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Impact of Total, Internal and External Government Debt on Interest Rate in Pakistan

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Abstract
This study analyzes the long run and short run impact of total government debt as well as external and internal debt on interest rate in Pakistan. The study follows the loanable funds theory to examine the relationship between government debt and interest rate and estimates three econometric models under ARDL framework. The study uses time series data of Pakistan from 1973 to 2018 at annual frequency. The results of the study found negative and significant effect of total government debt and external government debt on interest rate in the long run, while no relationship exists between internal government borrowing and interest rate in the long run. Unidirectional causality exists from total government debt, and external government debt to nominal long term interest rate, while no causality exists between internal government debt and nominal long term interest rate. Government has to reduce fiscal and foreign trade deficit by expanding export opportunities instead of lowering nominal interest rate to decrease the repayment of borrowing. Government has to increase internal borrowing resources instead of taking loans from external sources to control the increase in real interest rate. The government has to take long term debt instead of relying on short term debt.

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

JEL: C22, E43, E62

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 and 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

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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 and 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 school of thought state that increase in government borrowing creates upward pressure on interest rate and in turn generate crowding out effect on private investment, while Keynesians argue that increase in government borrowing increases interest rate but this increase stimulate savings and capital formation. Keynesians and Neo-classical models depict that increase in government debt changes 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 and Mankiw, 1998).

There has been an increasing concern in the literature to analyze the relationship between government debt and interest rate. Policy makers have always remained interested in examining the 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 and Spinell, 2013; Checherita-Westphal and Rother, 2011; Wang and Rettenmair, 2008; Gale and Orzag, 2004; Saleh and Harvie, 2005). The second strand found that government debt has no relation with interest rate (Baro, 1987; Findley, 1990; Kalulumia, 2002; Darrat, 2002). The third strand believed that expected or projected government debt has positive and significant effect on forward or expected interest rate (Engen and 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 and Smith, 2012). Increase in government debt is associated with increase in long term 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 and 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 in literature from the last three decades. Limited work is available on the impact of government debt on interest rate in Pakistan. The objective of this study is to analyze the long run and short run impact of total government debt as well as external and internal debt on interest rate in Pakistan. 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

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study will provide useful information to individuals and help government to predict the effect of large government borrowing 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 discussed in section 5.

2. Literature Review

Chakrabarty (2002) examined the relationship between fiscal deficit and interest rate from 1991 to 2000. Results of the study showed that fiscal deficit does not cause interest rate to increase and found reverse causality between deficit and interest rate. Kalulumia (2002) investigated the effects of government debt on interest rate for United States, United Kingdom, Germany and Canada from 1957:1 to 1993:4. Results showed the existence of Ricardian Equivalence hypothesis in the selected economies. Akinboade (2004) analyzed the association between budget deficit and interest rate for South Africa from 1964 to 1999. Results showed independent relation between budget and interest rate. The results of London School method also showed that budget deficit did not effect interest rate.

Gale and Orzag (2004) examined the relationship between budget deficit, national saving and interest rate from 1954 to 1992 and 1956 to 2002. They found that an increase in deficit lead to increase in saving rate, while deficit effects the interest rate and exchange rate. Pandit (2005) examined the relationship between fiscal deficit and interest rate on internal debt for Nepal from 1971 to 2003. Results showed that deficits caused positive and insignificant impact on interest rate. Darrat (2002) examined the relation between government budget deficit and interest rate for Greece from 1950 to 1993. Results of the study showed that no correlation exists between deficit and interest rate.

Kinoshita (2006) examined the relationship between government debt and interest rate for nineteen OECD countries. Results of the study showed positive relation between long term interest rate and government debt. Paesani et al. (2006) examined the impact of government debt on long term interest rate in US, Germany and Italy from 1983 to 2003. They found that sustained accumulation of government debt lead to higher long run interest rate. Wang and Rettenmaier (2008) investigated the implicit and explicit impact of debt on interest rate. They found that both implicit and explicit government debt effect interest rate in long term.

Laubuch (2009) analyzed the expected debt and expected deficit on long horizons of interest rate in USA. The study found that significant relationship exists between deficit and expected debt on forward interest rate. Hsing (2010) examined the impact of government debt on long term interest rate for US economy from 2002 to 2009. Results of the study showed positive relation between government debt and nominal interest rate in long run. 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 USA, Germany and Italy from 1983 to 2009. They found that sustained debt accumulation increases the long run interest rate significantly.

Kameda (2014) analyzed the effect of budget deficit and government debt on real long term interest rates in Japan from 1980 to 2008. Results of the study showed positive and significant long run impact of projected deficit, equity premium and expected inflation on interest rate. Checherita-Westphal and Rother (2011) examined the relationship between government debt and economic

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growth of twelve European countries from 1970 to 2011. They found negative relation between debt and growth. They 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 crowding out effect against Ricardian equivalence hypothesis for Turkey from 2006 to 2011. They found that budget deficit does not affect nominal interest rate, while Ricardian equivalence hypothesis holds in Turkish economy.

