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Abstract

The objective of the study is to examine impact of total, internal and external government debt on nominal interest rate in Pakistan. To attain these objectives, the study used annual time series data from 1973 to 2016. The study used loanable fund theory as theoretical model and ARDL bound testing approach for cointegration and Granger causality test to estimate the results. The results of the study found negative relation between total government debt, external debt and nominal interest rate in long run, while the study found no evidence of long run relation between internal government debt and nominal interest rate. In short run, positive relation exists between total government debt and nominal interest rate, while negative relation exists between external government debt and nominal interest rate. The results found unidirectional causality between total government debt and nominal interest rate. Government decrease nominal interest rate to lessen the repayment of government borrowing, which lead to decrease in interest rate. Reforms should be made to lessen the burden of government debt and to stabilize the interest rate.

Keywords: Total Debt, External Debt, Internal Debt, Interest Rate, ARDL, Pakistan

1. Introduction

Fiscal deficit in an economy is a situation when government spends more than its revenues. Government adopts different measures to overcome budgetary shortfall. Budget deficit can be financed by printing new currency, domestic borrowing and external borrowing (Fischer & Easterly, 1990). The process of financing deficit through printing new currency notes by central bank is known as seigniorage. It increases money supply, creates inflationary pressure and decrease interest rate. The second way of financing budget deficit can be through domestic borrowing, sale of treasury bills, short term federal bonds, defense saving certificates, etc. This type of deficit financing increases interest rate and crowds out private investment. Large deficits can also be financed through government borrowing from external resources. External borrowing is a widely used method to finance fiscal deficit in many developing countries because in most of the developing countries, domestic capital markets are too small and internal borrowing possibilities are also limited, that's why government borrow from the external resources to finance fiscal deficit (Fischer & Easterly, 1990). The impact of fiscal deficit on interest rate depends not only on the levels of deficit but also on the financing method of deficit. The excessive use of any financing procedure of deficit creates the macroeconomic imbalance (Chakraborty, 2002).

Classical state that increase in government borrowing create upward pressure on interest rate and in turn generate crowding out effect on private investment, while Keynesians argue that though increase in government borrowing raise interest rate but this increase stimulate savings and capital formation. Keynesians and Neo-classical models depict that rise in government debt change output and employment levels and cause increase in interest rate (Kalulumia, 2002). On the other hand, Ricardian Equivalence hypothesis state that demand remains unchanged by increasing government debt. This is due to the fact that people save excess money to pay for expected increase in future tax that will be used to pay off the government debt, therefore interest rate will not increase (Baro, 1987; Elmendorf & Mankiw,1998).

There has been increasing concern in the literature to analyze the relationship between government debt and interest rate. Policy makers have always remained interested in examining relationship between government debt and interest rate. The literature regarding government debt and interest rate is divided in four strands. The first strand found that government debt has

significant positive relation with interest rate (Ganguly, 1980; Spiro, 1990; Hsing, 2010; Turner & Spinell, 2013; Checherita & Rother, 2011; Wang & Rettenmair, 2008; Gale & Orzag, 2004; Saleh & Harvie, 2005). The second strand found that government debt has no relation with interest rate (Baro, 1987; Findley, 1990; Kalulumia, 2002; Darrat, 2006). The third strand believed that expected or projected government debt has positive and significant effect on forward or expected interest rate (Engen & Hubbard, 2004; Laubach, 2009; Kameda, 2014). Fourth strand found no casual relation from government debt to interest rate while they found reverse casual relation from interest rate to government debt (Chakraborty, 2002; Darrat, 2002; Kalulumia, 2002; Akinboade, 2004).

Government debt and its impact on interest rate has become a problem for developing countries after 1980s, before this period developing countries were borrowing at low interest rate (Todaro & Smith, 2012). Increase in government debt associated with increase in long run interest rate (Hoelsher, 1986). Increase in interest rate caused by increase in government debt lead to decline in investment and reduces indirectly consumption expenditures (Engen & Hubbard, 2004). High government debt influence interest rate, which can change the level of saving, investment and consumption (Ganguly, 1980). Permanent increase in government debt put upward pressure on interest rate, which in turn changes the consumption and saving behavior (Winter, 2017). Although effects of government debt on interest rate may tend to be small in long run. However, if an increase in government debt is combined with an increase in government consumption, the effect would be larger (Kinoshita, 2006).

Pakistan's public debt to GDP ratio has been floating around 65 percent over the past five years (Khalid, 2016). The relationship between government debt and interest rate has been controversial issue in literature for about three decades. Limited work is available to examine the impact of total government debt on interest rate in Pakistan. The study attempts to fill the gap by analyzing impact of total government debt as well as external and internal debt on interest rate in Pakistan. Following are the specific objectives of the study: to examine long run and short run relationship between total government debt and nominal interest rate, to examine long run and short run relationship between government internal debt and nominal interest rate, to examine long run and short run relationship between government external debt and nominal interest rate, to examine causality between total, external and internal government debt, and nominal interest rate.

The study contributes to the existing literature by providing better understanding of the impact of total, internal and external government debt on nominal interest rate in Pakistan. The study will provide useful information to individuals and help government to predict the effect of large government borrowing on interest rate by providing recent time series data. It will provide policy implications to increase investment and to stabilize interest rate. The study will help government to maintain its expenditures according to its revenue to increase growth rate and stabilize interest rate and also encourage the government to increase internal borrowing resources to get rid of external borrowing. By examining impact of external and internal government debt on interest rate separately, the study will provide information to the government about which type of borrowing, either external or internal effect on interest rate.

The structure of the remaining study is as follows. Sections 2 discuss previous literature on the relationship between government debt and interest rate. Model, methodology and data are discussed in section 3. The empirical results are presented in section 4. Conclusion and policy recommendations are narrated in section 5.

2. Literature Review

The existence of high government debt plays important role for its effects on interest rate stability and overall on the economy. Chakrabarty (2002) determined the relationship between fiscal deficit and interest rate and causality between the variables. The study used data from1990-91 to 1999-00 and used asymmetric vector auto regression model. Results showed that fiscal deficit did not cause interest rate to increase and found reverse causality between deficit and interest rate. The study used data for the post financial liberalization period and found that high interest rate caused debt to gather and then resulted as problem of debt-deficit. Kalulumia (2002) investigated the effects of government debt on interest rate for United States, United Kingdom, Germany and Canada. The study used ECM model for the quarterly and seasonally adjusted data for the period 1957:1 to 1993:4. Study found no casual relation between debt and interest rate from both direct test and indirect test approaches. Results described existence of Ricardian Equivalence Hypothesis approach for the selected economies. Akinboade (2004) investigated the association between budget deficit and interest rate for the economy of South Africa for the period 1964 to 1999. The study used two methodologies to examine the relationship, first, London School method and second, Granger-causality approach. Results of

granger causality in this study suggested independent relation between budget deficit and interest rate. The results of London School method also showed that budget deficit did not effect interest rate.

