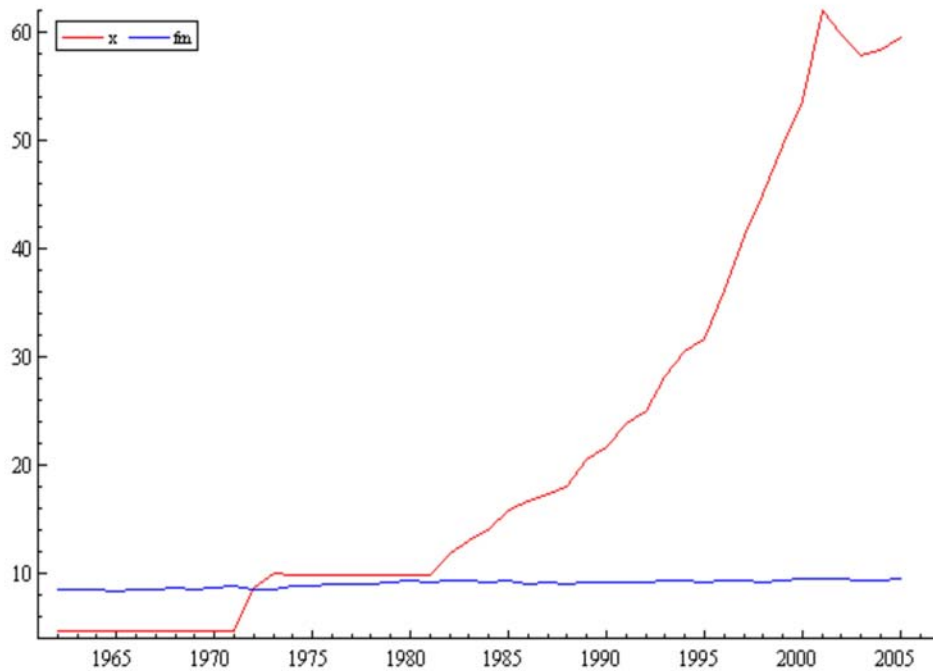
Major imports of Pakistan include Petroleum, Machinery, Chemicals, Drugs and Fertilizers. Petroleum constitutes about 29% of the total imports of Pakistan, and the demand of petroleum products is highly inelastic. Due the inelastic nature of these imports, the currency depreciation will only increase the import bill in terms of local currency. Figure 1 shows the relationship between imports of fuel and the exchange rate in Pakistan.

Figure 1 shows the cross plot of exchange rate and imports of fuel for Pakistan. It seems that there is no relationship between the two variables. The right panel shows the time series plot of the two series. The imports of fuel rise continuously regardless of the fluctuation of exchange rates.

FIGURE 1

Exchange Rate and Fuel Imports





The relationship between exchange rate and the prices was estimated using following ARDL model:

$$FM_t = a + b_1M_{t-1} + b_2X_t + b_3X_{t-1} + e$$

The static long-run solution shows that the relationship between two variables is not supported. This shows that the exchange rate movement is incapable to control the most important item in the import bill.

Similarly the other important items are chemicals, drugs and fertilizers. All of these items seem to be inelastic at the first look while, in fact, they are. Even if these items were elastic, it would not be feasible to cut down imports of these good since these items are either very important for individuals or for the economic activities. The reduction in imports of fertilizers and chemicals will reduce production in both agriculture and manufacturing. The reduction in imports of medicine and drugs will affect the health indicators of the countries. These items constitute about half of the total imports of Pakistan and it is not in the interest of country to reduce imports of these countries.

TABLE 6
ARDL Model for Fuel Imports
Dependent Variable: Fuel Imports (FM)

	Coefficient	Std. Error	t-value	t-prob
FM_1	0.874	0.0798	11.0	0.00
Constant	1.127	0.699	1.61	0.12
E	-0.0002	0.010	-0.02	0.98
E_1	0.002	0.010	0.19	0.85
Sigma	0.117		RSS	0.534
R ²	0.893		F(3,39)	108.6 [0.000]**
log-likelihood	33.343		DW	2.23
No. of observations	43		No. of parameters	4
Mean (FM)	9.09128		var(FM)	0.11613
Solved static long-run equation for fm				
	Coefficient	Std. Error	t-value	t-prob
Constant	8.97051		0.2617	34.3 0.0000
E	0.0136244		0.008532	1.60 0.1180
Long-run sigma = 0.931437				
ECM = FM – 8.97051 – 0.0136244*x				

