**An Analysis of Exchange Rate, J Curve and Debt Burden in Pakistan: An Analysis of Bound Testing**

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**Abstract**

Rate of exchange is a significant monetary variable that control balance of trade. J curve theory explains that depreciation in domestic currency wills sure that foreign goods costly for the domestic persons and domestic goods are inexpensive for the other country. In this result, imports will reduce and exports will rises. Therefore, trade balance would be improved. This theory proved that J curve have no exist in Pakistan because imports of Pakistan contains a large numbers of necessities and this imports present no movement in exchange rate. Therefore, rate of exchange and balance of trade both have negative relationship. Debt and GDP have positive related with each other because Government of Pakistan takes the debt to promote the economic growth. This study opens new perspectives for the decision makers.

**Keywords:** Exchange Rate, Debt, Gross Domestic Product, Debt Burden, Pakistan

**INTRODUCTION**

This economic research is about to the exchange rate, J curve and total burden of debt and J curve. The burden of debt per person increased day by day at every day. According to the economically data, in 2016 the total debt in Pakistan had been raised to 729878 USD million and now- a- days the average of debt in Pakistan is 50697.67 USD million. When the value of exchange rate is 104.80 and due to this, let the value of dollar increase by 1 % then the debt would be surprised by increase. That is why, the burden of debt on every individual rapidly increase. Almost 22.5% Pakistani are obtaining under 40 rupee per day that is the serious problem which is to be bear by every persons in the country. During the time of 2007, the value of 44 billion dollar which was equal to PKR 2860 billion. Therefore, the debt which have included internal and external amount within 6 year, it was big aggregate to 4667 PKR/ Billion at the end of 2013 had due to exchange rate of changing. Since the previous three decades, the exchange rate of Pakistan especially in U.S dollar would have is decrease. Due to this time, Pakistan has been adopted the floating exchange rate system. The favouritism of vigorous view in all economists had the depreciation of the currency that is called the concept of J curve phenomenon .When we study the J curve; we should be kept in mind the following two views
to explain the depreciation of currency:

1. When the domestic currency depreciate than the foreign currency. As a result, local goods or exports will be cheaper as soon as the compared to the imports goods. In this result, exports are greater than imports. That is cause by enhance the trade balance and local goods will become more aggressive in other foreigners markets and demand of local goods will increase.

2. On the other way, when the foreign currency appreciate than the local currency, foreign currency goes up as compared to the home currency then home goods will be cheaper. This becomes cause the trade deficit because bills of foreign will increase by the appreciation in foreign currency.

The real use of cash balance will decrease due to devaluation of money and the price of real tradable goods and non-tradable goods have been improved. However, the important concept of determining the trade balance is the imports elasticity. The major parts of Pakistani imports consist of oil, capital machinery, different fertilizer, vegetables, dyes, grains, tea and pulses etc. Developing countries have the deficit in trade balance when they have local currency devaluated as a significant tool. The values of local currency into extend currency had been increase the price of local imports and decline in the price of external exports (Ali and Mustafa 2012).

LITERATURE REVIEW

In this section, researcher exhibited the review of studies related to debt burden, exchange rate and j-curve for the case of developed and developing states. Mendoza, (1995) explained the association amid rate of exchange and terms of trade and its impact on economic fluctuations was. The conclusion point of this study showed that exchange rate and terms of trade had low and positive correlated due to purchasing power of purity. Arize, Osang and Slottje (2000) analysed amid the volatility of foreign trade and exchange rate. This study contained the 13 lower developed countries (LDC). They used quarterly data from the session of 1973 to 1996. They used the Johnson’s multivariate and error correction model. When they applied the Granger causality, estimates exhibited that exchange rate volatility had Granger cause with net export’s.

Boyd, Caporale and Smith (2001) argued the Marshall-Lerner conditions with trade balance and real exchange rate. They had taken the variables of trade balance, real GDP, CPI and real exchange rate that examined in this research. They took the quarterly data till February 2001. They selected 4 lags on the base of Akaike information criteria (AIC). They applied Engle-Granger technique in case of Italy and United State. They also used the Johnson’s co integration and vector auto regressive distributed lag (VARDL). So, the Marshall-Lerner conditions had hold in the long run. Lane and Milesi-Ferretti, (2003) exhibited association amid balance of trade, external wealth and real exchange rate. Gross domestic product (GDP) per capita, untradable goods prices, real effective exchange rate (REER), real return, net investment income, trade balance, net capital gains and net foreign asset were variables took in this study. This research argued that there’s antagonistic association amid rate of exchange and balance of trade in the long run when some determinants were fixed. One of the determinants was that non-tradable goods was the better way to relate the association between real rate of exchange and balance of trade. Onafowora, (2003) examined J curve phenomenon in Japan and U.S. They applied the generalised ‘impulse response’ and ‘vector error correction model’ (VECM).
of exchange, real GDP, real external income and trade balance were variables used in this study. The final suggestion is that J- curve theory had applicable.

