AN ECONOMETRIC ANALYSIS OF DETERMINANTS OF EXTERNAL DEBT IN PAKISTAN

ABSTRACT

Present study examined macroeconomic determinants of external debt in Pakistan using annual time series data from 1976 to 2010.Cointegration technique has been used to find long run equilibrium relationship while short run dynamics have been analyzed using ECM. By applying ARDL model results depicted that Fiscal deficit, Nominal exchange rate and Trade openness are statistically significant determinants of external debt as they increase the debt burden of Pakistan. Foreign aid is also positively related to external debt but statistically insignificant. In contrast Terms of trade are negatively related to external debt being statistically insignificant.

Keywords: External debt, ARDL, Fiscal deficit, Nominal exchange rate, Trade openness, Foreign aid, Terms of Trade

1. INTRODUCTION

Foreign indebtedness always has been a debatable issue for policy makers, researchers and analysts as it not only affects the growth of a country but also in most of the cases, plunges the country in deep debt trap. A general perception is that foreign loans are supportive to the developing countries suffering from scarce capital stock. When these countries cannot properly manage these loans then this external debt provokes further borrowings and creates vicious circle of external debt. This hampers economic growth of country and raises debt obligations. Usually due to current account deficit and limited capital stock at initial stages of development these developing countries seek for financial assistance from donor countries in the form of loans and aid.

The need and possibility of borrowing results from basic macroeconomic relationships in which total production of a country is less than its total consumption. Inability to achieve inner balance leads to increased demand for foreign goods resulting in negative trade balance. Due to Trade deficit, the inflow of foreign exchange reduces and its negative effects spread out and the economy bears the budget deficit.

So this provides a conducive environment for external debt to developing countries. External debt and foreign aid are considered to be an effective means of income for emerging economies. External debt is effective for growth if it is managed properly and utilized in an effective manner. External debts supplement development up to a limit beyond which this supplement becomes hindrance for development (Fajana 1993).

Due to gap between saving and investment countries go for loans. The main reasons for high indebtedness of country are poor planning, uncertain political environment, weak terms of trade, current account balance of payments, misuse of borrowed resources, poor implementation of foreign aid projects, implementation of low economic priority development programs and projects, higher interest rates on loans, instability in exports earnings and non-development expenditures.

Corrupt government is also a key factor that increases the external debt burden. These types of governments spend money for their lavish activities, instead of investing foreign borrowing to improve the lives of great extent of poor people. Due to such reasons, the mainly overdrawn countries suffer from manifold debt crises, these factors eventually force them to ask for rearrangement and beg for debt reduction and relief. External Debt of Pakistan rose from 37.8 billion US dollar in 2000 to 55.87 billion US dollar by the end of 2010. In 2011 external debt was 59.47 billion dollar. Currently this amount is even more than 60 billion dollars. Current study analyzes different determinants of external debt in Pakistan adding some new variables like Trade Openness and Foregin aid. Also it examines long run as well as short run associations among the series.

Rest of the study has been organized as, section 2 gives literature review. Theoretical framework is in section 3. Section 4 illustrates Model, data and methodology. Section 5 is regarding results and discussions while last section 6 concludes the research article giving some policy recommendations.

2. LITERATURE REVIEW

Different researchers have used time series, cross sectional and panel data with different econometric techniques to discuss determinants of external debt. Empirical findings are also different. Few studies are given here.

Stambuli (1998) examined the causes of debt crises, and investigated the LDC debt crises consequences for borrowers and lenders on the basis of previous data. Study concluded that deflation in the product prices, rate of interest and appreciation in exchange rate are factors of debt crises in LDCs.

Tiruneh (2004) examined the causes of international debt crises in 1980s and 1990s. Panel data from 1982 to 1998 for ratio of foreign debt to Gross Domestic Product, ratio of debt service to exports, Capital flight to export ratio, terms of trade, exports, ratio of imports to Gross Domestic Product, Gross Domestic Product, population and velocity of growth to Gross Domestic Product for heavy and non heavily indebted countries were used. By applying random and fixed effects models, the results depicted that payments of debt service, imports to Gross Domestic Product ratio, capital flight, income per capita, and rate of growth of Gross Domestic Product are the main responsible factors of external borrowings.

Paudel and Perera (2009) studied the association among trade openness, external debt and labor force on growth in Sri Lanka. Time series annual data from 1950 to 2006 were taken for the variables foreign debt, GDP, real total trade and labor force from Central Bank of Sri Lanka. By applying the Johansen cointegration approach results showed that foreign debt negatively affects economic growth in Sri Lanka.