Odionye and Uma (2013) analyzed the relationship between budget deficit and interest rate in Nigeria from 1970 to 2010. They found positive relation between budget deficit and interest rate. Turner and Spinelli (2013) examined the relationship between external debt and its interaction with government debt on interest rate for twenty-two OECD economies from 1980 to 2012. They found non-linear relationship between government debt, external debt and interest rate initially but after the 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 sixty advanced and emerging economies from 1970 to 2006. They 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 from 1970 to 2011. They found that no relationship exists between budget deficit and interest rate, while shock to budget deficit lead to increase in interest rate positively. Borstel et al. (2016) examined the interest rate pass-through for the pre and post crises of sovereign debt for euro areas from 2003 to mid-2007 and from 2010 to 2013. They found no change in the transmission of conventional monetary policy to the bank lending rate in the crises period, however, with expansionary monetary policy change in composition of interest rate pass-through existed which lead to decrease in sovereign risk in small economies. Munir and Mehmood (2018) examined the impact of government debt on economic growth in South Asian countries from 1990 to 2013. They found that inverted U-shape relationship exists between debt and economic growth. They concluded that debt effect through private investment, public investment, and total factor productivity in South Asian countries.

Munir and Riaz (2019a) investigated the relationship between fiscal policy and macroeconomic stability in South Asian countries. They found that automatic stabilizers and cyclical policy have destabilizing impact, whereas discretionary policy has stabilizing impact in South Asian countries. Munir and Riaz (2019b) examined the effects of fiscal policy on macroeconomic variables in Pakistan from 1976:Q1 to 2017:Q4. They found that private consumption and interest rate are negatively related with taxes, while, private investment and prices are positively related with taxes. Munir and Riaz (2020a) analyzed the exogenous effects of fiscal policy on disaggregated macroeconomic variables in Pakistan from 1976:Q1 to 2018:Q4. They found that fiscal policy is an effective tool to stimulate economic activity and stabilize the economy of Pakistan at the cost of inflation. Munir and Riaz (2020b) explored the long run and short run impact of fiscal policy, fiscal policy volatility, discretionary fiscal policy, and volatility of discretionary fiscal policy on inflation volatility in Pakistan. They found that fiscal policy, fiscal policy volatility, discretionary fiscal policy, and volatility of discretionary fiscal policy have negative and insignificant effect on inflation volatility in the long run.

3. Model, Methodology and Data

3.1 Theoretical Model

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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. According to IS-LM framework an increase in the budget deficit affects the goods market equilibrium and causes to increase 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 increases 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), and 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:

$$SL=DL \tag{1}$$

Where, SL is supply of loanable funds, and DL is demand of loanable funds.

Following Hoelsher (1986) and Hsing (2010) the supply and demand of loanable funds depends on:

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

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

Where, IL is long term interest rate, IS is short term interest rate, Y is real GDP growth, MS is money supply, INV is investment, and TD is 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 with nominal interest rate and positively related with 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 provides:

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

Theoretically, long term 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 increases GDP growth. Expected relation between interest rate and money supply and interest rate

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is negative because increase in money supply tend to decrease the interest rate and increase the inflationary pressure.

3.2 Methodology

The study has three econometric models. The first model estimates the impact of total government borrowing on nominal long term interest rate. The study estimates the following econometric model to evaluate the relationship between total government debt and long term 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 is long term interest rate, TD is total government debt, IS is short term interest rate, Y is GDP growth rate, MS is money supply, INV is total investment, μ is error term.

The second model evaluates the association between external government debt and nominal interest rate. 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 is external government debt, and FDI is foreign direct investment.

Cebula (2005) suggested open economy model by including capital inflows in the loanable funds model. This study includes foreign direct investment as a control variable in 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 results are 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).

The third model examine the link between domestic government debt and nominal interest rate. To examine the relationship between internal government debt and nominal interest rate, the study establishes the following model:

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

Where, ID is internal government debt, IWL is world's long term interest rate, and NEX is nominal effective exchange rate.

The reason to add control variables, IWL and NEX, in the model is to get reliable results. Because when government take loans from internal resources, 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 term interest rate can shift the supply of loanable funds to the leftwards and increase the long term interest rate (Hsing, 2010).

