Dynamic Analysis of Government Debt and Interest Rate an Empirical Analysis in Case of Pakistan

G.R. Lakhan[1], **A. Shoaib[2] and A. Safia[2]**
[1]FUUAST, PAKISTAN
[2]Applied Economics Research Centre, PAKISTAN

Abstract

The current Renaissance of the government's budget deficit has reawakened discussions concerning the impact of government debt on interest rates. Whereas the effects of government debt on the economy can function through a number of diverse channels, many of the recent apprehension about government borrowing have concentrated on the potential interest rate effect. Higher interest rates due to growing government debt can diminish investment, slow down the consumption on interest-sensitive durable goods, and reduce the worth of assets held by households, therefore ultimately distort consumption expenditures through a wealth effect. The degree of these potential unfavorable effects depends on the extent to which government debt actually raises interest rates. This paper evaluates the impact of government debt on interest rate in case of Pakistan using "Autoregressive Distributed Lag Model" (ARDL) approach. To study the relationship, time series data is used from the period of 1971 to 2012. To do the research applicable, Interest rate (r), government debt (GD) percentage of GDP and inflation (CPI) taken as variables to evaluate the relationship. The end results of the study show that the interest rate moves positively if government debt increases. The study also proposed long run and short run relationship exist among variables. This paper also proposed some valuable suggestions for policy making.

Keywords: Autoregressive Distributed lag model, Government debt, interest rate, Pakistan.

Introduction

Fiscal deficit (FD) occurs when total expenditures of government are more than the revenue that the government collects. Importance of 'FD' has got to realize after Brettonwoods system, throughout the last twenty years, many of the DCs including Pakistan facing the problem of 'FD' and is painstaking as one of the major causes of macro-economic disproportions. Nevertheless, it is particularly complicated to conclude that a diminution in 'FD' always capitulates positive results. It is theoretically and empirically argued that if the goal of reduction in the deficit is achieved by decreasing development expenditures rather than by increasing revenue, then its impact in the long run will be negative for economic growth. Pakistan has faced the chronic problem of FD since very soon after independence, in the period of 1960's 'FD' was only 2.1 percent of GDP, during the period of 1972 to 1980 'FD' was on average 8.0 percent of its GNP. Afterward, during the period of 1980s FD was abridged and during this time period, it was on average 7.1 percent of GDP. In the time period of 1990s, the government accepted the proposal of the IMF in Structural Adjustment Program to decrease 'FD' to 4 percent and tried its level best to bring the 'FD' to 4% of GDP, but it was capable to decrease the 'FD' to only 6.9 percent of GDP. Nonetheless, 'FD' sustained to reduce in fiscal year 2003-04 it was only 2.3 percent of GDP. However, after this period FD once again starts rising and in fiscal year 2006-07 and it's

become 4 percent of GDP and it was projected that 'FD' would be 6.5 percent of GDP in fiscal year 2007-08. It is found that 'FD' for the year 2011 and 2012 is again increased to the value computed as 6.6 and 8.5 percent of GDP respectively.

The connection between 'r' and 'BD' is multifaceted. Economists argued that this relationship is multifaceted due to fact that countries apply different strategies to finance their deficit. In view of classical system components of commodity demand determined interest rate. The behavior of 'r' in classical system is examined by applying the concept of demand for and supply of loanable funds. Many economists argued that when government finance its deficit by borrowing from the domestic market, loan become scarce for private sector and this activity leads to higher 'r' and crowding out effect in the economy. The study of the World bank (1993) pointed out that countries where financial market are not suppressed, deficit financing of government from the domestic financial market increases the domestic 'r' if external borrowing is not possible. On the other hand, if the domestic financial market integrates with world capital market, higher domestic borrowing leads to higher domestic 'r' that results capital inflows in domestic market, thus cause foreign debt increases, so the shock on domestic 'r' will not be a large amount. Moreover, economies where the market is suppressed, higher 'BD' leads to higher "INF" with given a fixed interest rate.

The basic and standard model to understand the connection between 'r' and 'BD' is the model using the aggregate production function of an economy. This model explained that government debt, replace by productive physical capital. In short, this model explained that interest would increase if capital reduces in the aggregate production function due to the linkage of 'MPK' to the interest rate.

According to the Keynesian approach of interest rate determination, Keynesian proposed that 'BD' causes 'r' to rise by not only crowd out capital but also by stimulating aggregate demand in the short run. But the result of long run effect is different from short run effects of the Keynesian approach. It is also observed that in a growing economy, monetary authority may purchase government debt to increase MS and to keep prices constant, if this policy is adopted then there will be no crowed out of 'PI'. It is also important to know that difficulty arises when econometric model considers other factors that determine 'r' primarily when these factors are endogenous in the model of supply and demand for loanable funds in the credit market. Moreover, it is also noted in some studies, private sector debt also reduced capital formation by stimulating consumption. In some past studies when government debt taken as variable which may affect interest ignored the effect of private sector borrowing.