Gale and Orzag (2004) investigated the relationship between budget deficit, national saving and interest rate. The study used data for the period 1954-92 and 1956-2002 and applied OLS estimation. Results showed decrease in saving for the increase in deficit. The change in deficit has affected interest rate and exchange rate. Pandit (2005) examined the relationship between fiscal deficit and interest rate on internal debt for the economy of Nepal. They used annual data for the period from 1971 to 2003. The results of the study suggested that deficits caused interest rate to increase but insignificantly for the case of Nepal. Darrat (2006) examined the relation between government budget deficit and interest rate for the economy of Greece. The study has used ECM methodology by using time series data for the period 1950 to 1993. The study showed no casual effect of deficit on interest rate. The results showed strong correlation between deficit and interest rate because interest rate shocks caused change in budget deficit.

Kinoshita (2006) examined relationship between government debt and interest rate for 19 OECD countries by using panel data. The study used dynamic general equilibrium model. Results of the study showed positive relation between long term interest rate and government debt but there was small effect of debt on interest rate. Although increase in government consumption and debt lead to large effect. Result showed that the effect of debt on interest rate depend on the structural parameters of the economy. Pacsani, Strauch and Kremer (2006) examined the impact of government debt on long term interest rate on the economies of US, Germany and Italy for the period 1983 to 2003. The study used cointegration to find long term relationship and SVAR model to find short run relationship between government borrowing and interest rate. The result of the study suggested sustained accumulation of government debt lead to higher long run interest rate at least temporarily. The study also found spillover effect from US to Germany and Italy. Wang and Rettenmaier (2008) investigated the implicit and explicit impact of debt and interest rate. The study used impulse response function and VAR model to find the results. The results of the study showed that government debt, implicit and explicit debt all effect long term interest rate.

Laubuch (2009) investigated the expected debt and expected deficit on long horizons of interest rate in USA. The study used data of thirty years and used dynamic OLS model. The study found significant results of expected deficit and expected debt on forward interest rate. Hsing (2010) examined the impact of federal government debt on long term interest rate for US economy. The study used ARCH and GARCH model. By using loanable funds approach for the period 2002 to 2009. The study found positive relation between government debt to GDP ratio and Long run nominal interest rate. Marattin et al (2011) investigated the effects of fiscal shocks and public debt on long term interest rate by controlling inflation, monetary policy and international linkages for the economies of USA, Germany and Italy. The study used data for the period from 1983 to 2009 and used vector error correction model. The study found that sustained debt accumulation tend to increase long run interest rate significantly.

Kameda (2011) analyzed the effect of budget deficit and government debt on real long term interest rates in Japan. The study used fully modified OLS method by using data from 1980 to 2008. The study showed positive and significant long run impact of projected deficit to GDP ratio, equity premium and expected inflation on interest rate. Moreover, increase in budget deficit affected real long term interest rate more than the government debt. Checherita and Rother (2011) examined the relationship between government debt and economic growth on twelve European countries. The study used fixed effect method using data from 1970 to 2011. Results of the study found negative relation between debt and growth. The study concluded that debt effect through long term real and nominal interest rate. Bayat et al. (2012) examined causality between budget deficit and nominal interest rate, as well as examined crowding out effect against Ricardian equivalence hypothesis. The study used data for the period 2006 to 2011 for Turkish economy and employed Granger causality test. Results showed that budget deficit did not effect nominal interest rate. They found existence of Ricardian equivalence hypothesis for Turkish economy.

Odionye and Uma (2013) estimated relationship between budget deficit and interest rate in Nigeria. The study used VECM technique to estimate for the period 1970:QI to 2010:QIV. The study found positive relation between budget deficit and interest rate and concluded that increase in interest rate has caused by increase in budget deficit. Turner and Spinell (2013) investigated the relationship between external debt and its interaction with government debt on interest rate for 22 OECD economies. The study used data for the period 1980 to 2012. The results showed

non-linear relationship between government debt, external debt and interest rate initially but after the period of financial crises in Euro economies increase in both external and government debt caused increase in interest rate. Aisen and Hauner (2013) examined the effect of budget deficit on nominal interest rate for 60 advanced and emerging economies. The study used data from 1970 to 2006. The study found that budget deficit put increasing pressure on interest rate but this increase in interest rate depends upon the collaboration of other macroeconomic variables.

Nwosa and Ibas (2014) analyzed the impact of budget deficit on short run and long run interest rate in Nigeria for the period 1970 to 2011. Causality analyses determined no relation between budget deficit and interest rate while regression analyses determined insignificant effect of budget deficit on interest rate. Impulse response analyses described that a shock to budget deficit influenced interest rate positively. The study concluded that rise in interest rate due to budget deficit differently depend on methodology adopted. Boster et al (2016) investigated the interest pass-through for the period of pre and post crises of sovereign debt for euro areas. The study used data from 2003 to mid-2007 and from 2010 to 2013 and used factor augmented vector auto regression technique to estimate the results. The results of the study showed no change in transmission of conventional monetary policy to the bank lending rate with the crises period but there existed change in composition of interest pass-through with expansionary monetary policy which lead to decrease in sovereign risk in small economies.

The literature showed controversy about the relationship between government borrowing and interest rate. One group of economists stated rise in interest rate due to increase in government borrowing. Another group examined no relationship between government debt and nominal interest rate and determined that Ricardian equivalence hypothesis prevails in the economy. Some studies have found positive relation between expected future government borrowing and interest rate. However, few studies are conducted in Pakistan to determine effect of government debt on interest rate. This study estimates the effect of external and internal government debt on interest rate as well with the analyses of estimating effect of total government debt on nominal interest rate for Pakistan.

3. Model, Methodology and Data

3.1 Theoretical Model

Theoretically, deficit financing affects interest rate in two ways. Firstly, according to Keynesian's IS-LM framework, interest rate and budget deficit are correlated positively. Keynes gives IS-LM framework and according to this an increase in the budget deficit affects the goods market equilibrium and causes to raise interest rate by shifting IS curve to rightward. Deficits can be financed through borrowing or by printing new money. If it is financed through public borrowing, increase in interest rate reinforced by leftward shift in LM curve. If deficit is financed through printing new money then by increase in supply of money, the initial increase in interest rate offset by rightward shift in LM curve. Secondly, through Loanable Funds theory, which is known as Neo-classical theory of interest rate. According to this approach, if other things remain constant, government borrowing raise the supply of securities and result in increase of interest rate.

Hoelsher (1986), Cebula (1998, 2000, 2003), Quayes and Jamal (2007) provided a closed economy loanable funds approach. Cebula (2005), Hsing (2010) proposed open economy loanable funds model by considering net capital inflows in supply of loanable funds. This study follows the loanable funds theory to describe the determination of public debt and nominal interest rate. The advantage of using this model is that government borrowing is included in this theory as a direct determining factor of interest rate. The theory of loanable funds states that the rate of interest is the price that equates the supply and demand of loanable funds as:

$$\mathbf{SL=DL} \qquad \mathbf{(1)}$$

where,

SL = supply of loanable funds

DL = demand of loanable funds

By following Hoelsher (1986) and Hsing (2010) the supply of loanable funds depends on:

$$\mathbf{SL = S(IL, IS, MS)} \qquad \mathbf{(2)}$$

The demand of loanable funds depends on:

$$\mathbf{DL = D(IL, IS, MS, INV, TD)} \qquad \mathbf{(3)}$$

where,

IL = nominal interest rate long run

IS = short term interest rate

Y = real GDP growth,

MS = money supply

INV = investment,

TD = Total government debt,

As IS increases, the expected return on short term lending increases as a result SL decreases. When there is increase in expected inflation rate, there will be decrease in expected real long term lending and SL decreases. In equation (3) the demand of loanable funds is negatively related to nominal interest rate and positively related to expected inflation rate. According to Hoelsher (1986) demand of loanable funds should be positively related to short term interest rate because short term borrowing becomes more expensive due to increase in short term interest rate and as a result long term borrowing will be more attractive. GDP growth rate and government debt should also be directly related to demand of loanable funds.