Greenidge *et al. (*2010) analyzed the factors of external debt in CARICOM states. Panel data from 1987 to 2005 for export of domestic goods and services, cost of foreign borrowing in real term and income were taken from WDI database. Data on real effective exchange rate (REER) were taken from IFS. While the data on government expenditure and outputs as well as external debt were taken from Caribbean Development Bank's Social and Economic Indicators publication. By applying panel co-integration test and dynamic ordinary least square (DOLS) results revealed that divergence of government expenditure from its inclination value and external indebtedness were positively related while gap of output, cost of foreign borrowing in real term, REER and exports were negatively associated with external debt.

Asma Awan *et al.* (2011) examined the association among external debt, fiscal deficit, rate of exchange and terms of trade for Pakistan. Study used time series data from 1972 to 2008 for external debt, terms of trade, exchange rate in nominal form and fiscal deficits obtained from Pakistan economic survey and Federal Bureau of statistics (FBS). Johansen approach was used in order to determine long run dynamics as well as short run associations. long-run and one way causality among the variables were found from fiscal deficit to external debt and terms of trade to exchange rate in Pakistan.

Dimitrios (2011) traced macroeconomic factors in relation with national debt levels of Greece in the past. Time series data from 1998 to 2009 extracted from Eurostat database on the variables General Government Gross Debt at Nominal value, National Debt, Government Deficit, interest rate, country's contribution to the intra-EU27 trade of the Union and country's contribution to the extra-EU27 trade of the Union. By applying VAR analysis, study concluded that current national debt was granger caused by intra and extra-EU trade balance and interest rate, moreover debt is responsible for the country's poor intra-EU balance of trade.

Ezeabasili and Mojekwu (2011) examined the relationship of external debt with the performance of Nigerian economy. Time series data from 1980 to 2008 on real GDP, total external debt stock and debt service ratio were obtained from Federal Office of Statistics (FOS) and Federal Government of Nigeria (FGN). By applying Ordinary Least Square (OLS) technique results showed that debt reduction enhanced macro economic performance in Nigerian economy.

Curtasu (2011) investigated the issue of public debt sustainability. Study used annual data from 1970 to 2012 for the advanced European economies on real public debts, non interest real government expenditures, real government revenues, real interest rates. Cointegration test and Fiscal Reaction Function test were used in the analysis. Results depicted that it is quite difficult to assess public debt sustainability and that there is no proper way to follow, in order to depict an accurate conclusion.

Carroll (2013) studied the effect of external debt on growth in Nigeria. Time series data were taken from 1970 to 2010 for the variables Gross Domestic Product (GDP), External Debt, Government Expenditure

and foreign private investment taken from Central Bank of Nigeria. By applying ordinary least square (OLS) method results showed that impact of external debt on economic growth in Nigeria was negative.

3. THEORETICAL FRAMEWORK

Stewart's (1985) concept based on the debt of 1980s is called basic transfer. It is defined as the net foreign exchange inflow or outflow of country depending upon its borrowing. This is explained below;

Let the net capital flow Fn is the rate of accumulation of total external debt, D_t shows total accumulated external debt, d is the rate of increase in total debt (the percentage increase of debt), then;

Fn= d.D…….(1)

D.d-i.d = d(D-i)

Or d. D_t -d.i= d(D_t -i) "i" is the interest rate that must be paid every year on accumulated debt.

iD= total annual interest payment of the foreign debt.

So the basic transfer equation becomes

$BT_t = D_t d - id$…….…… (2)

$BT_t = d\,(D_t - i)$…… (3)

Hence BT_t is the difference between capital inflow and interest payment on it.

If d > I then positive basic transfer (BT_t) and country will gain from foreign exchange.

If d<i then basic transfer (BT_t) turns negative and nation will lose foreign exchange.

There are some factors that cause "d" and "i" to rise and fall which are

- At the initial stages of debt borrowing most of the debt incurred at low interest rates and long maturity period. So "i" is quite low as compare to "d". While using this debt for productive purposes then the rate of returns greater than "i". Then new foreign exchange and increase in external debt have no effect on the borrowing country.
- When the external debt exceeds from a limit then "d" starts declining and payment of external debt exceeds from new inflows.
- The country change borrowing from long term external debt on concessional rate of interest to short and medium term loans at market interest rate from private institutions which leads to increase in "I".
- Due to balance of payment problem the price of exportable goods decline and results in poor terms of trade
- External shocks such as oil prices fluctuations, US interest rate or change in the value of dollar affect the debtor country badly.
- Due to poor ability to pay of country the international private lending institutions stop their new lending.
- Due to political or economic reasons, people transfer their capital to other developed countries.