Theory of neo-classical viewed Recardian equivalence in a manner that government debt has no effect on 'are' because this debt offset by increasing private saving thus no change in capital stock and this remains 'r' with no change. It is also pointed out in some studies, an increase in government debt can also offset by lending of the foreign sector due to linkage with global capital market.

Pakistan is facing 'FD' like most DCs and low PI as compared with other developing countries. This problem is faced by Pakistan economy due to less potential in revenue collection and low tax to GDP ratio. It is also observed that 'FD' causes 'r' and 'INF' to increase. The aim of this research paper is to evaluate the relationship between 'GD' and 'r' and ultimately its effect on the performance of private sector in Pakistan.

Literature Review: R.V.S.S., Nagabhushana Rao et.al. Identify that demand side policies are responsible for higher inflation in India. In this study it is proposed that monetary policy should be used to tackle the inflation in India[1].

The view proposed by classical economists, while protecting the concept of 'Laissez Fair'. Classical economists argued that the involvement of government cause damaging market efficiency due to spending by government sector force the private sector's investment to reduce. That is why private investors find the government involvement in markets objectionable. Along with this, increasing 'r' also dishearten investment of private sector in the economy.

Shehnaz et al. inspected the consequence of debt and its lumber on Pakistan economy for the period (1970-2005)[2]. Their end results point out that intensifying of current and balance of payment deficits, variation in exchange rate and payments of interest on loans are the three important variable accounts for increases in government liability and the whole debt lumber. Moreover, the outcomes of the study also discovered that the public debt ratio is mostly affected by the exchange rate factor which increases the public debt ratio throughout the period of study and interest rate variable was slightly accountable for increases in 'ratio of external debt to GDP'. A matter of fact is that, budget and current account deficit are responsible for exchange rate and 'r' fluctuations in case of Pakistan.

Vieira explored the relationship between 'FD' and 'INF' using the data of six major European countries. The consequences attained by this study gave little support for the suggestion that 'INF' is largely being affected by 'BD'. On the contrary, somewhere signs of long run connection deficit and 'INF', this confirmation are further consistent with a thinking that deficit is added by the 'INF', somewhat than the overturn[3].

Chaudhary and Kiyoshi Abe have an opinion that similar to most developing countries, outsized and increasing 'BD' in Pakistan is one of the main terrific economic problems[4]. This persistent problem is responsible for creating high 'INF', stumpy growth, a current account deficit in addition to the interest-induce crowding out of 'PI' and consumption.

Study of Chaudhary and Ahmad found that in the long run creation of 'INF' is also the function of deficit financing, through the channel of domestic borrowing. The study also found a direct association between 'BD' and 'INF' for the duration of periods of seventies[5].

Laurance and Mankiw analyzed and discussed the effects of 'BD', in their study, they identify that decline in 'NI' is an important and the most damaging impact of BD[6]. Savings keep the smoothness in the consumption and create space to invest in future. The declining rate of 'NI' is the indication of lesser capital creation in the future period and it will reason for unemployment and squeeze capacity of production in long run period.

Abell calculates the magnitude of the impacts of 'BD' on the trade deficit and conclude that the financing of budget deficit financing with the help of financial instruments and securities may increase 'r' which cause foreign inflow in the economy. This interest induced foreign inflow would result in the enhancement in the value of domestic currency, which results daunt in net exports of the country and similar grounds for trade deficit[7].

Cebula analyzed the impact of 'BD' on 'r' in such a way, if the government uses the policy of selling bonds for deficit financing, this auction ground to increase in interest rates[8]. The

increase in 'r' is due to the needs of government to raise interest rates with the intention of attracting investors and struggle with private institutions for the accessible finances.

Therefore, we theorize that 'BD' affects private sector's investment due to government borrowings and expenditure. This condition is known as crowding out effect in the economic literature.

Premchand empirically projected that deficit financing through borrowing from public (bonds, securities) reason for financial crowding out of 'PI' because of increased 'r' interference of government in financial market[9].