VIII. ELASTICITY OF PAKISTANI EXPORTS

Our major exports include textile, leather items, sports material etc. The exports are facing challenges that have no direct relationship with exchange rate. A few years ago, Pakistani sports items were preferred for international sports events, now the Pakistani product has been abandoned not due to the exchange rate, but due to the concerns of international community about violation of labour laws in Pakistan. Now a days, the biggest challenge for Pakistani industry is provision of cheap and continuous electricity and other necessary inputs. The exports of Pakistan are facing very tough competition by the China and India, the two neighbours of Pakistan. A policy of

introducing incentives for the investors is proven to be more effective than the exchange rate policy.

Figure 2 shows relationship between percentage changes in exchange rate (Xg) and export growth (Xg). Figure 2 shows that there is no relationship between the two variables.

FIGURE 2
Exchange Rate and Exports

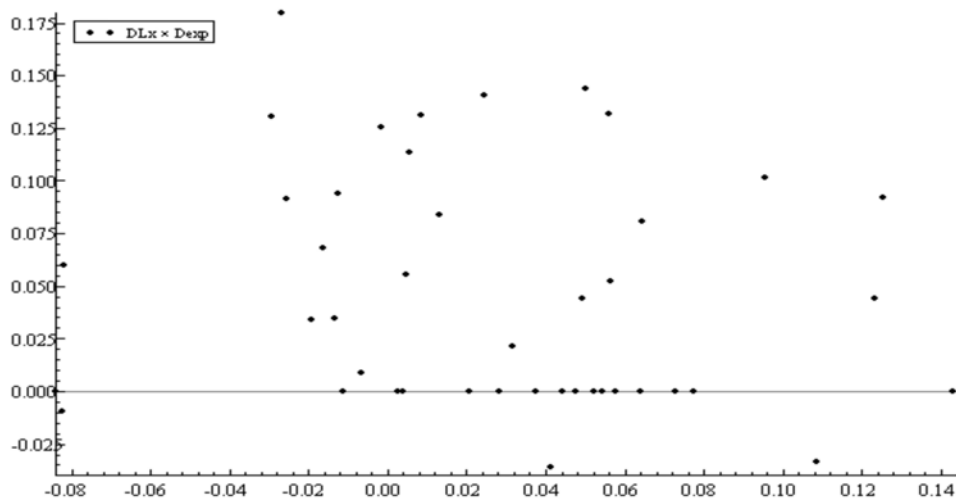


Figure 2 shows the story similar to the graph of exchange rate versus the imports. There is no significant relationship between the two variables. The growth of exports is independent of the movement in exchange rate.

Since the variables used in these graphs are in difference form (growth rate), the long-run information cannot be inferred from these graphs. In order to see the long-run relation between two variables, we estimate ARDL model with 1 lag of both variables. The results of ARDL model are summarized in Table 7.

As Table 7 shows, the estimate of long-run relationship is insignificant. In other words the imports/exports show no elasticity to the changes in exchange rate. Therefore, the Marshal Lerner conditions for the existence of J curve are not fulfilled. This shows that the exchange rate is not effective, neither in controlling the imports, nor exports. Therefore, the J curve based policies for exchange rate must be revisited.

TABLE 7
Cointegration Testing

Modeling exp by OLS; The estimation sample is: 1963-2005				
	Coefficient	Std. Error	t-value	t-prob
X_1	0.9499	0.05693	16.7	0.0000
Constant	0.4918	0.5276	0.932	0.3571
E	-0.0053	0.0046	-1.15	0.2584
E_1	0.0064	0.0046	1.41	0.1674
Sigma	0.0522		RSS	0.1066
R^2	0.976698		DW	2.11
Solved static long-run equation for exp				
	Coefficient	Std. Error	t-value	t-prob
Constant	9.8169	0.6748	14.5	0.0000
E	0.0226	0.0127	1.79	0.0816
Long-run sigma = 1.0436				
ECM = exp - 9.8169 - 0.0226*x				
WALD test: Chi^2(1) = 3.1881 [0.0742]				

IX. IS THE J CURVE ARGUMENT PLAUSIBLE TO SUPPORT DEPRECIATION?

The empirical evidences do not support existence of J curve. However, if the J curve exists, this does not support depreciation policy in case of Pakistan. This is because the increase in debt volume due to depreciation is much higher than the expected benefit of improvement in the trade balance. The historical record shows that maximum improvement in trade balance was during 1990-91, *i.e.* about \$ 2.7 billion, whereas the depreciation during this year had increased debt burden by about \$ 3 billion. So where are the gains of depreciation?