All these factors together decrease "d" and raise "I" in basic transfer equation. The result is negative basic transfer.

4. MODEL, DATA AND METHODOLOGY

In order to examine the factors of external debt, the functional form is as

ED_t =f(FD,TO,TOT,FA,ER)……(4)

Where ED = External Debt, FD = Fiscal Deficit, TO = Trade Openness, TOT= Terms of Trade, FA = Foreign Aid, ER = Nominal Exchange Rate are the variables.

Logarithm form for the variables is used. So the Empirical estimating model of study is as follows;

$LnED_t = \alpha_o + \beta_1 LnFD + LnTO + LnTOT + LnFA + LnER + \mu_t$…… (5)

LnED = Log of External Debt, LnFD = Log of Fiscal Deficit, LnTO = Log of Trade Openness, LnTOT= Log of Term of Trade, LnFA = Log of Foreign Aid, LnER = Log of Nominal Exchange Rate and μ_t= error term.

Study used annual time series data from 1976 to 2010 to analyze the determinants of external debts in Pakistan. The data were obtained from State Bank of Pakistan (SBP), Pakistan Economic Survey and International Financial Statistics (IFS).

4.1 METHODOLOGICAL FRAMEWORK

4.1.1 Unit root tests

Time series properties of data are first checked to avoid spurious results. In order to check the stationarity of the series, study used Augmented Dickey-Fuller (ADF) and Phillips-Perron(PP) unit root tests.

4.1.1.1 Augmented Dickey-Fuller (ADF) Test

ADF test of unit root is based on the following equation;

$$\Delta Y_t = \beta_1 + \beta_2 T + \beta_3 Y_{t-1} + \sum_{i=1}^{k} \theta i \Delta Y_{t-1} + u_t \quad \text{…… (6)}$$

Where

Y_t is the variable for which integration order is being examined, T is the time trend, k is the number of lags included and u_t is white noise residuals. The series y_t is considered to be stationary if fulfills following conditions

$E(Y_t) = \mu$ (constant mean)…… …… (7)

$Var(Y_t) = E(Y_t - \mu)^2 = \sigma^2$ (constant variance)……..(8)

$Cov(Y_t, Y_{t+s}) = Cov(Y_t, Y_{t-s}) = \gamma_s$ (covariance depends on s, not t)……(9)

The mean and variance of the series are constant over time as stated in equations 7 and 8. While the covariance among any two values of Y from the series (i.e., auto covariance) relies only on the duration of time of those two values (s) and not on the real period (t) at which the series are practiced. If covariance,

mean and variance of a series are independent of time, then that particular series is considered as stationary.

A stationary series has a trend to move in the direction of its average value and to move in the region of mean with a constant range and variance, while non-stationary series alters mean values at every point of time and the variance of such series changes with the interval of time period. Non stationary series move upward or downward from their mean, with or without trend.

The ADF test for unit, the null hypothesis is;

*H*o: $\rho = 0$ alternative hypothesis is

H_1: $\rho < 0$

The most suitable lag length for the series will be chosen with the help of Schwartz Bayesian Criterion (SBC) and also with the help of Akaike Information Criterion (AIC).

4.1.1.2 Phillips-Perron (PP) test

Phillips-Perron (PP) test uses the same preceding equation (6) but the problem of high order serial correlation of Augmented Dickey-Fuller (ADF) test is tackled by making adjustment by adding variation of lagged terms in the equation. Main advantage of Phillips-Perron (PP) test is that it makes alteration to t-statistics.

4.2 Autoregressive Distributed Lag Model (ARDL)

This technique of cointegration analysis was presented by Pesaran and Shin in 1999. This approach was further refined by Pesaran *et al*. ARDL approach is used when order of integration of the variables are different like I(0) and I(1). Even if order of integration is same, this approach can be applied for cointegration. This technique is more useful than other techniques as it is more proficient for small samples (Ghatak and Siddiki, 2001). Through the ARDL model unbiased estimates of model are obtained. It is also more efficient than other VAR methods because ARDL approach is in particular attractive when estimating cointegration for small samples Banerjee *et al.* (1993). Due to these merits, ARDL approach has advantages over other cointegration techniques. ARDL technique of Pesaran *et al*. (2001) and its ECM version is as follows:

$$DLnED = \alpha_0 + \sum_{i=1}^{r} b_i \Delta ED_{t-i} + \sum_{i=1}^{s} c_i \Delta ER_{t-i} + \sum_{i=1}^{u} d_i \Delta FD_{t-i} + \sum_{i=1}^{q} e_i TO_{t-i} + \sum_{i=1}^{u} f_i \Delta TOT_{t-i} + \sum_{i=1}^{u} g_i \Delta FA_{t-i} + \delta_1 ED_{t-1} + \delta_2 ER_{t-1} + \delta_3 FD_{t-1} + \delta_4 TO_{i-1} + \delta_5 TOT_{i-1} + \delta_6 FA_{i-1} + \varepsilon_t \ldots..(10)$$

Here "D" is the first difference operator. The parameters such as "b_i, c_i, d_i, and f_i" symbolize the short run relationship while the parameters "δ_1, δ_2, δ_3, δ_4, $\delta_5$and δ_6 "represent the long run relationship among the series. ε_t is error term in the model. If long-run dynamic association is found amongst the series, then long-run model for estimation is:

$$LnED = \alpha_0 + \sum_{i=1}^{r} \delta_1 LnED_{t-i} + \sum_{i=0}^{s} \delta_2 LnER_{t-i} + \sum_{i=0}^{u} \delta_3 LnFD_{t-i} + \sum_{i=0}^{q} \delta_4 LnTO_{t-i} + \sum_{i=0}^{q} \delta_5 LnTOT_{t-i} + \sum_{i=0}^{q} \delta_6 LnFA_{t-i} + \varepsilon_t \ldots..(11)$$

If long run association exists amongst the variables, next step is to determine short run relationship among given variables of the model. For this Error Correction Mechanism (ECM) Model is estimated. Following ECM model is used.

$$\Delta LnED_t = \beta_0 + v_1(ECM_{t-1}) + \sum_{i=1}^{r} \beta_2 LnED_{t-i} + \sum_{i=0}^{s} \beta_3 \Delta LnER_{t-i} + \sum_{i=0}^{u} \beta_4 \Delta LnFD_{t-i} + \sum_{i=0}^{q} \beta_5 \Delta LnTO_{t-i} + \sum_{i=0}^{q} \beta_6 \Delta LnTOT_{t-i} + \sum_{i=0}^{q} \beta_7 \Delta LnFA_{t-i} + \varepsilon_t .....(12)$$

Error Correction Mechanism test estimated for the analysis of short run dynamics tells us whether model is convergent towards equilibrium or is divergent and also the speed of adjustment. For the determination of the goodness of fit and/or model adequacy, stability tests and diagnostic tests are also conducted in ARDL approach.

5. RESULTS AND DISCUSSIONS

The results of Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test are shown in table 1. Phillips- Perron test results depict that all the variables are stationary of the same order I(1) at 1% significance level.The results of Augmented Dickey-Fuller (ADF) test show that Ln FD and Ln TO are level stationary I(0) while other series are I(1). Because of some advantages over other techniques of cointegration analysis, the present study proceeds with Autoregressive Distributive Lag Model (ARDL) technique.

Table 1: Unit Root Test Results

	PP- Test		ADF-Test	
Variables	At level	At first difference	At level	At first difference
lnED	-1.751929	-4.711422*	-0.011972	-4.609937*
lnER	-2.304630	-5.552171*	-2.148970	-5.554610*
lnFD	-3.109088	-6.562520*	-3.309088***	-6.562520*
lnTO	-3.161351	-7.346205*	-3.396498***	-7.346205*
LnTOT	-0.908329	-7.393189*	-2.103481	-7.297843*
lnFA	-2.950571	-7.276448*	-2.176448	-8.370534*

Note: *** significance at 10%. ** Significant at 5% level of significance and * significant at 1% level of significance.

Critical values of ADF are -3.6228 at 1% level of significance, -2.9446 at 5% level of significance and -2.6105 at 10% level of significance. While the tabulated values of PP test are -4.2268 at 1% level of significance, -3.5366 at 5% level of significance and -3.200 at 10% level of significance. According to

Phillips-Perron and Augmented Dickey-Fuller (ADF) test LnED, LnER, LnTOT, LnFA are stationary at first difference at 1% level of significance. While LnFD, LnTO are stationary at first difference at 1% level of significance in Phillips-Perron (PP) test but at level in Augmented Dickey-Fuller test at 10% level of significance.