Solving equation (2) and (3) for the equilibrium interest rate loanable funds simultaneously prpvides:

$$\mathbf{IL = f(TD, IS, Y, MS, INV)} \qquad \mathbf{(4)}$$

Theoretically interest rate (IL) has positive relation with government debt and short term interest rate. IL has inverse relation with Y (GDP) because as interest rate decreases, it gives incentive to invest in business and lead to increase investment components that in turn Increase in GDP growth. Expected relation between interest rate and money supply and interest rate is negative because increase in money supply tend to decrease the interest rate and increase the inflationary pressure.

3.2 Methodology

3.2.1 Econometric Model

3.2.1.1 Model for Total Government Debt

The study has three econometric models. The first model estimate the impact of total government borrowing on nominal long run interest rate. The dependent variable in the model is long run interest rate and independent variables are total government debt, short run interest rate, money

supply, total investment and GDP growth. The study estimates the following econometric model to evaluate the relationship between total government debt and interest rate:

$$IL = \alpha_0 + \alpha_1 TD + \alpha_2 IS + \alpha_3 Y + \alpha_4 MS + \alpha_5 INV + \mu \quad (5)$$

Where,

IL = nominal long run interest rate,

TD = total government debt,

IS = Short run interest rate,

Y = growth rate,

MS = money supply,

INV = total investment,

μ = error term

3.2.1.2 Model for External Government Debt

The second model evaluated the association between external government debt and nominal interest rate. Dependent variables are external government debt, short run interest rate, economic growth, money supply, total investment and one control variable which is foreign direct investment while nominal interest rate is dependent variable. To examine the association between external government debt and nominal interest rate the study developed the following model:

$$IL = \beta_0 + \beta_1 ED + \beta_2 IS + \beta_3 Y + \beta_4 MS + \beta_5 INV + \beta_6 FDI + \mu \quad (6)$$

Where,

ED = external government debt,

FDI = foreign direct investment

Cebula (1999, 2000, 2003) suggested open economy model by including capital inflows in the loanable funds model. This study includes foreign direct investment as control variable in second equation of the model to estimate the link between external government debt and interest rate to get reliable results, as without adding control variable in the determination of relationship

between external debt and interest rate, the estimated result was not reliable. The expected relationship between foreign direct investment and interest rate should be negative as increase in investment from abroad will shift supply of loanable funds to the right and decrease equilibrium interest rate (Hsing, 2010).

3.2.1.3. Model for Internal Government Debt

The third model accessed the link between domestic government debt and nominal interest rate. In the third equation domestic debt, short run interest rate, economic growth, money supply, total investment and two control variables, world's nominal interest rate and nominal effective exchange rate, are independent variables while nominal interest rate is dependent variable. To examine the relationship between internal government debt and nominal interest rate, the study establishes the following model:

$$IL = \gamma_0 + \gamma_1 ID + \gamma_2 IS + \gamma_3 Y + \gamma_4 MS + \gamma_5 INV + \gamma_6 IWL + \gamma_7 NEX + \mu \qquad (7)$$

Where,

ID = Internal government debt

IWL = world's long run interest rate

NEX = nominal effective exchange rate.

The reason to add control variables, IWL and NEX, in the third equation of the model is to get suitable results, as the estimated results, to determine relationship between internal government debt and nominal interest rate with the previous equations, were not reliable. Because when government take loans from internal resources of the country, interest rate is effected by the depreciation or appreciation of currency. That's why exchange rate plays an important role to determine equilibrium nominal interest rate. Theoretically, depreciation of Currency can shift the supply of loanable funds to the left and increase long run interest rate and vice versa while an increase in the world's long run interest rate can shift the supply of loanable funds to the leftwards and increase the long run interest rate (Hsing, 2010).

3.2.2 Unit Root Test

To avoid spurious regression in the analyses of time series data, the first and foremost step is to test the stationarity of data. If data series have unit root (non- stationery), then it gives ambiguous

and mislead the results because time series data is very sensitive to unit root test. To evade this problem, the study uses Augmented Dicky Fuller (ADF) and Phillip-Perron (PP) unit root test. Dickey and Fuller (1979) presented DF test for unit root. In DF test it is assumed that the error term is uncorrelated. But in time series data there may come a problem of serial correlation. To get rid of this problem, Dickey and Fuller again presented ADF test of unit root with the assumption of error term is correlated (serial correlation). To recover the problem of serial correlation, they add the lag of regressand on right side of the equation in their previous (DF) unit root test. The results of ADF unit root test have been checked and verified by the PP unit root test. Phillips and Perron (1988) treated the problem of serial correlation by suggesting nonparametric statistical methods.

3.2.3 Autoregressive Distributive Lag (ARDL) Model

There are several techniques that were used to check the cointegration between the variables among them Engle & Granger (1987), Johansen & Juselius (1990), Johansen (1995) methods of cointegration are available but all these procedures required that the variables must be of same order of integration. However, if the data series is small and having mixed level of integration, then these methods are not acceptable. Pesaran, Shin & Smith (2001) proposed another technique to find co integration between the variables that is known as "Autoregressive Distributive Lag" (ARDL) model. There are two assumptions of ARDL model. (i) Variables are of order I(0) and I(1) and no variable should be order of I(2). (ii) Regressand should be of I(1). If assumptions of ARDL are violated, then F statistics will give invalid result. The ARDL bound test approach has various benefits over other techniques. Firstly, there is no need to pre test the variables as independent variables are of mix order of integration i. e I(0) & I(1). Secondly, ARDL bound test provides information of structural breaks in data series. Thirdly, the simple linear transformation of ARDL model is used to evaluate Error Correction Model (ECM) for integrating short run adjustment with long run. Finally, when variables are of mutual integrated then application of other standard techniques gives inconsistence results. That's why this technique gives consistence results in this situation.

Specification of ARDL model:

$$\Delta Y_t = \lambda_0 + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} \sum_{i=1}^{p} \beta_i \Delta X_{t-i} + \sum_{i=1}^{p} \varphi_1 Y_{t-1} + \sum_{i=1}^{p} \varphi_1 X_{t-1} + \epsilon_t \qquad (8)$$

This is the dynamic equilibrium model. where on the right hand side Δ is the first difference of lagged variable, α, β shows the short run dynamics and φ1, φ2 represent long run coefficients which shows marginal change in dependent variable due to change in independent variable. Following null hypothesis is tested for cointegration

H0: $\varphi_1 = \varphi_2 = 0$ (There is no cointegration)

H1: $\varphi_1 \neq \varphi_2 \neq 0$ (There is cointegration)

The value of F statistics is compared with the upper and lower bound values in ARDL bound test approach. If F value is greater than the upper bound value, then it assures that there is cointegration between the variables and reject the null hypothesis of no cointegration. If F value falls below the lower bound then it confirms that there is no integration existing between the variables. If F value falls in the middle of upper and lower bound values, then the results are inconclusive.