Motley performed empirical research to know the behavior of the association among 'MS', real interest rate and 'BD' using the date regarding San Francisco[10]. The real interest rate has gone up raucously, shown by the result of a study conducted by Motley. It is comprehensively found that the linkage of contractionary monetary policy with a policy of combating increasing deficit financing may have a favorable effect. The experimental results of this research support that this relative behavior only showed in the stage of the seventies and that even during this period the cause was not strongly important when federal deficit and changes in the supply of money occurred at the same time. It was suggested by studying that there are two sides of effect of real interest rate. The first phase of interest rate effect is crowding out of 'PI'. And the second face is increasing 'INF' due to money supply and money in circulation in the economy.

Aghevli and Khan exercised the simultaneous equation model and made use of tests for dependency to inspect the connection between 'BD', 'INF', 'MS' and output growth for four DCs include Brazil, Colombia, the Dominican Republic, and Thailand time span from 1978-2009[11]. It is originated that revenue gaps cause deficits and the crucial role of government expenditures. The result of the study reveals that the supply of money increases in an economy when government attempt to finance the deficit, therefore creating upward pressure on the price level and slow growth of an economy.

Objective of the study: The following are the objectives of the study: i. To check the association and measure the magnitude of variability in the dependent variable (interest rate) due to changes in the independent variables. ii. To check the long-run and short-run adjustments of the variables in case of disequilibrium.

Methodology

Empirical literature showed that economists use to measure the short run and long run relationship among variables of interest. For the purpose of measuring, most studies extensively used "Standard Johanson Cointegration" and "Vector Error

Correction Model" skeleton, but these frameworks experience some considerable faults.

We used ARDL technique to set up the course of dependency among parameters. One of the advantages of this technique is that this test does not engage in pretesting of variables, this suggests that an empirical test for the concern variables is appropriate without worrying about whether the considering variables are purely integrated at the level I (0), integrated of I (1), or a combination of both.

For the purpose of obtaining robust results, we make use of the ARDL technique to set up the existence of a long run and short run association among variables. ARDL is enormously helpful because it enables us to explain the presence of convergence among variables without losing long run information. Equation to be estimated is as follows

$$\text{LENDING RATE}_t = \beta_0 + \beta_1 \text{GOVTDEBT}_t + \beta_2 \text{CPI}_t + u_t \quad (1)$$

Where: Lending Rate$_t$: is used as a proxy for interest rate. Govtdebt$_t$: is government debt from the banking sector. CPI$_t$: (Consumer Price Index) is used as a proxy for inflation. u$_t$: represents an error term

An ARDL demonstration of equation 1 is as follows

$$\Delta \text{LENDING RATE} = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta \text{LENDING RATE}_{t-i}$$
$$+ \sum_{i=0}^{n} \alpha_{2i} \Delta \text{GOVTDEBT}_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta \text{CPI}_{t-i} + \beta_1 \text{LENDING RATE}_{t-1}$$
$$+ \beta_2 \text{GOVTDEBT}_{t-1} + \beta_3 \text{CPI}_{t-1} + e_t \quad (2)$$

Where: Δ denotes the first difference operator. α_0 is the drift component. e_t is usual white noise residual

The equation-2 also represents the technique of short run and long run estimation. First four expressions of the equation on the left hand side shown as (α_0 to α_3) represents short run dynamics and expression shown as (β_1 to β_3) represents the long run dynamics of the model.

Results and Discussion

Table -1 showing the autoregressive distributed lag estimates using Schwarz Bayesian Criterion (SBC). This estimate ensures the maximum lag with which the model is best for the estimation. Table no. 2 showing that the lending rate with lag one, govtdebt at level and also the 'CPI' are at level, is a favorable model for achieving the desired results of the estimation. This ensures that we will proceed with this lag selection model. Table no. 2 also showing the diagnostic result, as we can see that we fail to reject the hypothesis of no serial correlation as the probability 0.803 is more than 1%, 5% and10% level of significance (based on the F - statistic).

Similarly, we fail to reject the correct functional form and homoscedasticity at 1%, 5% and 10% level of significance (based on the F - statistic). R-Squared shows how much dependent variable is changed by explain part of the regression. Our selected model demonstrates that the dependent variable is 71 percent explained by the independent variables. Probability of F-statistic is 0.000 indicated that overall the model is significant.

Table-2 showing the results of long run coefficients using ARDL Approach. This table highlights estimation of the long run behavior of variables. In the long run one percentage point change in govtdebt (relative to GDP) will change lending rate by 1.391 basis points. This relationship is positive and significant from zero at the 5 percent level. This relationship confirmed one of the theories which say that if government debt increases, it will exert upward pressure on interest rates. The theory suggested that if government finance their BD through borrowing (domestic banks), the loans available for the private sector become scarce as a result, it will increases 'r' or in other words the available loan is reduced for the private sectors.