Kandil and Mirzaie, (2005) analysed the fluctuations of exchange rate through price and output. This study consists of 33 developing countries. They discussed the two factors of exchange rate fluctuations. First factor was anticipated currency and 2nd was unanticipated currency. Un-anticipated currency consists of aggregate demand and aggregate supply. Anticipated currency had limited impact on inflation and growth rate of output. The final conclusion of this study showed that unanticipated currencies were significant on output and inflation within among developing countries. Trade balance would reduce when they constructed the J curve. So J curve theory could not applied in Pakistan. (Afzal, Rehman and ur Rehman, 2008).

Tenreyro, (2007) estimated effect of volatility of nominal exchange rate (NEER) on trade situation. He described the 104 countries in this study. They used the yearly time series data which coated the period from 1970 to 1997. He applied the novel and IV- PML approaches from taking the different biases. So, the bilateral exchange rate had no effected on trade situations. Aftab and Khan (2008) studied the J-curve among Pakistan and it’s exchange partner’s. In this theory, imports cheaper and exports expensive, balance of trade faced to worse. They also discussed the exchange rate effects. First effect was price effect and second was volume of effect. They had seen the price effect in short run. Second effects promoted the depreciation and applied the Marshall-Lerner condition. Second effects had seen in long run. Quarterly data was used from the panel of 1980 – 2005. The final result of this study showed that United Kingdom, united states and France were those countries that had significant effect on Balance of trade. Due to real depreciation, trade balance had improved for Pakistan.

Jokob, (2016) explained the exchange rate impact on growth. They also took 74 countries. They also gave the cross section data. 36 countries were developed while 38 countries were developing. Controlled variable was gross domestic product growth and control variables were exchange rate human capital, government spending and inflation. Government spending, human capital, fixed exchange rate, inflation and gross domestic product were predictors’ variables and gross domestic product was predicted used in this model. The final epitome of this paper showed that gross domestic product growth and exchange rate regimes had correlated with each other.

**Conceptual and Theoretical Framework**

J curve is the concept of international trade. J curve hold when our currency has depreciate and in this result, we face the trade deficit. In this way, abroad things are very expensive for the country and exports goods are cheaper for the outsider that why our imports will be higher day by day and exports will lower soon. That’s cased, trade balance improvement. J curve theory applies only elastic of imports and exports and rate of exchange perform properly.
This figure shows the J curve situation. In this curve, depreciation of country, currency will worsen of the country balance of trade by present the net improvement. To examine the effect of devaluation in currency in terms of trade, the study inculpate the “Marshal Theory of Price Elasticity of Demand” it is very crucial theory in the approach of elasticity’s to the terms of trade. It is named on the name of economist who discovered it who was “Alfred Marshal (1842-1924)”, “Abba Lerner (1903-82) and John Robinson (1903-83)”. Essentially, the Marshal-Lerner condition is an expansion of Marshal’s theory, which is the “Theory of price elasticity demand” to foreign trade.

This condition requires the answer of the question: how the real depreciation in currency of the country makes terms of trade better. Answer is that let terms of trade is expressed in the home currency units at one ultimate case, if the demand of import have elasticity zero, then the import value in home currency would increase with complete maximum percentage of real devaluation. For the terms of trade to become better, the export value in home currency has increase. This is the case where the elasticity of export is more than one. Let the elasticity of demand for export is equal to zero than, the devaluation, the export value in the home currency remain unchanged. For the terms of trade to improve a real devaluation, the imports value in home currency has to decrease.

This theory mostly depends on one price, yet the good’s cost should be constant all over the world. In this theory, after the rate of exchange rate adjustment, the prices difference is higher between two nations for the similar product than another opportunity is created that is known as arbitrage opportunity. This opportunity is that goods which can be acquired from the lowest price country.