3.2.4 Error Correction Model

The ARDL model transformation into Error Correction representation is needed to estimate the short run dynamics. Error Correction term is the rate of adjustment which shows the speed of adjustment of variables towards equilibrium. The ECT term should be negative and statistically significant for the confirmation of long run association between variables because negative sign shows the convergence in the short run.

The specification of Error Correction model

$$\Delta Y_t = \lambda_0 + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} \sum_{i=1}^{p} \beta_i \Delta X_{t-i} + \delta ECT_{t-1} + \epsilon_t \qquad (9)$$

3.2.5 Diagnostic Tests

The strength of this model is tested by using diagnostic tests. Breusch-Godfrey (1978) test is to test the residuals for serial correlation. Breusch-Pagan-Godfrey test for heteroscedasticity (1979) and Ramsey Reset (1969) test for functional misspecification is used. To test the stability of the parameters CUSUM and CUSUMSQ test has been applied. The condition when two error terms are correlated to each other is known as serial correlation. The presence of serial correlation problem makes variance of residuals underestimated. R^2 will give high value but the results of t

and F statistics will invalid. Residuals for serial correlation are tested under the Null hypothesis (no serial Correlation).

The condition when variance of error terms does not remain consistence is known as Heteroscedasticity. In the presence of heteroscedasticity parameters will not have minimum variances either. Breusch-Pagan-Godfrey test is used to test heteroscedasticity under the Null hypothesis of (no heteroscedasticity). If model is not correctly specified, there will come various problems. Firstly, model misspecification error comes in the model. Secondly, Variance of error term is incorrectly estimated. Thirdly, hypothesis testing will provide misleading results and lastly, forecasted values will be inappropriate.

CUSUM and CUSUMSQ tests have been used to test the stability of the parameters. Pesaran, Shin and Smith (2001) follows these tests to estimate the stability of the parameters in their analyses. The parameter of ECM can be checked for stability under the null hypothesis (the regression equation is correctly specified). If the stability test remains under within the 5 percent level of significance, accept null hypothesis.

3.2.6 Granger Causality Test

The ARDL through bound test approves the long run association between the variables but does not give us any information about the casual relation of variables. Bound test does not tell that which variables cause the other. Granger (1988) stated that if there is an evidence of strong cointegration among the variables, then there will be a casual relation in at least one direction. So, to estimate short run causal relationship between variables, Granger Causality test has been applied under the VAR framework as follows:

$$\Delta \ln Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta \ln Y_{t-i} + \sum_{i=1}^{p} \alpha_{2i} \Delta \ln X_{t-i} + \varepsilon_t \quad (10)$$

$$\Delta \ln X_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta \ln X_{t-i} + \sum_{i=1}^{p} \beta_{2i} \Delta \ln Y_{t-i} + \varepsilon_t \quad (11)$$

3.3 Data

The study uses time series data for Pakistan from 1973 to 2016 at annual frequency. The main sources of data are Pakistan Economic Survey, International Financial Statistics (IFS). Data for nominal long run interest rate, short run interest rate and world's long run interest rate is collected from International Financial Statistics. Data for total, external and internal government debt, GDP growth, nominal effective exchange rate, total investment, foreign direct investment

and money supply is collected from Pakistan Economic Survey. Detail definition of variables is presented in Appendix A.

4. Results

4.1. Unit Root Test

To avoid spurious regression, it is essential to evaluate the time series properties of the data. Augmented Dickey Fuller (ADF) and Philips-Perron (PP) unit root tests are used to check the order of integration of the variables. These are most commonly used methods to check stationarity of the time series data. The results of the unit root test in table 4.1 shows that the dependent variable (interest rate) is I(1). The explanatory variables total debt, internal debt, external debt, money supply, foreign direct investment, world's long run interest rate are I(1) while short run interest rate, inflation and total investment are stationary at level (I(0)). Results of ADF test are verified by PP unit root test and reported in table 4.1.

Table 4.1 Results of ADF and PP Unit Root Tests

Variables	Augmented-Dickey Fuller		Phillips- Perron		Order of Integration	
	Level	First Difference	Level	First Difference	ADF	PP
TD	-2.0547 (0.2634)	-6.4819*** (0.0000)	-2.2924 (0.1789)	-6.5411*** (0.0000)	I(1)	I(1)
ID	-1.8956 (0.3302)	-5.1640*** (0.0000)	-1.2241 (0.6554)	-5.2009*** (0.0000)	I(1)	I(1)
ED	-2.4080 (0.1456)	-6.6082*** (0.0000)	-2.4653 (0.1308)	-6.6691*** (0.0000)	I(1)	I(1)
INV	-3.7747** (0.029)	-	-2.9909 (0.1465)	-4.8980*** (0.0000)	I(0)	I(1)
IS	-4.8645*** (0.0003)	-	-2.9635** (0.0465)	-	I(0)	I(0)
IL	-2.8682 (0.0576)	-6.1933*** (0.0000)	-2.7763 (0.2134)	-6.8732*** (0.0000)	I(1)	((1)
MS	-2.9118 (0.1690)	-5.8198*** (0.0000)	-2. 9118 (0.1690)	-5.9922*** (0.0000)	I(1)	I(1)
FDI	-2.1107 (0.5217)	-6.3027*** (0.0000)	-1.1302 (0.2310)	-4.1945*** (0.0001)	I(1)	I(1)
NEX	-1.8703 (0.0593)	-2.6657*** (0.0090)	-2.8909*** (0.0048)	-	I(1)	I(0)
IWL	-2.7170 (0.2353)	-4.8005*** (0.0000)	-3.0031 (0.1432)	-4.8410*** (0.0000)	I(1)	I(1)
Y	-4.5556*** (0.0007)	-	-4.5556*** (0.0007)	-	I(0)	I(0)

*Note: Standard errors are in parenthesis. ***, **, * shows significance at 1%, 5% and 10% level respectively.*

4.2. Results for Total Government Debt

The results of unit root test confirm that assumptions of ARDL model are not violated as the variables are combination of I(0) and I(1) and none of the variables is I(2). So these results lead to employ ARDL model to find whether the variables are cointegrated or not. Table 4.2 reports the results of ARDL model. To check for cointegration, bound test is applied by using (1,4,0,4,0,1) model specification (lag selection according to SIC). After applying bound test, F-statistics is compared with lower and upper bounds values (5 % level of significance) as suggested by Pesaran et al (2001).