To avoid spurious regression in the analyses of time series data, the first and foremost step is to test the stationarity of data. Dickey and Fuller (1981) and Phillips and Perron (1988) tests are used to test the stationarity of the series. There are several techniques that are used to check the cointegration between the variables among them Engle and Granger (1987), Johansen and Juselius

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(1990), Johansen (1995) methods of cointegration are available but all these procedures require 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, et al. (2001) proposed another technique to find cointegration between the variables that is known as "Autoregressive Distributive Lag" (ARDL) model. There are two assumptions of ARDL model i.e. none of the variable is of order I(2) and regressand should be of order I(1). If assumptions of ARDL are violated, then F-statistics will give invalid result. ARDL bounds testing approach is better than other techniques due to following reasons: firstly, this approach is applied regardless of regressors are purely I(0) or I(1) or mutually integrated, secondly, it provides information about structural breaks in the series, thirdly, in error correction model (ECM), ECT (error correction term) integrate short run adjustments with long run, finally, it gives more accurate result than other techniques because in the presence of mixture of I(0) and I(1) standard cointegration techniques yield unstable results.

Specification of ARDL model:

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

Where, α and β are representing the short run dynamics and φ1 and φ2 are long run coefficient which shows marginal change in dependent variable due to change in explanatory variables. In order to test the cointegration, the following null hypothesis is tested:

H0: φ1= φ2 = 0 (There is no cointegration)

H1: φ1 ≠ φ2 ≠0 (There is cointegration)

In ARDL bound test the value of F-statistics is compared with upper and lower bounds. If the value is greater than upper bound then it confirms the existence of cointegration among the variables by rejecting the null hypothesis and if the value of F-statistics fall below the lower bound then there is no cointegration but if the value falls between the upper and lower bound then the results are inconclusive. The strength of the model is tested by conducting diagnostics tests. Breusch-Godfrey test is used to check the residuals for serial correlation, Breusch-Pagan test for heteroscedasticity, and Ramsey Reset test for functional misspecification.

To estimate the short run dynamics, it is necessary to transform the ARDL model into error correction representation. Error correction term (ECT) is the rate of adjustment which indicates that how quickly variables adjust towards equilibrium and its negative sign represents the convergence in the short run. This term should be negative and statistically significant to establish the long run relationship among the variables. CUSUM and CUSUMSQ tests have been used to test the stability of the parameters.

The ARDL bound test confirms the existence or absence of the long run relationship among the variables but it does not provide the direction of causality. For this purpose Granger causality test is used to determine the direction of causality. Granger (1988) stated that within the framework of ECM, causal relations among variables can be examined. The individual coefficients of the lagged terms captured the short run dynamics, while the error correction term contains the information of long run causality. So, to examine the relationship between variables, the study used VAR framework as follows:

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

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

3.3 Data

The study uses time series data of Pakistan from 1973 to 2018 at annual frequency. Data for external government debt (ED), internal government debt (ID), total government debt (TD), foreign direct investment (FDI), total investment (INV), and M2 (proxy for money supply (MS)) as a percentage of GDP is taken from Pakistan Economic Survey. Call money rate annual average (proxy for short term interest rate (IS)), GDP growth rate (Y), and nominal effective exchange rate (NEX) are also taken from Pakistan Economic Survey. Government bond yield (proxy for long term interest rate (IL)), and world long term interest rate for Euro area (IWL) are taken form International Financial Statistics.

4. Results

Augmented Dickey Fuller (ADF) and Philips-Perron (PP) unit root tests are used to check the order of integration of the variables and results are reported in table 1. Result shows that the dependent variable (long term interest rate) is I(1). The explanatory variables total debt, internal debt, external debt, money supply, foreign direct investment, world's long term interest rate are I(1), while short term 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 1 as well.

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	-2.055 (0.263)	-6.482*** (0.000)	-2.292 (0.178)	-6.541*** (0.000)	I(1)	I(1)
ID	-1.896 (0.330)	-5.164*** (0.000)	-1.224 (0.655)	-5.201*** (0.000)	I(1)	I(1)
ED	-2.408 (0.146)	-6.608*** (0.000)	-2.465 (0.131)	-6.669*** (0.000)	I(1)	I(1)
INV	-3.775** (0.029)	-	-2.991 (0.146)	-4.898*** (0.000)	I(0)	I(1)
IS	-4.864*** (0.001)	-	-2.963** (0.046)	-	I(0)	I(0)
IL	-2.868 (0.057)	-6.193*** (0.000)	-2.776 (0.213)	-6.873*** (0.000)	I(1)	((1)
MS	-2.912 (0.169)	-5.819*** (0.000)	-2. 912 (0.169)	-5.992*** (0.000)	I(1)	I(1)
FDI	-2.111 (0.522)	-6.302*** (0.000)	-1.130 (0.231)	-4.194*** (0.000)	I(1)	I(1)
NEX	-1.870 (0.059)	-2.665*** (0.009)	-2.891*** (0.004)	-	I(1)	I(0)
IWL	-2.717 (0.235)	-4.801*** (0.000)	-3.003 (0.143)	-4.841*** (0.000)	I(1)	I(1)
Y	-4.555*** (0.001)	-	-4.556*** (0.001)	-	I(0)	I(0)

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

For checking the long run relationship between the variables the study used ARDL bound test for cointegration. Bound test is applied on three models described above and reported in table 2. The lag length criteria is selected on the basis of Schwarz information criteria (SIC). F-statistics is compared with upper and lower bounds values as proposed by Pesaran et al. (2001). The result

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of bound test indicates that F-statistics fall above the upper bounds at 1% significance level in model-I and model-II which means that null hypothesis of no cointegration is rejected. On the other hand, F-statistics fall below the lower bounds at 1% significance level which means that null hypothesis of no cointegration is accepted in model-III.