MODEL SPECIFICATION, DATA AND METHODOLOGY

Data

For the build-up this model, I choose the time series data of 42 years. This study exposed the time period from 1974 to 2016. In this research, Augmented dicker fuller (ADF) unit root, econometric technique of auto regressive distributed lag (ARDL), descriptive of variables and Granger causality test is used.
Model Specification

Equation 1:
\[ Y = f (EXR, DEBT) \] (General model (1))

Equation 2:
\[ Y_1 = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \varepsilon_t \] (2)
\[ Y_2 = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \varepsilon_t \] (3)

Now equation 2, 3 also reconstructs as

Equation 2:
\[ EXR = \alpha_0 + \alpha_1 (IMP) + \alpha_2 (EXP) + \alpha_3 (TB) + \alpha_4 (INF) + \varepsilon_{t1} \] (Specific model (2))

Equation 3:
\[ Debt = \beta_0 + \beta_1 (INF) + \beta_2 (TT) + \beta_3 (GDP) + \beta_4 (FDI) + \varepsilon_{t2} \] (Specific model (3))

Equation 1 is the general model equation that contains the dependent variable output and independent variables of exchange rate and debt. Equation 2, 3 are the specific model equations in which exchange rate and debt are dependent variables and foreign direct investment (FDI), imports, exports, trade balance (TB) and gross domestic product (GDP), total taxes and inflation are independent variables.

Description of Variables

In this part of description of variables, we will shortly elaborate the all variables which including both dependent and independent variables.

Exchange Rate

One country’s currency into other country’s currency is called exchange rate. In this system, state bank play a key role and keep the foreign reserves. This has divided by two parts, one is the home currency and 2nd has the foreign currency. This is two stanzas, one is the direct and other is indirect. When the foreign currency price of per unit is converted into home/domestically currency is called the direct method. However, when the home currency changed into foreign/outside currency called indirect method.

Imports

A good or services brought into one country from another. This variable data is collected from 1974 to 2016. Along with export, import from the backbone of international trade. The higher values of imports entering a country, compared to the value of export, the more negative that countries a balance of trade becomes”, all economists agree for the above import’s definition.

Exports

A function of international trade whereby goods produced in one country is shaped to another country for future sale nation’s gross output. Exports are those goods and services that are produced by own country and sold by abroad. Rice, cement, cotton, chemicals, sports-goods,
mangoes and vegetables are major exports product.

**Trade Balance**

The simple formula to calculate the trade balance is the import minus export. Trade balance is the biggest indicator of the balance of payment. Here, there is two items i-e debit and credit. when imports is greater than exports it means that trade’s economy face to deficit second situation comes when imports is less than country’s exports, its means that country’s is going to surplus. In these two situations, trade balance is become negative in deficit and positive in surplus condition.

**Inflation**

Inflation is the economy condition when arise in the general level of price of all goods and services for the given time session. As results, when inflation arises, purchasing power of money reduces. The impact of inflation may be positive and negative.

**External Debt**

External debt is performing both advantages and disadvantages that have impact on economy especially in Pakistan. External debt is positive, if government spends it from the beneficially projects like industrial and agriculture sectors. While it is negative impact on economy when it consumes on private and public sector and have no returning on it.

**Taxes**

The art of taxation consists of plucking the goose so as to obtain the largest amount of feathers with the least possible amount of hissing (Jean Baptists Colbert). Taxation are the main source that the status of rich and poor are make equal and raise to develop the economy. There are two types of taxes like as direct and indirect taxes.

**Gross Domestic Product (GDP)**

Gross domestic product is very important economic indicator that is mostly used to measure the economy’s situation. Due to particular time period, all values of goods and services manufactured in the whole country, this period may be consisting of 1 year, 6 months and quarterly. The gross domestic product equation is

“GDP= C+I+ G+ (X-M)”

Gross domestic product fluctuation comes due to business cycle. When economy have the prosperity period and increasing the gross domestic product then inflationary point comes out and utilization of productive factors and labour.

**Foreign Direct Investment**

Foreign direct investment is the economic growth indicator. It performs positive and vital role in the development of country when foreign direct investment is increasing, its means that our economy is also growing.
Table 1: List of all control variables with estimated expected signs with Exchange rate Model

| Variables | Description of variables | Unit of measurement | Expected sign |
|-----------|--------------------------|---------------------|---------------|
| Exr       | Exchange rate            | % of growth rate    | -             |
| IMP       | Import                   | % of growth rate    | -             |
| EXP       | Export                   | % of growth rate    | +             |
| TB        | Trade balance            | % of growth rate    | -             |
| Inf       | Inflation                | % of growth rate    | -, +          |
| Debt      | Debt                     |                     |               |
| TT        | Total taxes              | % of growth rate    | +             |
| GDP       | Gross domestic product   | % of growth rate    | +             |
| FDI       | Foreign direct investment| % of growth rate    | -             |

Source of data

The sources of the study about variables data are fifty years of Pakistan economy Handbook of statistics of Pakistan (SBP) and Pakistan bureau statistics (PBS). Selected sampling size for this analysis is "50". The reason for the selection of SBP as a source of data is that, at aggregate level central authority (state Bank) of an economy may significantly provide data related to that economy as a whole. Sampling technique for this analysis is “convenience sampling”. Objective behind this sampling is to avoid systematic error and time constraints that may result if we examine more large data & sample set.