Table 4.2: ARDL Model for Total Debt

Dependent Variable: IL **Selected Model: ARDL (1, 4, 0, 4, 0, 1)**			
Variable	**Coefficient**	**Variable**	**Coefficient**
IL(-1)	0.4759*** (0.1585)	**Y(-2)**	-0.7785*** (0.2761)
TD	-1.3104 (6.2836)	**Y(-3)**	-0.6126** (0.2352)
TD(-1)	-3.7498 (7.5019)	**Y(-4)**	-0.5715** (0.2412)
TD(-2)	4.4830 (7.6547)	**MS**	-27.5676* (14.3806)
TD(-3)	2.0756 (7.5906)	**INV**	110.3901* (58.68930)
TD(-4)	-16.5915*** (5.5890)	**INV(-1)**	120.6231*** (40.1956)
IS	0.01590 (0.2105)	**C**	-2.7827 (5.3232)
Y	-0.1325 (0.1971)	**R-Square**	0.7729
Y(-1)	-0.2708 (0.2531)		

*Note: Standard errors are in parenthesis. ***, **, * show level of significance at 1%, 5% and 10% respectively.*

The value of F- statistics 5.14 falls above the upper bounds at 1% significance level, which means null hypothesis of no cointegration is rejected. This provides evidence of long run relationship between the variables. The results of bound test are given in table 4.3.

After establishing cointegration, it is necessary to check whether the model is free from serial correlation (LM serial correlation test), heteroscedasticity (White test for heteroscedasticity) and model specification error (Ramsey RESET test) to avoid misleading results. Results of diagnostic tests are reported in table 4.4. Residuals are checked for serial correlation under the

null hypothesis of no serial correlation and results of LM test are given in table 4.4. Breusch-Pagan-Godfrey test is used for heteroscedasticity under the null hypothesis of no heteroscedasticity. Results of Breusch-Pagan-Godfrey test are presented in table 4.4. Ramsey RESET test is used for misspecification of model and results are given in table 4.4.

Table 4.3 ARDL Bound Test

Test Statistic	**Value**	**k**
F- Statistics	5.1420	5
Critical Value Bounds		
Significance	**I_0 Bound**	**I_1 Bound**
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Table 4.4 Results of Diagnostic Test

Test	**F-statistics (p-values)**	**Null Hypothesis**
Serial Correlation: Breusch-Godfrey LM Test:	1.9414 (0.1673)	No serial correlation
Heteroscedasticity: Breusch-Pagan-Godfrey Test	0.8270 (0.6419)	No Heteroscedasticity
Model Specification: Ramsey Reset Test	0.4648 (0.5022)	Model is Correctly Specified

Note: ARDL model is not suffering from serial correlation, heteroscedasticity and specification error.

After establishing that variables are cointegrated, the parameters of long run are estimated. Parameter of total government debt has negative and significant impact on interest rate in long run. The results describe that interest rate decreases as government increases borrowing. According to the results, there is negative relation between government debt and nominal interest rate in Pakistan. Economic growth also effect interest rate negatively and significantly in long run. Parameter of investment is significant and positively effects the long run interest rate. This shows as total investment increase, borrowing becomes expensive due to increase in interest rate. Estimation of long run dynamics are given in table 4.5.

Table 4.5: Long Run Dynamics

Coint Eq = IL- (- 5.3099 -28.7886*TD + 0.0303*IS –4.5147 Y - 52.6038*MS + 440.8139*INV)	
Variable	**Coefficient**
TD	-28.7886** (11.6585)
IS	0.0303 (0.3968)
Y	-4.5147** (2.0082)
MS	-52.6038 (36.1360)
INV	440.8139** (176.8585)
C	-5.3099 (10.1214)

*Note: Standard errors are in parenthesis. ***, **, * show level of significance at 1%, 5% and 10% respectively.*

To estimate short run dynamics, it is necessary to transform the ARDL model into Error Correction Model. Error correction term (ECT) is the rate of adjustment that indicates how quickly variables adjust towards equilibrium and its negative sign represents convergence in short run. It should be negative and significant for establishing long run relationship in Pakistan. Coefficient of ECT is -0.50 which means that in each period about 50% of deviation from long run equilibrium is corrected. The negative and significant coefficient of ECT shows the existence of long run relationship. Results of short run dynamics are given in table 4.6.

Table 4.6: Short Run dynamics

Variable	**Coefficient**	**Variable**	**Coefficient**
Δ (TD)	-1.5275 (5.5507)	**Δ(Y(-2))**	1.3338*** (0.2474)
Δ(TD(-1))	10.6259 (6.2800)	**Δ(Y(-3))**	0.6284*** (0.1536)
Δ(TD(-2))	17.1055*** (5.4702)	**Δ(MS)**	-20.0121 (15.2015)
Δ(TD(-3))	20.9876*** (4.9102)	**Δ(INV)**	71.4689* (40.4541)
Δ(IS)	0.2184 (0.1897)	**ECT(-1)**	-0.5058*** (0.0841)
Δ(Y)	-0.0342 (0.1555)	**C**	-0.0695 (0.2446)
Δ(Y(-1))	2.0591*** (0.3250)		

Note: Standard errors are in parenthesis. *, **, *** shows significance at 1%, 5%, 10% level respectively.

Stability of the parameters is analyzed by CUSUM and CUSUMSQ Test. Residuals of estimated ECM is investigated for stability by using CUSUM and CUSUMSQ tests (Pesaran and Shin (2001)) under the null hypothesis that regression equation is correctly specified. Figures 4.1 and 4.2 shows graphs of CUSUM and CUSUMSQ tests and it shows that these statistics remains within the critical bounds of the 5 percent significance level. So, parameters are stable.

Figure 4.1: CUSUM Test

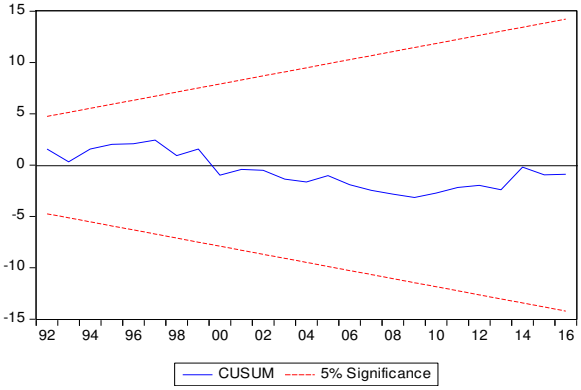
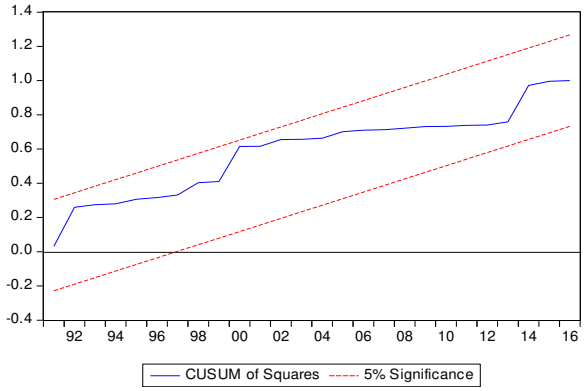


Figure 4.2: CUSUMSQ Test



Granger causality test has been applied to determine the direction of casual relation between variables in short term. The results of the granger causality show that there exist unidirectional causal relation that runs from total government debt to long run interest rate. For other variables, there is unidirectional causal relation from long run interest rate to short run interest rate, from short run interest rate to economic growth and from short run interest rate to investment. According to the results, the causal relation between long run interest rate and investment is bidirectional. Results of Granger causality test has been reported in table 4.7.