Table 2: Results of Bound Test

Dependent Variable: IL Model	F-Statistics	1 percent critical values Bound Test I(0)	 I(1)	Co-integration Exist
Model-I: $F_{(IL\mid TD, IS, Y, MS, INV)}$ (1, 4, 0, 4, 0, 1)	5.142	3.41	4.68	**Yes**
Model-II: $F_{(IL\mid ED, IS, Y, MS, INV, FDI)}$ (4, 3, 4, 4, 4, 2, 4)	8.096	3.15	4.43	**Yes**
Model-III: $F_{(IL\mid ID, IS, Y, MS, INV, IWL, NEX)}$ (1, 0, 0, 1, 0, 1, 0, 0)	2.083	2.73	3.9	**No**

Before estimating the long run and short run parameters, diagnostic tests are applied for serial correlation (Breusch-Godfrey LM test), heteroscedasticity (Breusch-Pagan-Godfrey test) and model specification error (Ramsey Reset test). These tests are applied to avoid misleading results. The result of these tests are reported in table 3 and indicate that ARDL models are not suffering from the problem of serial correlation, heteroscedasticity and model specification error.

Table 3: Diagnostic Tests

Model	Test	F-statistics (p-value)	Null Hypothesis
Model-I	Serial Correlation: Breusch-Godfrey LM Test:	1.941 (0.167)	No Serial Correlation
	Heteroscedasticity: Breusch-Pagan-Godfrey Test	0.827 (0.642)	No Heteroscedasticity
	Model Specification: Ramsey Reset Test	0.465 (0.502)	Model is Correctly Specified
Model-II	Serial Correlation: Breusch-Godfrey LM Test:	0.090 (0.915)	No Serial Correlation
	Heteroscedasticity: Breusch-Pagan-Godfrey Test	0.378 (0.975)	No Heteroscedasticity
	Model Specification: Ramsey Reset Test	1.434 (0.270)	Model is Correctly Specified
Model-III	Serial Correlation: Breusch-Godfrey LM Test:	0.189 (0.828)	No Serial Correlation
	Heteroscedasticity: Breusch-Pagan-Godfrey Test	1.882 (0.1855)	No Heteroscedasticity
	Model Specification: Ramsey Reset Test	0.102 (0.752)	Model is Correctly Specified

Note: P-values are in parenthesis and shows that null hypothesis cannot be rejected.

After diagnostic tests, the long run and short run parameters are estimated as proposed by Pesaran et al. (2001). The results of long run coefficients are reported in panel A and short run

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dynamics are presented in panel B of table 4. Results of model-I shows that parameter of total government debt has negative and significant impact on long term interest rate in the long run. The results describe that interest rate decreases as government increases borrowing. According to the results, there is a negative relation between government debt and nominal interest rate in Pakistan. Economic growth also effect interest rate negatively and significantly in the long run. Parameter of investment is significantly and positively effects the long term interest rate. It shows that as total investment increases, borrowing becomes expensive due to increase in interest rate. Results of model-II shows that 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. 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 the short run. Negative and significant coefficient of ECT (-0.50 in model-I and -0.62 in model-II) shows the existence of long run relationship.

Table 4: Long Run and Short Run Dynamics

	Dependent Variable IL	
Var	**Model-I**	**Model-II**
Panel A: Long Run		
TD	-28.789** (11.658)	----
ED	----	-53.343* (25.969)
IS	0.030 (0.399)	-2.114 (2.019)
Y	-4.515** (2.008)	-4.833 (3.017)
MS	-52.604 (36.136)	-72.790 (86.256)
INV	440.814** (176.858)	403.705 (268.431)
FDI	----	-655.138* (307.496)
C	-5.309 (1.897)	32.662 (33.837)
Panel B: Short Run ECM		
ECT(-1)	-0.506*** (0.084)	-0.626*** (0.061)