Procedure of Estimation

The procedure of estimation is consist of different steps, procedure of estimation is passing through with the help of computation E-Views (9.5) version that is used to check the time series properties, data stationary will be tested by E-View. It will also be helped to define the short run and long run relationship of the models though ARDL bound test technique.

Stationary of Time Series Data

In this research step, it must be checked by stationary of time series data. If the time series data is stationary, it means that mean, variance and covariance of the model remain same or constant (time is invariant) [Gujrati (1995)]. There is no matter at what point we are measure then (mean and variance in 1990, 1995, 2000, and 2005). Cov (Yt, Yt+k) ≠ 0.

Unit Root Test

When we apply the unit root test its means that we check the stationary of both dependent and independent variables the order of integration test is that for the numbers of unit roots. In process of spurious regression, the coefficients of estimate will not BLUE. Dicky and fuller (1979) elaborated the ADF. The ADF test has more lagged terms of the regressand variable to detect the autocorrelation. This model is follow the ADF.

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta t^{-i} + \mu_t$$

There are three situations of Augmented Dicky fuller (ADF) test. These regression equations
are different that are ao and \( a_2t \) elements are deterministic. Doldado et al, (1990) explained the process that was started from above equation.

**Co-Integration Analysis**

The co-integration analysis examines the long-run association between endogenous and exogenous variables which do not exist at level I (0). But there're many different methods to check the long run relations among variables. These techniques had two steps one was residual base method and second was auto-regressive distributed lag (ARDL) advance method.

**Auto Regressive Distributed Lag (ARDL)**

Pesaran et al (2001) showed the methodology of Auto regressive distributed lag (ARDL). Auto regressive distributed lag (ARDL) is used to measure the long-run short-run association amid variable's. According to Narayan (2004), auto regressive distributed lag (ARDL) method applied just one equation and supported when the size of sample is little. The approach of ARDL model passes away by two important steps. First is bound test (F- statistics) and next is coefficient of variables within short-run and long-run.

The model 1 of ARDL equation is given as below:

\[
\Delta EXR_t = \alpha_0 + \sum_{i=1}^{k_1} \alpha_1 \Delta (EXR_{t-i}) + \sum_{i=0}^{k_2} \alpha_2 \Delta (IMP)_{t-i} + \sum_{i=0}^{k_3} \alpha_3 \Delta (EXP)_{t-i} + \sum_{i=0}^{k_4} \alpha_4 \Delta (TB)_{t-i} + \sum_{i=0}^{k_5} \alpha_5 \Delta (INF)_{t-i} + \theta_1 \Delta (EXR)_{t-1} + \theta_2 (IMP)_{t-2} + \theta_3 (EXP)_{t-3} + \theta_4 (TB)_{t-4} + \theta_5 (INF)_{t-5} + \varepsilon_t
\]

Here sign of \( \Delta \) is the operator of first difference. The equation of 5.4 shows the long and short run association among the variable's. \( \alpha_0 = \) intercept, \( \alpha_1, \alpha_2, \ldots, \alpha_5 = \) short run coefficient and \( \theta_1 \theta_2 \ldots \ldots \theta_5 \) are the long run coefficient.

The model 2 of ARDL equation is given below:

\[
\Delta Debt_t = \alpha_0 + \sum_{i=1}^{k_6} \beta_1 \Delta (Debt_{t-i}) + \sum_{i=0}^{k_7} \beta_2 \Delta (inf)_{t-i} + \sum_{i=0}^{k_8} \beta_3 \Delta (TT)_{t-i} + \sum_{i=0}^{k_9} \beta_4 \Delta (GDP)_{t-i} + \sum_{i=0}^{k_{10}} \beta_5 \Delta (FDI)_{t-i} + \phi_1 (Debt)_{t-1} + \phi_2 (inf)_{t-2} + \phi_3 (TT)_{t-3} + \phi_4 (GDP)_{t-4} + \phi_5 (FDI)_{t-5} + \varepsilon
\]

(5.5)

Hence \( \beta_0 = \) intercept value \( \beta_1, \beta_2 \ldots \ldots \beta_5 = \) short term coefficients model and \( \phi_1, \phi_2 \ldots \ldots \phi_5 = \) long run coefficients.