It would be interesting to cite that the total improvement in trade balance during 2000-2005 is negative, indicating deficit of about PKR 60 billion. Meanwhile the amount of total debt of Pakistan in 2000 rose by about PKR 200 billion during the same period. The net result of depreciation is obvious.

X. EXCHANGE RATE AND FOREIGN DEBT

On one hand, we have shown that the so-called J curve hypothesis is not supported by the data, *i.e.* exchange rate movements are incapable of controlling the trade balance. On the other hand, it is shown that the changes in exchange rate have severe impact on the life of citizens by increasing the loan burden.

Figure 3 shows increase in burden of debt due to currency depreciation and the improvement in balance of trade for the period 1982-2007.

FIGURE 3

Changes in Debt and Balance of Trade During 1982-2007

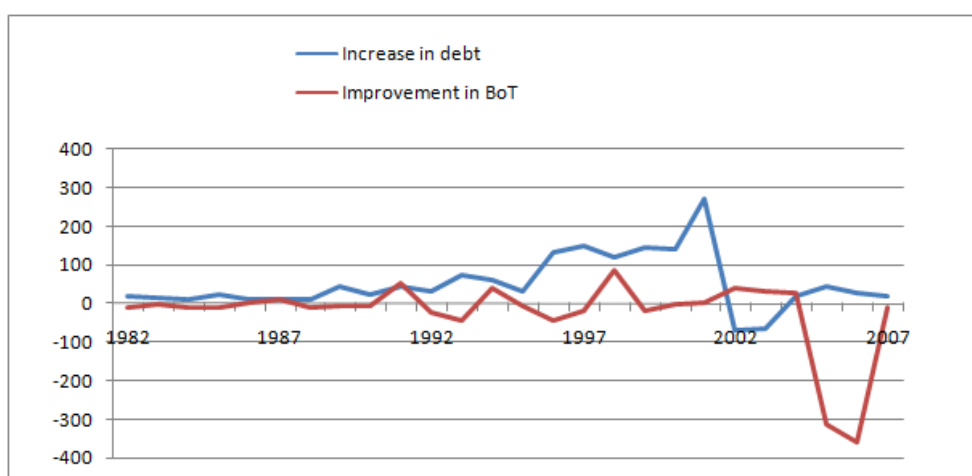


Figure 3 shows that the increase in debt burden is greater than the improvement in balance of trade for approximately all of the sample period. This implies that the net result of depreciation is loss, even if we assume all the improvements in BoT are because of currency depreciation.

The largest depreciation in Pakistani rupee occurred during 1972 when the exchange rate changed from PKR 4.76/\$ to PKR 8.68/\$. This depreciation caused an increase of about 85% in the debt burden. The amount of debt in 1971 was 3.79 billion dollars, which is equivalent to 18.07 billion Pakistani rupees at the exchange rate of 1972. The same debt amounts to 32.95 billion rupees when converted at 1972 exchange rate. Therefore, the rise in debt burden is 14.87 billion rupees. The total rise in exports during next 5 years was PKR 10.5 billion whereas the one time increase of debt burden due to depreciation in just one year is equal to PKR 14.87 billion.

XI. ETHICAL ASPECT OF DEPRECIATION

Suppose the J curve was functional, the immediate expected beneficiaries of depreciation are the persons involved in import-export business who belong to upper cohort of the society. People who will lose are all the citizens who have to purchase the petroleum at higher cost. In particular the loss of depreciation is to be faced by the low income cohort of the society. So even if the J curve exists, the currency depreciation can be challenged on ethical grounds. So the question remains: is it morally justified to depreciate the currency given the scenario stated above?

XII. CONCLUSION

Based on the evidence from the previous research and from the empirical results presented in this paper, it is obvious that the exchange rate is not effective in improving the trade balance. Also we show that the currency depreciation increases the burden on Pakistani economy in the form of increased external debt. It has been shown the burden of debt that increases due to depreciation is some time greater than total volume of trade between Pakistan and its partners. Therefore, it is recommended that SBP must not depreciate domestic currency as a policy variable to improve the balance of trade. Also SBP should adopt a policy of protecting the value of Pakistani rupee against foreign currencies in order to protect against the rise in debt burden.

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