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

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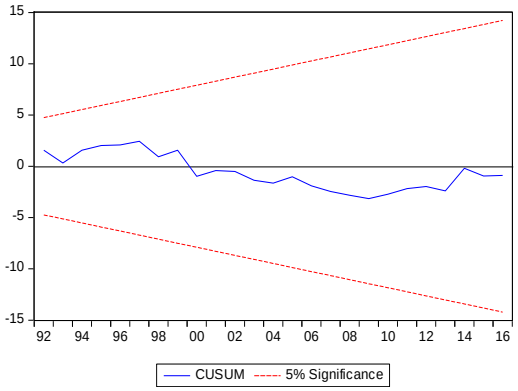

Figure 1: CUSUM Test for Model-I

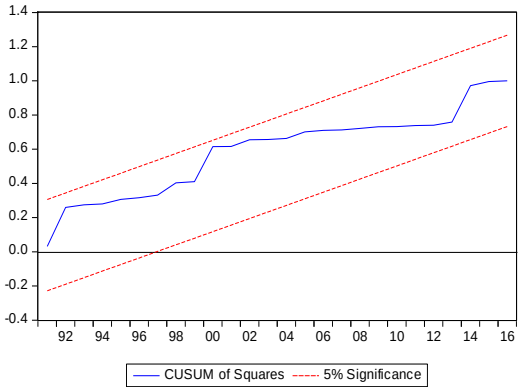

Figure 2: CUSUMSQ Test for Model-I

Residuals of estimated ECM is investigated for stability by using CUSUM and CUSUMSQ tests (Pesaran et al., 2001) under the null hypothesis that regression equation is correctly specified. Figure 1 and 2 shows graphs of CUSUM and CUSUMSQ tests for model-I, while figure 3 and 4 shows graphs of CUSUM and CUSUMSQ tests for model-II. CUSUM and CUSUMSQ test shows that these statistics remains within the critical bounds of 5 percent significance level. So, parameters are stable in both the models.

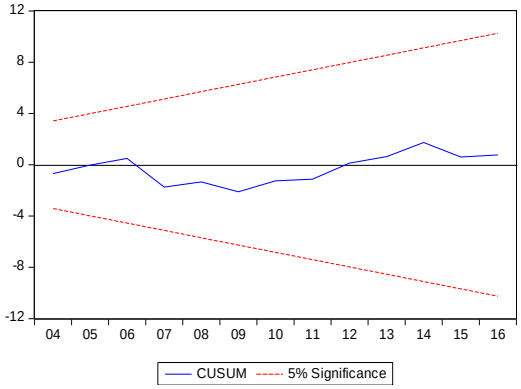

Figure 3: CUSUM Test for Model-II

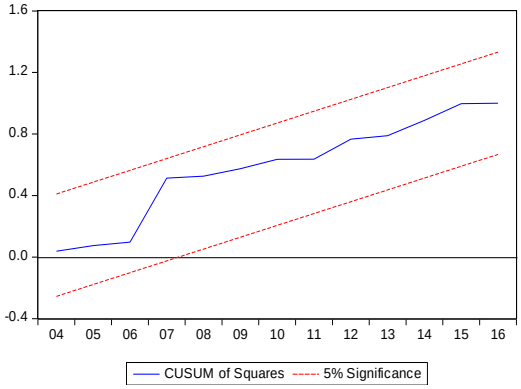

Figure 4: CUSUMSQ Test for Model-II

Granger causality test has been applied to determine the direction of casual relation between variables in the short term. Results of the granger causality for model-I presented in table 5 and shows that there exists unidirectional causal relation that runs from total government debt to long term interest rate. For other variables, there is unidirectional causal relation from long term interest rate to short term interest rate, from short term interest rate to economic growth and from short term interest rate to investment. Causal relation between long term interest rate and investment is bidirectional.

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Table 5: Granger Causality Test for Model-I

Dep vars→ Indep vars↓	Short Run Causality (Chi-Square Test)					
	IL	**TD**	**IS**	**Y**	**MS**	**INV**
IL	----	2.307 (0.114)	5.556*** (0.008)	2.064 (0.1417)	1.185 0.3175)	6.383*** (0.004)
TD	2.877* (0.069)	----	0.0865 (0.917)	0.500 (0.610)	2.867 (0.069)	1.775 (0.184)
IS	2.233 (0.122)	5.025 (0.012)	----	3.279** (0.049)	2.077 (0.140)	5.234** (0.010)
Y	1.259 (0.296)	0.128 (0.879)	0.953 (0.395)	----	0.009 (0.991)	3.219* (0.052)
MS	0.783 (0.465)	1.605 (0.215)	0.422 (0.659)	3.688 (0.035)	----	0.333 (0.719)
INV	3.601** (0.037)	0.211 (0.810)	0.033 (0.967)	0.246 (0.783)	1.091 (0.347)	----

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

Results of granger causality for model-II are reported in table 6 and shows the existence of unidirectional causal relation that runs from external government debt to long term interest rate, from long term interest rate to short term interest rate, from external debt to money supply. However, there is inverse causality that runs from short term interest rate to external debt. Bidirectional causality exists between long term interest rate and total investment, while unidirectional causality runs from short term interest rate to foreign direct investment, from short term interest rate to total investment, from economic growth to total investment and from money supply to economic growth.