The above equation shows the co-integration analysis to ARDL.

**The Bound Test (F-Statistics)**

The next step after examining Auto Regressive Distributed Lagged (ARDL) equation is the bound test. When the bound test might be examined to estimate the long-run relationship amid variable's then examined bound test, we compare the F statistics value to the upper bound criteria value.
Lag Length Selection

There are many criteria’s to select the lag length such as R2, Akaike information criterion (AIC), Hanna and Quinn and Schwartz Bayesian information criterion (SIC). When the smallest value of lag length is low its means the model will consider to best.

Error Correlation Model (ECM)

In short run, error correlation model (ECM) values must be negative and statistical significant that shows the variables have short run and long run relation.

\[ \Delta Y_t = \alpha_0 + b_1 \Delta X_t - \pi u_{t-1} + \varepsilon_t \]

The above model shows that variables have short and long run relations.

Test for Stability the Model

In this analysis, we testify stability to the 'Cumulative Sum of Recursive residual' (CUSUM) and 'Cumulative Sum of Recursive Square' (CUSUMS). The CUSUM and CUSUMS diagram shows the stability of the model. If the plotted lines lie between two critical boundaries it means our model will be accepted and stable. This situation is best for the policy maker.

ECONOMETRIC ISSUES

Descriptive Statistics

The descriptive statistics plays an important role to understand the future trends and provides the quantitative values.

| Variables | Means  | Std. Dev | Skewness | Kurtosis | J.B     | Prob. |
|-----------|--------|----------|----------|----------|---------|-------|
| EXR       | 40.177 | 29.495   | 0.67     | 2.21     | 4.234   | 0.12  |
| IMP       | 20.05  | 2.518    | -0.519   | 2.451    | 2.417   | 0.298 |
| EXP       | 13.551 | 2.308    | -0.067   | 1.95     | 1.96    | 0.375 |
| TRADE     | 21.331 | 3.1      | -0.617   | 2.655    | 2.651   | 0.033 |
| INF       | 10.204 | 5.796    | 1.262    | 3.912    | 12.619  | 0.001 |
| DEBT      | 17.89  | 6.776    | -0.117   | 2.241    | 1.103   | 0.575 |
| TT        | 262290.2 | 348347.3 | 1.836    | 5.924    | 38.568  | 0     |
| GDP       | 4.868  | 2.076    | 0.303    | 2.687    | 0.814   | 0.665 |
| FDI       | 123429 | 479346.8 | 5.973    | 37.737   | 2361473 | 0     |

E-views 9.5 based calculation

The mean value of exchange rate is 40.177 which show that exchange rate is high in Pakistan, yet standard deviation of exchange rate is 29.495 which present the measure variation in data. The average value is 237883.0 of trade balance during the time period and its standard deviation value is 433461.2 which present the greater fluctuation in variable of trade balance. The mean value of inflation is 10.204 and its deviation value is 5.796 that show the higher fluctuation in debt model. However, all variables are negative skewed except exchange rate, inflation, total taxes, GDP and FDI.
Table 3: Augmented dickey fuller

| Models | Variables | Intercept | Trend & Intercept | Intercept | Trend & Intercept | Conclusion |
|--------|-----------|-----------|------------------|-----------|------------------|------------|
|        | EXR       |           |                  | -4.322*   | -9.113**         | I(1)       |
| Model 1| IMP       |           |                  | -7.789*   | -7.788*          | I(1)       |
|        | EXP       |           |                  | -6.292**  | -6.405**         | I(1)       |
|        | TB        |           |                  | -7.100*   | -7.071           | I(1)       |
|        | INF       | -5.379*   | -5.296**         |          |                  | I(0)       |
| Model 2| DEBT      |           |                  | -9.165**  | -9.113**         | I(0)       |
|        | TT        |           |                  | -7.028**  | -4.418**         | I(0)       |
|        | GDP       | -4.142**  | -4.698**         |          |                  | I(1)       |
|        | FDI       | -5.149**  | -5.742**         |          |                  | I(1)       |

Source: calculations are raised with the help of E-views 9.5.  
(Note: * suggest that coefficient is significant at 1 % level, ** suggest that coefficient is significant at 5 %, *** indicates that significance at 10 %.)