Table 4.7: Granger Causality Test

Dep. Variable	**Short Run Causality (Chi-Square Test)**					
	Δ(IL)	**Δ(TD)**	**IS**	**Y**	**Δ(MS)**	**Δ(INV)**
Δ(IL)	–	2.3075 (0.1140)	5.55615*** (0.0079)	2.06377 (0.1417)	1.18475 0.3175)	6.38272*** (0.0042)
Δ(TD)	2..87708* (0.0693)	–	0.0865 (0.9173)	0.50045 (0.6104)	2.86755 (0.0699)	1.77536 (0.1839)
IS	2.23316 (0.1218)	5.0253 (0.0119)	–	3.27875** (0.0489)	2.07756 (0.1400)	5.23444** (0.0101)
Y	1.25979 (0.2959)	0.12836 (0.8799)	0.95262 (0.3950)	–	0.00865 (0.9914)	3.21979* (0.0517)
Δ(MS)	0.78297 (0.4647)	1.60479 (0.2150)	0.42246 (0.6586)	3.68830 (0.0349)	–	0.33278 (0.7191)
Δ(INV)	3.60115** (0.0375)	0.21132 (0.8105)	0.03343 (0.9672)	0.24644 (0.7829)	1.09154 (0.3466)	–

*Note: P-values are in parenthesis. ***, **, * show level of significance at 1%, 5%, and 10% respectively.*

The relationship between total government debt and nominal long run interest rate contradict with the study of Hoelscher (1986), Hsing (2010) and Cebula (2005) while consistence with the Turner and Spinelli (2013). The increase and decrease of interest rate depends upon the supply and demand of credit. The above results for the relation between total government debt and interest rate shows inverse relation between total government debt and nominal long run interest rate. The results show that government decrease the nominal interest rate to lessen the burden of debt but government decrease nominal interest rate just to a certain limit. Constantly decrease in nominal interest rate decrease real interest rate. In short run the total government debt shows positive association with nominal interest rate. Pakistan's real interest rate is declined from past few years due to decrease in nominal interest rate (SBP, 2004).

4.3. Result for External Government Debt

Table 4.8 reports the results of ARDL model. To check for cointegration, bound test is applied by using (4, 3, 4, 4, 4, 2, 4) model specification (lag selection according to SIC).

Table 4.8: ARDL Model for External Government Debt

Dependent Variable: IL **Selected Model: ARDL (4, 3, 4, 4, 4, 2, 4)**					
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
IL(-1)	0.5929* (0.3013)	**IS(-3)**	-0.8630* (0.4051)	**MS(-4)**	-31.9090** (12.8970)
IL(-2)	-0.6028* (0.2645)	**IS(-4)**	-1.4653*** (0.3670)	**INV**	-113.1156 (65.7352)
Il(-3)	-0.5994** (0.2543)	**Y**	0.0175 (0.2157)	**INV(-1)**	286.1893*** (57.1428)
IL(-4)	0.9941** (0.2963)	**Y(-1)**	-0.1343 (0.2175)	**INV(-2)**	75.3105 (64.6201)
ED	-10.3457 (12.1785)	**Y(-2)**	-0.9442*** (0.2427)	**FDI**	-126.2010 (121.1255)
ED(-1)	-41.1561** (12.3643)	**Y(-3)**	-1.2802*** (0.3244)	**FDI(-1)**	-114.3169 (138.6602)
ED(-2)	-18.9069 (14.7136)	**Y(-4)**	-0.6317 (0.3815)	**FDI(-2)**	-276.7378** (116.8545)
ED(-3)	37.5942** (12.1526)	**MS**	-89.4072** (30.03237)	**FDI(-3)**	-9.3256 (153.3319)
IS	-0.8717** (0.35901)	**MS(-1)**	-3.7339 (23.2021)	**FDI(-4)**	123.5649 (114.2224)
IS(-1)	0.5736 (0.3760)	**MS(-2)**	97.7105** (31.2212)	**C**	20.0922 (12.6433)
IS(-2)	1.3259*** (0.3297)	**MS(-3)**	-17.4382 (24.6032)	**R-Square**	0.9696

*Note: Standard errors are in parenthesis. ***, **, * show level of significance at 1%, 5% and 10% respectively.*

After applying bound test, F-statistics is compared with lower and upper bounds values (5 % level of significance) as suggested by Pesaran et al (2001). The value of F- statistics 8.09 is significant at 1% level of significance. This means that null hypothesis of no cointegration between variables is strongly rejected and shows evidence of strong cointegration. Results for the Unrestricted ECM model and ARDL bound test has been reported in table 4.8 and 4.9 respectively.

Table 4.9: ARDL Bound Test

Test Statistic	**Value**	**k**
F- Statistics	8.0957	6
Critical Value Bounds		
Significance	**I_0 Bound**	**I_1 Bound**
10%	2.12	3.23
5%	2.45	3.61
1%	3.15	4.43

The results of diagnostic tests show that the selected ARDL model is free from serial correlation, heteroscedasticity and model specification error. Table 4.10 shows results of the diagnostic tests.

Table 4.10: Results of Diagnostic Test

Test	**F-statistics (p-values)**	**Null Hypothesis**
Serial Correlation: Breusch-Godfrey LM Test:	0.0900 (0.9151)	No serial correlation
Heteroscedasticity: Breusch-Pagan-Godfrey Test	0.3778 (0.9755)	No Heteroscedasticity
Model Specification: Ramsey Reset Test	1.4336 (0.2702)	Model is Correctly Specified

Note: ARDL model is not suffering from serial correlation, heteroscedasticity and specification error.

Results for long run dynamics are reported in table 4.11. According to results, the parameter of external government debt has negative and significant impact on interest rate while FDI has negative and significant impact on interest rate of Pakistan.

Table 4.11: Long Run Dynamics

Coint Eq = IL- (-53.3427*ED – 2.1138*IS – 4.8328*Y – 72.7902*MS +403.7046*INV - 655.1378*FDI + 32.6616)	
Variable	**Coefficient**
ED	-53.3427* (25.9687)
IS	-2.1138 (2.0197)
Y	-4.8328 (3.0173)
MS	-72.7902 (86.2560)
INV	403.7046 (268.4312)
FDI	-655.1378* (307.4960)
C	32.6616 (33.8374)

*Note: Standard errors are in parenthesis. ***, **, * show level of significance at 1%, 5% and 10% respectively.*

Results of short run dynamics are reported in table 4.12. coefficient of ECT is -0.62 which means almost 62% of deviations from long run equilibrium are corrected in each period. According to results, coefficients of short run interest rate, investment, economic growth and foreign direct investment have significant impact on long run interest rate.