Table 6: Granger Causality Test for Model-II

Dep vars→ Indep vars↓	Short Run Causality (Chi-Square Test)						
	IL	**ED**	**IS**	**Y**	**MS**	**INV**	**FDI**
IL	----	1.982 (0.152)	5.556*** (0.008)	2.064 (0.142)	1.185 (0.317)	6.383*** (0.004)	0.028 (0.972)
ED	3.915** (0.029)	----	0.131 (0.878)	0.523 (0.597)	4.506** (0.018)	2.288 (0.116)	0.965 (0.390)
IS	2.233 (0.122)	3.791** (0.032)	----	3.279** (0.049)	2.077 (0.140)	5.234** (0.010)	5.767*** (0.007)
Y	1.256 (0.296)	0.423 (0.658)	0.953 (0.395)	----	0.009 (0.991)	3.219* (0.052)	0.984 (0.384)
MS	0.783 (0.465)	0.809 (0.453)	0.422 (0.659)	3.688** (0.035)	----	0.333 (0.719)	0.418 (0.661)
INV	3.601** (0.037)	0.110 (0.896)	0.033 (0.967)	0.246 (0.783)	1.091 (0.347)	----	1.618 (0.212)
FDI	2.346 (0.110)	0.677 (0.514)	0.439 (0.648)	0.093 (0.911)	0.503 (0.609)	1.078 (0.351)	----

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

Results of granger causality for model-III are reported in table 7 and shows that no causal relation exists between internal government debt and long term interest rate. Unidirectional causality exists from short term interest rate and money supply to internal government debt, unidirectional causality also exits from long term interest rate and nominal effective exchange rate to short term interest rate. Unidirectional causality exits from short term interest rate and money supply to GDP growth rate, while unidirectional causality also exits from long term interest rate, short term interest rate, and GDP growth rate to investment.

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Table 7: Granger Causality Test for Model-III

Dep vars→ Indep vars↓	Short Run Causality (Chi-Square Test)							
	IL	**ID**	**IS**	**Y**	**MS**	**INV**	**IWL**	**NEX**
IL	----	1.834 (0.174)	5.556*** (0.008)	2.064 (0.142)	1.185 (0.317)	6.383*** (0.004)	0.124 (0.884)	0.944 (0.398)
ID	0.968 (0.389)	----	0.084 (0.919)	0.368 (0.695)	0.530 (0.593)	1.084 (0.349)	0.586 (0.562)	0.579 (0.566)
IS	2.233 (0.122)	4.878** (0.013)	----	3.279** (0.049)	2.077 (0.140)	5.234** (0.010)	0.330 (0.720)	0.105 (0.901)
Y	1.259 (0.295)	0.021 (0.979)	0.953 (0.395)	----	0.009 (0.991)	3.219* (0.052)	0.311 (0.735)	0.159 (0.854)
MS	0.783 (0.465)	3.181* (0.053)	0.422 (0.659)	3.688** (0.035)	----	0.333 (0.719)	0.115 (0.892)	0.173 (0.841)
INV	3.601 (0.037)	0.358 (0.701)	0.033 (0.967)	0.246 (0.783)	1.091 (0.347)	----	0.133 (0.876)	0.084 (0.919)
IWL	1.720 (0.193)	0.806 (0.454)	1.682 (0.200)	0.598 (0.555)	1.116 (0.338)	0.904 (0.414)	----	1.432 (0.252)
NEX	0.051 (0.951)	1.260 (0.297)	0.509* (0.605)	0.454 (0.638)	2.774* (0.076)	0.218 (0.805)	1.143 (0.252)	----

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

The relationship between total government debt and long term interest rate contradict with the study of Hoelscher (1986), Hsing (2010) and Cebula (2005), while consistent with Turner and Spinelli (2013). Increase and decrease of interest rate depends upon the supply and demand of credit. The relationship between total government debt and interest rate shows inverse relation. Government decreases the nominal interest rate to lessen the burden of debt but government decrease nominal interest rate just to a certain limit because continuous decrease in nominal interest rate decreases real interest rate. In short run the total government debt shows positive association with interest rate. Pakistan's real interest rate is declining from past few years due to decrease in nominal interest rate (SBP, 2004). On the other hand, external debt significantly effects nominal interest rate in the 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. Theoretically, if external debt rises, there should be no effect on domestic interest rate. The causality analysis also shows unidirectional causal relation that runs from external debt to interest rate which means that external borrowing effect the nominal interest rate in the short run. According to SBP (2004), despite increase in external borrowing the cost of borrowing sharply reduce which has slightly reduce the burden of debt. Domestic borrowing has no long run relation with nominal interest rate. SBP (2004) witnessed the decrease in short term interest rate due to increase in domestic borrowing. According to the SBP (2004) domestic debt, short term 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.