The order of integration of exchange rate, import, export, trade, debt and total taxes are come at 'level' while inflation, GDP and FDI are integrated at 'first difference'. However, our ADF results present those variables are stationary at mixed. So ARDL econometric technique is used in this study through below table. Here, amount of selected lag is 4.

Table 4: ARDL Model

| Model | R²   | Adjusted-R² | Durbin Watson | AIC      | SIC     | Prob. |
|-------|------|-------------|---------------|----------|---------|-------|
| Model 1| 0.999 | 0.998       | 2.021         | 2.819    | 3.992   | 0     |
| Model 2| 0.913 | 0.805       | 2.338         | 5.427    | 6.341   | 0     |

Author’s calculations (E-views 9.5)

The model of ARDL describe that the numerical value of R² in present table is 0.99 it means that 99% change in rate of exchange (explained variable) is due to variation in all explanatory variables i-e import, export, trade balance and inflation. The value of Durbin Watson is 2.02 which show that there is no auto correlation between controlled variables of the explain model. The standard co-efficient hint that exchange rate is most effective vital variable which have more effect on different variables. The value of 'Akaike information criterion' (AIC) is 3.933 and 'Schwarz Bayesian criterion' (SBC) is 4.482 which shows that estimated model is best. The ARDL model explain that R² value is 0.913 that shows which 91% variation in debt (depend variable) is cause for disparity in independent variables like as inflation, GDP, total taxes and foreign direct investment (FDI). The Durbin Watson of 2nd model is 2.3 that means no autocorrelation exist in this model. The value of AIC and SBC shows that this model is good.
Table 5: Bound Test

| Equation                        | F-statistics | Upper Bound Value | Conclusion                        |
|---------------------------------|--------------|-------------------|-----------------------------------|
| **Model 1**                     |              |                   |                                   |
| $EXR = IMP + EXP + TRADE + INF$ | 13.31        | 3.09              | There is exist co integration and long run |
|                                 |              | 3.49              |                                   |
|                                 |              | 3.87              |                                   |
|                                 |              | 4.47              |                                   |
| **Model 2**                     |              |                   |                                   |
| $DEBT = INF + TT + GDP + FDI$   | 6.415        | 3.09              | Long run and co integration had existed |
|                                 |              | 3.49              |                                   |
|                                 |              | 3.87              |                                   |
|                                 |              | 4.47              |                                   |

Note: This estimation is based on Quantitative software 9.5

The model one exhibits that there's co-integration and long-run association amid variable's because the value of F-statistics of model 1 is 13.310 and this value is higher than upper-bound values. The upper bound value of 3.09, 3.49, 3.87 and 4.47 had at 10%, 5%, 2.5% and 1%. For model 2, the calculated F-value is 6.415 that show we accepted the alternative hypothesis. So, there's long run relationship amid variables.

*Estimation of Long-Run*

The next effort after bound test is estimation of run long run relation between explanatory and explained variable.

Table 6: Estimation of Long Run Coefficient of Model 1 & 2

| MODEL 1                | MODLE 2                  |
|------------------------|--------------------------|
| Exchange rate .Dependent Variable ( EXR) ARDL ( lag | DEBT. Dependent Variable (DEBT) ARDL (lag |
| **Variables**          | **Co-efficient**         | **Co-efficient** |
| IMP                    | -0.0075 (0.000)          |                |
| EXP                    | 0.00181(0.000)           |                |
| TB                     | -0.795 (0.075)           |                |
| INF                    | -0.0024 (0.730)          |                |
| INF                    | 1.2478 (0.037)           |                |
| TT                     | 0.003( 0.572)            |                |
| GDP                    | 3.1187( 0.002)           |                |
| FDI                    | -0.0026( 0.000)          |                |

Note: This result based on software 9.5

From the analysed long run table, the coefficient of the import is negative and the value of import is -0.00075 that is statistically significant. The value of import’s coefficient shows that 1% increase in import that will decrease in exchange rate by -0.00075 %. The prob. value shows that it is statistically significant. The reason is that price of dollar increase due to increase in exchange rate. So that’s why, there’s negative association amid exchange and import. When Exchange rate rise, people prefer the local goods then government established infant industries which to promote the exports. Therefore, exchange rate and export are positive relationship with each other. The coefficient value of trade is negative and trade value is -0.792 and it is not statistically significant. The probability value shows that it is not significant statistically because
export of our country reduces and imports are increase so the trade balance is negative. My result is in line with that of (Ali 2009: Rehman and Afzal 2003).