Before applying ARDL model bound test (F-test) is conducted to test the existence of co-integration among the variables. The results of Bound test for presence of co-integration show that calculated F-Statistics is 5.1214. Co-integration exists since F-statistics is greater than upper bound tabulated value. In the next step long run relationship among variables are determined with the help of Auto Regressive Distributive Lag (ARDL) econometric model. Akaike Information Criterion has been used as the value of F- Statistics from Akaike Information Criteria is greater than Schwarz Bayesian Criteria.

Table 2: Long Run Coefficients using the ARDL Approach at Model

Estimated Long Run Coefficients using the ARDL Approach,ARDL (1,0,1,2,0,1) selected based on Akaike Information Criterion.			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
ER	1.0716	.20027	5.3506* [.00]
FA	.010233	.10475	.097684 [.923]
FD	.39539	.14729	2.6844* [.014]
TOT	-.093976	.10315	-.91109 [.372]
TO	.46425	.21334	2.1762*** [.041]
INPT	6.0512	.92072	6.5722* [.000]

Note: * significant at 1% ** significant at 5% and *** significant at 10%.

The first column shows variables which are exchange rate, foreign aid, fiscal deficit, terms of trade and trade openness where INPT is intercept. In the second column estimated coefficients are reported. On the basis of t statistics following variables exchange rate, fiscal deficit and trade openness are statistically significant while foreign aid and terms of trade are statistically insignificant. The results of present study verify trade openness, fiscal deficit and exchange rate increase the external debt burden of Pakistan. This mainly shows that change in exchange rate, fiscal deficit and trade openness cause the increase in external debt of Pakistan. One percent increase in exchange rate causes 1.0716 percent increase in external debt burden at 1 percent significance level. Asma Awan *et al.* (2011) also concluded that one percent change in nominal exchange rate bring about 0.79 percent increase in external debt.

Similarly one percent increase in fiscal deficit cause 0.39539 percent increase in external debt in Pakistan at one percent significance level. Folorunso and Falade (2013) also confirmed positive relationship between fiscal deficit and external debt.

The trade openness is found positively related to external debt. One percent increases in trade openness causes 0.46425 percent increase in external debt at 10 percent significance level. While the variable Terms of Trade is negatively related with external debt but insignificant statistically, so no valid conclusion can be drawn. Similarly foreign aid is also insignificant statistically. The outcomes of Error Correction Mechanism are given in the table 3.

Table 3: Error Correction Representation for the Selected ARDL Model

Error Correction Representation for the Selected ARDL Model ARDL (1,0,1,2,0,1) based on Akaike Information Criterion

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dER	1.0282	.15592	6.5944* [.000]
dFD	-.073017	.049897	-1.4634 [.156]
dFD1	-.073017	.054303	-2.8139* [.009]
dTOT	-.047509	.048909	-.97137 [.341]
dTO	.23470	.13343	1.7589*** [.091]
dFA	-.071436	.038460	-1.8574 *** [.075]
dINPT	3.0591	1.1838	2.5841* [.016]
ecm(-1)	-.50554	.15598	-3.2410* [.003]

R-Squared .99923 R-Bar-Squared .99888 S.E. of Regression .041336

F-stat F(10, 22) 2847.4[.000]

Akaike Info. Criterion 54.0035 Schwarz Bayesian Criterion 45.7727

DW-statistic 2.0135 Durbin's h-statistic -.087222[.930]

Note: * significant at 1% ** significant at 5% and *** significant at 10%.

The value of ECM is **-0.50554**. The negative sign shows that the model is convergent towards equilibrium and the value shows speed of adjustment of the model. It means that adjustment speed of previous year's disequilibrium to current year is 50%.

5.1 Diagnostic tests

Diagnostic tests are conducted to observe the troubles of serial correlation, functional form and problem of hetroscedasticity shown in table 4. The value of DW-statistics is 2.0135, therefore it is concluded that

there is no problem of autocorrelation. The Diagnostic test clearly demonstrates no problem of serial correlation, functional form problem and existence of Heteroscedasticity.