Many theoretical and empirical researches identify that 'INF' and 'EFINF' both are affected by the dynamics between long term and short term interest rates. It is generally believed that short term interest rates are set by the central bank authority. As regards to long term interest rate, it is set by the market forces which mean that condition of demand and supply sets the equilibrium price of bonds, which in turn sets long-term interest rate. If the market for bonds considers that the central bank authority has set the 'treasury rate' low, 'EFINF' increase, which means that long-term interest rate increase as compared with a short term interest rate. If the market considers that the central bank authority has set the treasury rate too high, the reverse condition prevails, the long term interest rate goes down as relate to short term interest rate. It is estimated that in case of Pakistan if one unit change in CPI variable the dependent variable (lending rate) increases by 0.34 with positive sign and significant from zero at the 5 % level. C shows the constant variable which is also significant at the 1 % level of significance.

Table-1
Autoregressive Distributed Lag Estimates
ARDL (1,0,0) selection based on SBC

Variables	Coefficient	Standard Error	T-Ratio (Probability)
LENDING RATE (-1)	0.60900	0.12189	4.9963 (0.000)*
GOVTDEBT	0.54405	0.25079	2.1683 (0.039)**
CPI	0.13335	0.04376	3.0468 (0.005)*
C	2.6175	1.3748	1.9039 (0.067)***
R-Squared 0.71222 R-Bar-Squared 0.68139 F-statistic (prob.) 23.0994 (0.000) DW- 1.9550 Serial Correlation 0.62075 (0.803) Functional Form 1.3858 (0.239) Heteroscedasticity 0.01153 (0.914)			

Source: Tabulated and summarized by the authors: significant at *1%, **5%, and ***10% level of significance.

Table-2
Long Run Coefficients using the ARDL Approach

Variables	Coefficient	Standard Error	T-Ratio (Probability)
GOVTDEBT	1.3914	0.54393	2.5581 (0.016)**
CPI	0.34105	0.16134	2.1139 (0.044)**
C	6.6944	1.7766	3.7681 (0.001)*

Source: Tabulated and summarized by the authors: *1%, **5%, and ***10% level of significance.

Table-3
Error Correction Model

Variables	Coefficient	Standard Error	T-Ratio	Probability
D (GOVTDEBT)	0.54405	0.25079	2.1693	0.039**
D (CPI)	0.13335	0.043767	3.0468	0.005*
D (C)	2.6175	1.3748	1.9039	0.067***
ECM (-1)	-0.39100	0.12189	-3.2078	0.003*
R-Squared 0.44291 R-Bar-Squared 0.38322 DW- Statistic 1.9550 F-Statistic (7.4203) 0.001				

Source: Tabulated and summarized by the authors: *1%, **5%, and ***10% level of significance.

Table-3 revealed the short run dynamics of concern relationship. It is confirmed that short run behavior is captured by the error correction model. Variable D(GOVTDEBT) is significant from zero at the 5 % level of significance which shows that in the short run 'r' is changed by 54 percent basis points if government debt is changed by one unit. Similarly, variable D(CPI) is significant from zero at the 1 % level of significance, which indicates that if 'INF' is increased by one unit it causes 'r' to increases by 13 percent basis points. The error correction term which is the indication of whether a short run relationship exists or not, is also significant at a level of 1%, which shows that the short run relationship is present among variables of concern. The speed of adjustment towards equilibrium is moderately high as shown by the value (-0.39100). So, it is confirmed in our study that in case of Pakistan government debt and 'INF' causes an increase in 'r' in the short run.

Conclusion and policy recommendation

The present study explored the consequences of 'government debt' and "INF" on 'r' using ARDL method. Most of the study suggested that increasing government debt reduces funds available for the private sector, which in turn put upward pressure on interest rates. The existence of long run and short run association among variables is verified by our study. Government debt and 'INF' have a significant effect on 'r' in case of Pakistan. The effect of this increasing 'r' reducing demand for investment goods and output of goods and services. This in turn reduces employment and national income of a country, and the overall welfare of people would decline. Thus, government must reduce unproductive expenditures to decrease the share of government debt. If government debt decreases it is suggested by our study that it will reduce 'r' up to the favorable stage, which give confidence to the private sector to invest in different projects. This will in turn increase employment and national income.

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Abbreviations

"r"	interest rate
"DCs"	Developing countries
"BD"	budget deficit
"FD"	fiscal deficit
"PI"	private investment
"INF"	inflation
"EFINF"	expected future inflation
"MS"	money supply
"GOVTDEBT"	government debt
"CPI"	consumer price index (proxy for inflation)
"LENDING RATE"	proxy for interest rate
"IMF"	International Monetary Fund
"MPK"	marginal productivity of capital/