Inflation is regression co-efficient value is -0.000 that indicates 1% increase in inflation will lead the 1% decrease in exchange rate. When people are prefer imported goods then the price of imported goods will increase day by day. The imported good prices are also affecting the domestic prices. It means when people demand more imported goods, the price of imported goods increased due to shortage of supply. In this situation, people use the domestic goods because the price of imported goods increased. Construction of variable in this way was measured by Mendoza 1995. The coefficient value of inflation, TT and GDP shows that one % increase in inflation, TT and GDP which will increase in debt. The probability values shows that there is statistically significant and have a positive relation with debt. When Government will more take the debt it means inflation will increase in the country. However, inflation and debt have positive relation. The FDI coefficient value has a negative relationship. According to the value of FDI coefficient, 1% increase in FDI that will also lead the 1% decrease in debt. When country dependency will increase on other country, FDI will decrease. Investors and firms are not interested to invest in our country because Pakistan’s growth is mostly depending on debt.

Table 7: Short Run Estimation of Model 1

| Co Integration Form | Variables | Co-efficient | Std-ERROR | T- Statistics | Probability |
|---------------------|-----------|--------------|-----------|---------------|-------------|
| D(ER(-1))          | -1.038631 | 0.153287     | -6.775713 | 0.0001        |
| D(ER(-2))          | -0.309782 | 0.111906     | -2.768235 | 0.0218        |
| D(ER(-3))          | 0.152615  | 0.123678     | 1.233968  | 0.2485        |
| D(ER(-4))          | -0.63055  | 0.209445     | -3.010578 | 0.0147        |
| D(ER(-5))          | 0.584696  | 0.149833     | 3.90231   | 0.0036        |
| D(import)           | -0.000001 | 0.000003     | -0.319735 | 0.7565        |
| D(import(-1))       | 0.000009  | 0.000003     | 3.17539   | 0.0113        |
| D(import(-2))       | 0.000017  | 0.000003     | 5.63609   | 0.0003        |
| D(export)           | -0.000013 | 0.000002     | -5.58521  | 0.0003        |
| D(export(-1))       | 0.000043  | 0.000005     | 8.039487  | 0             |
| D(export(-2))       | 0.000026  | 0.000003     | 8.783582  | 0             |
| D(trade)            | -0.269947 | 0.085492     | -3.157554 | 0.0116        |
| D(trade(-1))        | -0.713744 | 0.096234     | -7.416728 | 0             |
| D(trade(-2))        | -707163   | 0.088376     | -8.001718 | 0             |
| D(inflation)        | 0         | 0            | 5.085731  | 0.0007        |
| D(inflation(-1))    | 0         | 0            | 2.51031   | 0.0333        |
| D(inflation(-2))    | 0         | 0            | -6.132561 | 0.0002        |
| D(inflation(-3))    | 0         | 0            | -4.711261 | 0.0011        |
| Coint(Equ)          | -3.376228 | 0.033755     | 11.145893 | 0             |

Cointeq = ER - (-0.0001*IMPORT + 0.0002*EXPORT - 0.7958*TRADE - 0.0000*INFLATION + 34.1712

Note: estimated results based on software 9.5

In short run, the difference between actual and calculated value called error correlation
model (ECM). The coefficient of ECM is - 3.376228 that are greatly significant and its probability is 0.0000. Both conditions of ECM are completed in the above table. ECM value shows the speed of adjustment into the equilibrium of long run.

Table 8: Short run Analysis

| Variables    | Co-efficient | Std. Error | T - Statistics | Prob.  |
|--------------|--------------|------------|----------------|--------|
| D(INF)       | 0.175265     | 0.10003    | 1.752135       | 0.0989 |
| D(INF(-1))   | -0.944051    | 0.161062   | 5.861414       | 0      |
| D(INF(-2))   | -0.659583    | 0.138916   | 4.748074       | 0.0002 |
| D(INF(-3))   | -0.482954    | 0.110863   | 4.356298       | 0.0005 |
| D(TT)        | 0.000012     | 0.000002   | 4.83489        | 0.0002 |
| D(TT(-1))    | 0.000005     | 0.000002   | 1.959361       | 0.0677 |
| D(TT(-2))    | 0.000003     | 0.000002   | 1.436827       | 0.17   |
| D(GDP)       | -0.662015    | 0.278245   | 2.37925        | 0.0301 |
| D(GDP(-1))   | -3.943012    | 0.532929   | 7.393752       | 0      |
| D(GDP(-2))   | -2.972327    | 0.492649   | 6.03358        | 0      |
| D(GDP(-3))   | -2.201941    | 0.397051   | 5.545737       | 0      |
| D(GDP(-4))   | -1.728073    | 0.284912   | 6.005294       | 0      |
| D(FDI)       | -0.000002    | 0.000001   | 2.096882       | 0.0523 |
| D(FDI(-1))   | -0.000013    | 0.000002   | 6.354422       | 0      |
| D(FDI(-2))   | -0.000007    | 0.000001   | 5.432553       | 0.0001 |
| Coint E(-1)  | -0.861438    | 0.121196   | 7.107797       | 0      |