5. Conclusion

Fiscal deficit is a situation when government spends more than its revenues and adopts different measures to overcome budget deficit i.e. printing new currency, domestic borrowing and external borrowing. Classical economists argue that increase in government borrowing create upward pressure on interest rate and generate crowding out effect, while Keynesians believes that

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increase in government borrowing increases interest rate but this increase stimulate savings and capital formation. The objective of this study is to analyze the long run and short run impact of total government debt as well as external and internal debt on nominal long term interest rate in Pakistan. The study follows the loanable funds theory to examine the relationship between government debt and interest rate and estimates three econometric models under ARDL framework. The study uses time series data of Pakistan from 1973 to 2018 at annual frequency.

The results of the study shows significant negative relationship between total government debt and nominal long term interest rate in the long run. As government borrowing increases, the nominal interest rate declines. Economic growth effect negatively and significantly, while investment effect positively and significantly to interest rate in the long run. The study also found long run relationship between external government debt and nominal interest rate and shows significant negative relationship among them, however no evidence of long run relationship exists between internal government borrowing and nominal interest rate. FDI has negative and significant impact on interest rate in the long run. Results of the granger causality test shows that unidirectional causality exists from total government debt, and external government debt to nominal long term interest rate. However, no causality exists between internal government debt and nominal long term interest rate.

On the basis of the results study suggest the following recommendations. Firstly, 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. Secondly, government has to reduce fiscal and foreign trade deficit by expanding export opportunities instead of lowering nominal interest rate to decrease the repayment of borrowing. Lastly, government has to increase internal borrowing resources instead of taking loans from external sources to control the increase in real interest rate.

References

Aisen A, Hauner D. 2013. Budget deficit and interest rates: a fresh perspective. *Applied Economics* 45:17, 2501–2510.

Akinboade OA. 2004. The relationship between budget deficit and interest rate in South Africa: some econometric results. *Development Southern Africa* 21:2, 289–302.

Barro RJ. 1987. Government spending, interest rates, prices, and budget deficits in the United Kingdom, 1701–1918. *Journal of Monetary Economics* 20:2, 221–247.

Bayat T, Kayhan S, Senturk M. 2012. Budget deficits and interest rates: an empirical analysis for Turkey. *Eastern Journal of Business and Economics* 9:5, 119–128.

Borstel JV, Eickmeier S, Krippner L. 2016. The interest rate pass-through in the Euro area during the sovereign debt crises. *Journal of International Money and Finance* 68, 386–402.

Cebula RJ. 1988. Federal Government Budget Deficits and Interest Rates: An Empirical Analysis for the United States, 1955-1984. *Public Finance* 43:3, 337–348.

Cebula RJ. 2000. Impact of budget deficit on ex-post real long-term interest rate. *Applied Economics Letters* 7:3, 177–179.

Cebula RJ. 2003. Budget deficit and interest rate in Germany. *International Advances in Economic Research* 9:1, 64–68.

Cebula RJ. 2005. New historical evidence on the impact of budget deficits in the US on long term high grade corporate bond interest rate yields. *RISEC: International Review of Economics and Business* 52:1, 103–111.

 ISSN 1927-033X

Chakraborty LS. 2002. Fiscal Deficits and Interest: an econometric analysis of the deregulation financial regime. *Economic and Political Weekly* 37:19, 1831–1838.

Checherita-Westphal C, Rother P. 2011. The impact of government debt on growth: an empirical investigation for the Euro area. *Revue Economique* 62:6, 1015–1029.

Darrat AF. 2002. On budget deficits and interest rates: another look at the evidence. *International Economic Journal* 16:2, 19–29.

Dickey DA, Fuller WA. 1981. Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica* 49:4, 1057–1072.

Elmendorf DA, Mankiw NG. 1998. Government debt. *NBER Working Paper*, (6470).

Engen EM, Hubbard RG. 2004. Federal government debt and interest rates. *NBER Macroeconomic Annual* 19, 83–138.

Engle RF, Granger CW. 1987. Co-integration and error correction: representation, estimation and testing. *Econometrica* 55:2, 251–276.

Findlay DW. 1990. Budget Deficits and Interest Rates: Reply to Spiro. *IMF Economic Review* 37:4, 889–891.

Fischer S, Easterly W. 1990. The economics of the government budget constraint. *The World Bank Research Observer* 5:2, 127–142.

Gale WG, Orzag PR. 2004. Budget deficits, national saving and interest rates. *Brooking Papers on Economic Activity* 2004:2, 101–187.