Table 4.12: Short Run Dynamics

Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
ΔIL(-1)	0.2441* (0.1286)	**ΔIS(-3)**	1.4308*** (0.1802)	**ΔINV**	-126.5345*** (26.5783)
ΔIL(-2)	-0.3347** (0.1247)	**ΔY**	0.0951 (0.1476)	**Δ(INV(-1)**	-85.4997** (33.1438)
ΔIL(-3)	-0.9862*** (0.1393)	**ΔY(-1)**	3.0498*** (0.3628)	**ΔFDI**	-121.0323* (58.2081)
ΔED	-6.9860 (7.3305)	**ΔY(-2)**	2.0711*** (0.2859)	**ΔFDI(-1)**	175.4920*** (52.3796)
ΔED(-1)	-15.9301** (6.4901)	**ΔY(-3)**	0.6985*** (0.1623)	**ΔFDI(-2)**	-85.0635 (59.6610)
ΔED(-2)	-35.7287*** (7.7422)	**ΔMS**	-96.7010*** (15.9362)	**ΔFDI(-3)**	-147.6190* (68.9303)
ΔIS	-0.9044*** (0.1738)	**ΔMS(-1)**	-53.3721*** (13.1556)	**ECT(-1)**	-0.6257*** (0.0611)
ΔIS(-1)	1.0007*** (0.1718)	**ΔMS(-2)**	50.2565*** (11.7825)	**C**	0.0364 (0.17720)
ΔIS(-2)	2.3465*** (0.2293)	**ΔMS(-3)**	31.4471*** (8.4509)		

*Note: Standard errors are in parenthesis. ***, **, * show level of significance at 1%, 5% and 10% respectively.*

CUSUM test and CUSUMSQ test shows that model is stable. Graphs of these tests are given in figure 4.3 and 4.4 respectively.

Figure 4.3: CUSUM Test

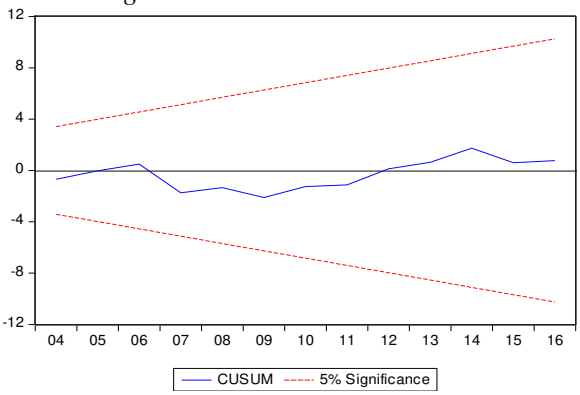
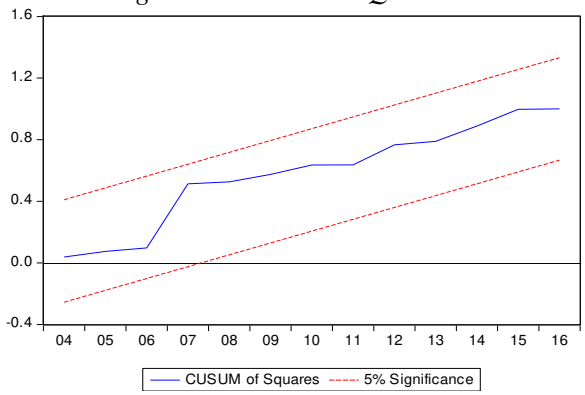


Figure 4.4: CUSUMSQ Test



The results of the granger causality show the existence of unidirectional causal relation that runs from external government debt to long run interest rate, from long run interest rate to short run interest rate, from external debt to money supply and there is inverse causality that runs from short run interest rate to external debt. Table 4.13 reveals that there is bidirectional causality between long run interest rate and total investment. There exists unidirectional causality runs from short run interest rate to foreign direct investment, from short run interest rate to investment, from economic growth to total investment and from money supply to economic growth. Results has been reported in table 4.13.

Table 4.13: Granger Causality Test

Variables	**Short Run Causality (Chi-Square Test)**						
	ΔIL	**ΔED**	**IS**	**Y**	**ΔMS**	**ΔINV**	**ΔFDI**
ΔIL	_	1.98224 (0.1525)	5.55615 (0.0079)***	2.06377 (0.1417)	1.18475 (0.3175)	6.38272 (0.0042)***	0.02822 (0.9722)
ΔED	3.91512 (0.0289)**	_	0.13088 (0.8777)	0.52297 (0.5972)	4.50596 (0.0179)**	2.28772 (0.1161)	0.96550 (0.3904)
IS	2.23316 (0.1218)	3.79146** (0.0320)	_	3.2787** (0.0489)	2.07756 (0.1400)	5.23444** (0.0101)	5.76635*** (0.0067)
Y	1.255979 (0.2959)	0.42324 (0.6581)	0.95262 (0.3950)	_	0.00865 (0.9914)	3.21979* (0.0517)	0.98451 (0.3835)
ΔMS	0.78297 (0.4647)	0.80953 (0.4530)	0.42246 (0.6586)	3.68830** (0.0349)	_	0.33278 (0.7191)	0.41893 (0.6609)
ΔINV	3.60115** (0.0375)	0.11002 (0.8961)	0.03343 (0.9672)	0.24644 (0.7829)	1.09154 (0.3466)	_	1.61852 (0.2123)
ΔFDI	2.34642 (0.1102)	0.67745 (0.5143)	0.43983 (0.6476)	0.09310 (0.9113)	0.50348 (0.6086)	1.07842 (0.3509)	_

*Note: P-values are in parenthesis. ***, **, * show level of significance at 1%, 5%, and 10% respectively.*

The above results show that external debt significantly effects nominal interest rate in long run. Government decreases the rate of interest to reduce the expected future loans. The negative effect of FDI on interest rate shows high dependence on external debt by the government. If FDI increases it causes decrease in government borrowing. The study shows that increase in FDI put interest rate downward which cause to increase in external government debt. Theoretically, if external debt rises, there should be no effect on domestic interest rate. The causality analyses also show unidirectional causal relation runs from external debt to interest rate which means that external borrowing effect the nominal interest rate in short run. According to state bank report of Pakistan (2004), despite increase in external borrowing the cost of borrowing sharply reduced that has slightly reduced the burden of debt.

4.4. Results for Internal Government Debt

Table 4.14 reports the results of ARDL model. To check for cointegration, bound test is applied by using (1, 0, 0, 1, 0, 1, 0, 0) model specification (lag selection according to SIC).

Table 4.14: ARDL Model for Internal Government Debt

Dependent Variable: IL **Selected Model: ARDL (1, 0, 0, 1, 0, 1, 0, 0)**			
Variable	**Coefficient**	**Variable**	**Coefficient**
IL(-1)	0.5341*** (0.1813)	**INV**	-12.0341 (34.0362)
ID	0.0365 (5.7577)	**INV(-1)**	55.3216 (36.6177)
IS	0.2725 (0.2152)	**IWL**	0.2460 (0.3079)
Y	0.2191 (0.2346)	**NEX**	-0.0088 (0.0054)
Y(-1)	0.2606 (0.2065)	**C**	4.2998 (5.6824)
MS	-28.7279 (18.8395)	**R- square**	0.6498

*Note: Standard errors are in parenthesis. ***, **, * show level of significance at 1%, 5% and 10% respectively*.