Co-inteq = debt – (1.2478*INF + 0.0000* TT + 3.1188*FDI – 7.7013)

Source: Table is determine by software 9.5 E-views

The variation between real and estimated values in short run is called the ECM. The ECM coefficient is negative and is statistically significant that is showing by its probability. There are two vital conditions of ECM and both conditions are completely satisfied in second model.

Table 9: Diagnostic Test

| Models     | Serial Correlation | Hetro- Skedastic | Jarque –Bera |
|------------|--------------------|------------------|--------------|
| Model 1    | 1.866( 0.224)      | 131.088(0.02)    | 7.296( 0.026) |
| Model 2    | 0.492(0.62)        | 3.022(0.014)     | 2.032(0.362)  |

Note: calculation is based on E- views 9.5

According to rules of thumb, the probability value must be greater than 5%, so this model exhibits that there’s no serial-correlation. The rules of thumb of Hetro- skedastic is less than 5%. Our model has no hetro skedastic problem. However, Jarque Bera test is not normally distributed. The serial correlation f-statistics value is 0.492 and its probability is 0.621 that shows there’s no auto-correlation. The value of hetro – skedastic is 0.014 that shows there is no hetro. Jarque Bera test is used to examine the normality of the model. This value shows that there is normally distributed.

Stability test is used to approximate stability. Therefore, we will plot the 'Cumulative Sum of Recursive Residuals' (CUSUM) and 'Cumulative Sum of Recursive Residual Square' (CUSUMS). For the power of the model, the straight lines shows the critical boundaries at the level of 5% and our model graph exist between two boundaries.
Model 1 of Test of Stability

The results exhibit that model is stable statistically shown by figure:

EXR / import, export, trade, inflation

Figure 2: CUSUM Model 1:
Source: Authors Calculation

Figure 3: CUSUMS for Model 1
Model 2 stability Test: Our results estimate the following figure:

\[ \text{Debt} / \text{INF, TT, GDP, FDI} \]

**Figure 5: CUMSUMS**

**E-views 9.5 based Calculation**

**DISCUSSIONS AND CONCLUSION**

In this whole paper, an attempt is made to find the J curve, Exchange rate and Debt situation in Pakistan. The vital and prominent aim of study is to analysis the existence of J curve. In this research, annual time series data are used from 1974 to 2015 which are covering the 42 years. Exchange rate and debt are taken as independent variables. Inflation, import, export, trade, taxes; GDP and FDI are employed as independent variables. The measuring unit of exchange rate and debt are same (% growth rate).
Exchange rate depreciation is incompetent to improve the balance of trade situation. Due to competition of other countries; we are facing a difficult period of time because our exchange rate policies are not efficient that have improved our trade situations. However, currency depreciation is the main reasons to enhance debt in Pakistan. Findings of this study also affirm this notion. Coefficient value for Trade balance (-0.795) shows that trade balance has negative association in case of Pakistan.

Which means that our exports get low pieces in foreign market then imports due to this we will face deficit in payments. Which lead us towards more debt burden. Findings of Mirzaie and Mrs. Magda (2003). studies also signifies this notion. In short, both models of the study affirms statistical significant association. In addition, literary studies such as Lane and Milesi-Ferretti (2002): Obstfeld, and Rogoff (2005) and many others signifies our estimates.

POLICY SUGGESTION

All policies maker should take the debt only for needed purposes and these debts also far away from the corrupt politicians. Debt should not take the international monetary fund (IMF) because their rules and regulation are almost deteriorating the economy. So, Government should take the debt from other resources. Currency should be appreciated so that debt burden should decrease and balance of trade should be improved. Pakistan Government should think about the debt situation so they should follow the trade policies, not follow the aid policies. So, Government should motivate the domestic products. If we accepted the suitable exchange policies then our exports increase that reason to develop the economy. Policy Maker should review the exchange rate policies and pursue an active strategy of encourages production of infant industries in order to improve the balance of trade.

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