Ganguly P. 1980. The effect of government debt on interest rates. *The American Economist, 24* (1), 52–56.

Granger CW. 1988. Causality, cointegration and control. *Journal of Economic Dynamics and Control* 12:2-3, 551–559.

Hoelscher G. 1986. New evidence on deficits and interest rates. *Journal of Money Credit and Banking* 18:1, 1–17.

Hsing Y. 2010. The government debt and long term interest rate: application of the loanable fund model to Greece. *Journal of Economic Integration* 25:4, 722–733.

Johansen S, Juselius K. 1990. Maximum likelihood estimation and inference on cointegration-with applications to the demand for money. *Oxford Bulletin of Economics and Statistics* 52:2, 169–210.

Johansen S. 1995. *Likelihood-Based Inference in Cointegrated Vector Auto-regressive Models*. Oxford University Press, New York.

Kalulumia P. 2002. Effects of government debt on interest rates: evidence from causality test in Johansen-type models. *Universite de Sherbrooke Working Papers*, (02-07).

Kameda K. 2014. Budget deficit, government debt and long term interest rate in Japan. *Journal of the Japanese and International Economies* 32, 105–124.

Khalid A. 2016. Perspectives on Public debt sustainability. *SBP Staff Notes*, (04/16).

Kinoshita N. 2006. Government debt and long-term interest rates. *International Monetary Fund Working Paper*, (06/63).

Laubach T. 2009. New evidence on the interest rate effects of budget Deficits and debt. *Journal of the European Economic Association* 7:4, 858–885.

Marattin L, Paesani P, Salotti S. 2011. Fiscal shocks, public debt and long-term interest rate dynamics. *Quaderni DSE Working Paper*, (740).

Munir K, Mehmood NR. 2018. Exploring the Channels and Impact of Debt on Economic Growth: Evidence from South Asia. *South Asia Economic Journal* 19:2, 1–21.

 ISSN 1927-033X

Munir K, Riaz N. 2019a. Fiscal Policy and Macroeconomic Stability in South Asian Countries. *Hacienda Publica Espanola/Review of Public Economics* 228:1, 13–33.

Munir K, Riaz N. 2019b. Macroeconomic Effects of Fiscal Policy in Pakistan: A Disaggregate Analysis. *Applied Economics* 51:52, 5652–5662.

Munir K, Riaz N. 2020a. Macroeconomic Effects of Exogenous Fiscal Policy Shocks in Pakistan: A Disaggregated SVAR Analysis. *Hacienda Publica Espanola/Review of Public Economics* 233:2, 141–165.

Munir K, Riaz N. 2020b. Fiscal Policy, Macroeconomic Flux and Inflation Volatility in Pakistan. *Journal of Applied Economics and Business Research* 10:4, 194–206.

Nwosa PI, Ibas CK. 2014. Does budget deficit affect short and long term interest rates differently? *International Journal of Economics and Business Research* 8:4, 399–414.

Odiony JC, Uma KE. 2013. The relationship between budget deficit and interest rate: evidence from Nigeria. *European Journal of Business and Social Sciences* 2:1, 158–167.

Paesani P, Strauch R, Kremer M. 2006. Public debt and long-term interest rate: the case of Germany, Italy and USA. *ECB Working Paper*, (656).

Pandit R. (2005). The Impact of Fiscal Deficit on Long-term Nominal Interest Rate in Nepal. *NRB Economic Review* 17, 113–133.

Pesaran MH, Shin Y, Smith RJ. 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics* 16:3, 289–326.

Philips PCB, Perron P. 1998. Testing for Unit Root in Time Series Regression. *Biometrica* 75:2, 335–346.

Quayes S, Jamal AMM. 2007. Budget deficits and interest rates: The US evidence since 1946. *Singapore Economic Review* 52:2, 191–200.

Saleh A, Harvie C. 2005. The budget deficit and economic performance. *Singapore Economic Review* 50:2, 211–243.

SBP. 2004. *Annual Performance Report 2003-2004*. State Bank of Pakistan, Karachi.

Spiro PS. 1990. The effect of government debt on short-term real interest rates: Comment on Findlay. *IMF Staff Papers* 37:4, 881–888.

Todaro PM, Smith CS. (2012). *Economic Development*, 11th ed. Pearson Addison Wesley, Boston.

Turner D, Spinelli F. 2013. The effect of government debt, external debt and their interaction on OECD interest rates. *OECD Economic Department Working Papers*, (1103).

Wang Z, Rettenmaier AJ. 2008. Deficits, explicit debt, implicit debt and interest rate: some empirical evidence. *Southern Economic Journal* 75:1, 208–222.

Winter C. 2017. The impact of government debt on the long run natural real interest rate- a quantitative evaluation. *Applied Economic Letters* 24:20, 1429–1434.

 ISSN 1927-033X