To check for cointegration, bound test has been applied and value of F-statistic has computed. The value of F-statistics is 2.08 which is less than lower bounds at 5% level of significance respectively. This shows evidence of no cointegration between the variables. Results of the ARDL model and bound test are given in table 4.14 and 4.15 respectively.

Table 4.15: ARDL Bound Test

Test Statistic	Value	k
F- Statistics	2.0835	7
Critical Value Bounds		
Significance	**I_0 Bound**	**I_1 Bound**
10%	1.92	2.89
5%	2.17	3.21
1%	2.73	3.9

The results of diagnostic tests show that the selected model is free from serial correlation, heteroscedasticity and specification error. Table 4.16 represents the results of the diagnostic tests.

Table 4.16: Results of Diagnostic Test

Test	F-statistics (p-values)	Null Hypothesis
Serial Correlation: Breusch-Godfrey LM Test:	0.1893 (0.8285)	No serial correlation
Heteroscedasticity: Breusch-Pagan-Godfrey Test	1.8816 (0.1855)	No Heteroscedasticity
Model Specification: Ramsey Reset Test	0.1016 (0.7520)	Model is Correctly Specified

Note: ARDL model is not suffering from serial correlation, heteroscedasticity and specification error.

The results show no causal relation exist between internal government debt and nominal interest rate. The results of short run Granger causality between all variables are reported in table 4.17.

The above results show that domestic borrowing has no long run association between domestic debt and nominal interest rate. The State Bank of Pakistan (2004) witnessed the decrease in short term interest rate due to increase in domestic borrowing. According to the State Bank of Pakistan (2004) domestic debt, short run interest rate and domestic borrowing may have both positive or negative relation. The decline in real interest rate in Pakistan from the last few years is due to decline in nominal interest rate and increase in the inflationary pressure.

Table 4.17: Granger Causality Test

Variables	Short Run Causality (Chi-Square Test)							
	ΔIL	**ΔID**	**IS**	**Y**	**ΔMS**	**ΔINV**	**ΔIWL**	**ΔNEX**
ΔIL	_	1.8343 (0.1743)	5.5562*** (0.0079)	2.06377 (0.1417)	1.18475 (0.3175)	6.38272*** (0.0042)	0.12420 (0.8836)	0.94458 (0.3983)
ΔID	0.9678 (0.3896)	_	0.08435 (0.9193)	0.36796 (0.6947)	0.53005 (0.5931)	1.08418 (0.3490)	0.58622 (0.5616)	0.57893 (0.5656)
IS	2.23316 (0.1218)	4.8779** (0.0133)	_	3.27875** (0.0489)	2.07756 (0.1400)	5.23444** (0.0101)	0.33044 (0.7208)	0.10504 (0.9006)
Y	1.2597 (0.2959)	0.02061 (0.9796)	0.95262 (0.3950)	_	0.00865 (0.9914)	3.21979* (0.0517)	0.31071 (0.7349)	0.15878 (0.8538)
ΔMS	0.78297 (0.4647)	3.18088* (0.0534)	0.42246 (0.6586)	3.6883** (0.0349)	_	0.33278 (0.7191)	0.11465 (0.8920)	0.17347 (0.8414)
ΔINV	3.60115 (0.0375)	0.35808 (0.7015)	0.03343 (0.9672)	0.24644 (0.7829)	1.09154 (0.3466)	_	0.13271 (0.8761)	0.08399 (0.9196)
ΔIWL	1.72007 (0.1934)	0.80607 (0.4545)	1.68246 (0.2002)	0.59786 (0.5554)	1.11650 (0.3385)	0.90386 (0.4140)	_	1.43250 (0.2520)
ΔNEX	0.05053 (0.9508)	1.2603 (0.2970)	0.50879* (0.6055)	0.45453 (0.6383)	2.77442* (0.0758)	0.21807 (0.8051)	1.14346 (0.2515)	_

*Note: P-values are in parenthesis. ***, **, * show level of significance at 1%, 5%, and 10% respectively.*

5. Conclusion

This study analyzed the impact of total, internal and external government debt on nominal long run interest rate in Pakistan. The specific objectives of the study are to examine long run and short run relationship between total government debt, external government debt, and internal government debt on nominal long run interest rate. Time series data is used over the period 1973 to 2016 to estimate the results. The study has used ARDL bound test approach for cointegration to identify long run relationship and Granger causality test for causality analyses.

Theoretical model of the study is based on loanable funds theory which provided framework to estimate long run relationship between total, external and internal government debt and nominal interest rate. According to loanable funds approach, interest rate is determined through the equilibrium of supply and demand of loanable funds. The advantage of using this model is that government borrowing is included in this model as direct determinant of interest rate.

The results of the study found evidence of significant negative relationship between total government debt and nominal long run interest rate. As government borrowing increases, the nominal interest rate will decline. Nominal interest rate set as low as possible to decrease the repayment of government borrowing. The study also found long run relationship between external government debt and nominal interest rate and shows significant negative relationship

among them. The results of the study showed no evidence of long run relationship between internal government borrowing and nominal interest rate. This may be due to inadequate internal borrowing facilities and increase borrowing from external resources to decrease nominal interest rate.

The results of short run estimation described the existence of significant positive relationship between government debt and nominal interest rate while significant negative relationship between external government debt and nominal interest rate. In case of total government debt and nominal interest rate, there exist unidirectional causality runs from total government debt to nominal interest rate. in case of external government debt and nominal interest rate, unidirectional causality exits between external government debt and nominal interest rate that runs from external government debt to nominal interest rate. The results analyzed no causal relation between internal government debt and nominal interest rate.

The following policy recommendations can be suggested in the light of above findings:

- Government should provide protection to lower income groups by formulating policies that will give tax incentives, increase investment which lead to stable nominal as well as real interest rate.
- Government should design policies to reduce fiscal and foreign trade deficit by expansion of exports opportunities instead of lowering nominal interest rate to decrease the repayment of borrowing.
- Government should increase internal borrowing resources instead of taking loans from external sources to ensure control of rise in real interest rate.
- Government should maintain its expenditures according to its revenues, so that fiscal deficit could not arise. If borrowing is necessary, then long term debt should be taken instead of relying on short term debt. It will increase investment and GDP in the country and reduce adverse effects of short term borrowing.

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Appendix- A

Variable	Description	Source
IL	Nominal interest rate (Government bond yield)	International Financial Statistics
TD	Government Debt (% of GDP)	Pakistan Economic survey
ID	Internal Debt (% of GDP)	Pakistan Economic Survey
ED	External Debt (% of GDP)	Pakistan Economic Survey
IS	Short term real interest rate (annual average call money rate)	Pakistan Economic Survey
Y	GDP growth rate	Pakistan Economic Survey
INV	Total investment (% of GDP)	Pakistan Economic Survey
NEX	Nominal Effective Exchange rate (domestic currency in USD)	Pakistan Economic Survey
MS	Money supply (M_2 % of GDP)	Pakistan Economic Survey
IWL	World nominal interest rate (euro area)	International Financial Statistics
FDI	Foreign Direct Investment (FDI % of GDP)	Pakistan Economic Survey