Table 4: Diagnostic Tests of model

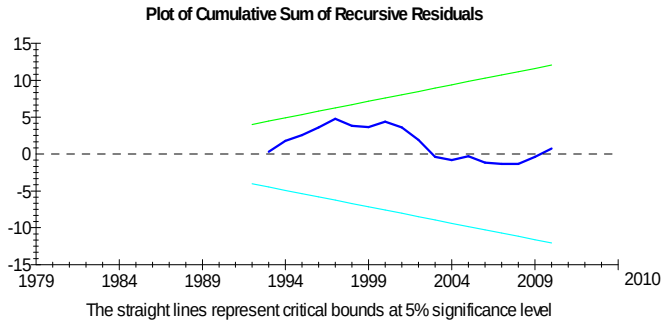
Test Statistics	LM Version	F Version
A. Serial Correlation	CHSQ(1)= .087078[.768]	F(1, 21)= .055560[.816]*
B. Functional Form	CHSQ(1)= .35073[.554]	F(1, 21)= .22559[.640]*
C. Normality	CHSQ(2)= 3.6806[.159]	Not applicable
D. Heteroscedasticity	CHSQ(1)= .73595[.391]	F(1, 31)= .70712[.407]*

A: Lagrange multiplier test of residual serial correlation B: Ramsey's RESET test using the square of the fitted values C: Based on a test of skewness and kurtosis of residuals D: Based on the regression of squared residuals on squared fitted values

5.2 Stability Test

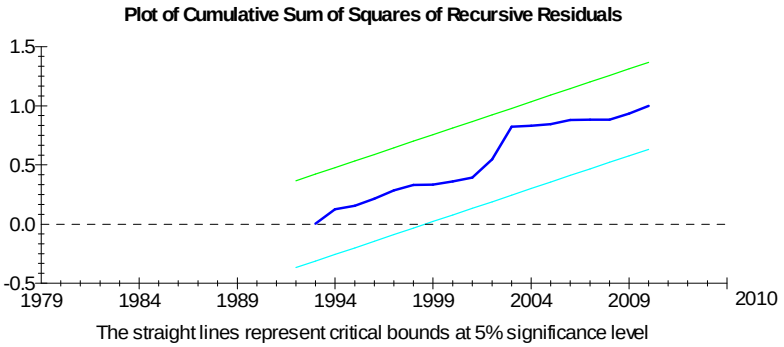
Consistency of parameters is examined with the help of stability test. For examination of structural stability of model, Brown *et al*. (1975) introduced cumulative sum (CUSUM) and cumulative sum of square (CUSUM) tests. Cumulative sum test is used for systematic change in the parameters. On the other hand cumulative sum of squares helps in showing sudden change in the regression coefficients.

Figure 1: Cumulative Sum (CUSUM) Test



Graphs show that the model is stable, because the residual lies between the two straight lines showing 5% critical bounds. It means if a series is excluded from the model, there is no effect on the rest of the series.

Figure 2: Cumulative Sum Square (CUSUM) Test



6. CONCLUSION AND POLICY IMPLICATIONS

The results depict that Fiscal Deficit, Trade Openness and Exchange Rate are statistically significant factors that determine the External debt. The study found evidence of long run positive association between Fiscal Deficit and External debt, Nominal Exchange Rate and External debt burden of Pakistan. Foreign Aid is also positively related to External debt but statistically insignificant while Terms of Trade are negatively related to External debt being statistically insignificant. One percent increase in exchange rate causes 1.0716 percent increase in External debt burden, similarly one percent increase in fiscal deficit cause 0.39539 percent increase in external debt and One percent increases in trade openness causes 0.46425 percent increase in external debt

Short run results of Error Correction Model (ECM) confirm that Fiscal deficit and Terms of Trade are statistically insignificant that negatively affect External debt while the other factors are statistical significant which negatively affect external debt except Nominal Exchange rate that affects External debt positively. External debt increases 1.0282 percent due to one percent increase in nominal exchange rate. Similarly 0.23470 percent increase in External debt is due to one percent increase in Trade Openness whereas -0.71436 percent decrease in external debt is due to one percent increase in foreign aid. The value of ECM is negative and less than one. This shows there is disequilibrium in short run and it converges to equilibrium at speed of adjustment -.50554 (6 months approximately).

On the basis of results, the study has some policy suggestions;

- Appropriate debt management strategy should be adopted because while crossing the limits these foreign loans are harmful in achieving economic growth objective
- Government should use borrowing for productive and commercial purposes in order to generate sufficient resources to pay back easily.

- Policy makers should adopt those measures which minimize fiscal deficit so that the problem of severe external debt burden may be tackled.
- Suitable exchange rate policy should be devised to minimize the external debt burden.
- In order to reduce the debt burden the policy makers should adopt those policies that enhance the exports of country and reduce imports of luxuries items.

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