GOVERNMENT BORROWING AND MACROECONOMIC DYNAMICS OF PAKISTAN

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Sub-Theme: Macroeconomic Policies in a changing global and Local Landscape

ABSTRACT

Every economy employs certain procedures to address the growth and inflation dilemma. In the capitalistic economies of present day, the objectives of sustained growth and minimal inflation are achieved through the coordinated efforts of fiscal and monetary authorities. In developing countries like Pakistan where both the authorities face the dilemma of meagre resources to achieve their objectives, it is pertinent to study the effects of government borrowing on macroeconomic dynamics. This study utilizes a modified New Keynesian Model to study the impact of government borrowings on economic indicators like inflation, aggregate demand, interest rate and exchange rate. In addition, the role of the State Bank of Pakistan in stabilization of the economy by controlling government borrowing is also studied. Both Law of One Price and Uncovered Interest Parity condition are relaxed. The data was taken for the period of 1975 to 2015. Rational expectation restrictions are identified by following Keating (1990). For estimation purposes, Structural Vector Autoregressive (SVAR) model is used as to check the structural changes with policy shocks. Johansen Cointegration (1990) is applied on the basis of the results of unit root test of stationarity to check the long run association between the variables. The responses of macroeconomic variables to government borrowing shocks and risk premium shocks are assessed with impulse response function. Both the government borrowing and risk premium shock have permanent positive effect on macroeconomic aggregates in the long run. An effective monetary-fiscal coordination effort is needed to ensure the applicability of FDLA in its true spirit.

Keywords: *Monetary Policy, Fiscal Policy, Government Borrowing, SVAR, Impulse Response, Risk Premium Shock*

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1. INTRODUCTION

During the past thirty years, an important issue for the policy makers remains around the repercussions of government borrowing on macroeconomic performance of a country. It is not difficult to understand the reasons behind rapid rise in government borrowing in comparison to GDP all over the world. History, prior to last three decades, witnesses rapid increase in the government borrowing only during the depression periods or the war. However, the policy makers, more or less, remains silent to devise policies to overcome this rising trend. This episode raises a very relevant question, that is, what are the repercussions of government borrowing?

In Pakistan from the beginning of financial restructuring, the idea of monetary and fiscal policy coordination is least bothered even in academic research. During 1973-90, domestic borrowings was high because of fiscal policy failure. In 1990s, it is witnessed that there are many changes in monetary authority rules and debt management rules. One of those changes is the change for policy makers. That was conducting of monetary policy by central bank of Pakistan. It was a modification in the State Bank of Pakistan Act, 1956, monetary policy conducting comes first responsibility of SBP.

The economic policy should be organized in a way so as to provide stable economic growth which is free from the impacts of inflation. So, to achieve those end results of economic policy, there is need for coordination between fiscal and monetary authorities whose objectives are often conflicting and contradictory. Keeping this in mind is always important as the autonomy of central banks has been advocated in the past few decades due to the distrust in government's policies to reduce inflation. As a result, the idea of 'independence of central banks' was propagated to keep a check on inflation through monetary policy. The study aims to frame theoretical model comprising impact of government borrowing on aggregate demand, exchange rate, interest rate, inflation and other macroeconomic indicators so as to understand the role of government borrowing in affecting macroeconomic dynamics of the economy of Pakistan.

Many times, governments take political decisions about the infrastructure development and the projects which can be quoted for winning the upcoming elections. These politically motivated decisions are normally rationalized economically. More specifically in the economy of Pakistan, lack of independence of the monetary authority (which is State Bank of Pakistan) which, during the last many years, is working under the fiscal dominance, the sustained fiscal deficit historically and the popular decisions by the sitting governments are the major factors which provide good base to analyze the economy. This study makes choice to adopt a New Keynesian Model developed by Cebi (2012) for Turkey and recently verified numerically by Shahid et al (2016). Based on this model, the study aims to make the policy analysis where in magnitude of the relationship among the macroeconomic variables will also be focused on along with relying on simulation analysis.

Much of the literature both for the developed and developing countries emphasis only partially on impact of government borrowing on few of the macroeconomic indicators like economic growth, inflation etc. The great evolution in macroeconomic modeling, after the happening of the Oil price shock of 1973 that results in capturing the Lucas critique, has not been covered under the topic. There is need to understand the short run dynamics of government borrowing through New Keynesian model considering most theoretically sound models wherein these models address the Lucas Critique efficiently. The literature on Pakistan is greatly missing in this perspective. The current study will use the New Keynesian model wherein uncovered interest parity condition and the assumption of law of one price will be relaxed. Both the Fiscal and monetary policies framework will be included in the model so as to complete the model in all dimensions. Thus, government purchases will be explicitly included in the aggregate demand equation. Equation for fiscal solvency will also be a part of the model. The model developed by Cebi (2012), who worked for Turkey, is adopted mostly.

In Section 2, theoretical framework along with model is discussed that depict most of the channels through which government borrowing impact the economy. Section 3, discusses the methodology and identification of rational expectation restrictions. Section 4 incorporates analysis of estimated results and last section concludes the study and present policy recommendations.

2. THEORETICAL FRAMEWORK

It is a matter of routine in macroeconomics to approximate the solutions to non-linear, DSGE using linear techniques, ever since the works of Kydland and Prescott (1982) and King et al. (1988). Certain aspects of the dynamic properties of complicated models are characterized by linear approximation methods. The first-order approximations do give reasonable answers to questions such as the identification and determination of equilibrium and magnitudes of second moments of the endogenous variables, where the support of shocks riding aggregate fluctuations is small and an internal stationary than solution exists.

Economists of the last two decades of the 20^{th} century began constructing the macroeconomic models on the basis of microeconomic foundations of rational choice in response to Lucas Critique. These models are known widely as dynamic stochastic general equilibrium (DSGE) models. These models start by categorizing agents actively working in the economy, i.e. firms, households and governments in a single or multiple countries, as well as technology, preferences and budgetary constraints of each one of them. It is assumed that every economic agent makes an optimal choice, after taking into consideration the prices and strategies of other agents, for both the present and the future. By considering the decisions of the different kinds of agents, all at a time; it is very much possible to ascertain the price which equates supply to demand in every market. Hence, a kind of equilibrium self-consistency is embodied in these models: given the prices that must be in parallel with the agent's supply and demand, agents

choose optimally. With the use of these models, we can choice structural shocks from the models.

2.1 Aggregate Demand Curve

According to Ricardian equivalence, any tax cut or increase in government spending, which may result in increase in budget deficit, requires implementation of taxes in the future. Thus, the rational consumers increase their savings to pay future taxes which neutralizes the impact of decrease in government savings. Ultimately, there will be no impact on the national savings and the other macroeconomic variables as well. However, the empirical failure of Ricardian Equivalence is mainly due to presence of market imperfections specifically in the capital market. Market imperfections ensure the rigidity of prices in the short run which results in increase in aggregate demand as a result of any decrease in nominal interest rate and the subsequent real interest rate. Thus, real interest rate has negative affect on the aggregate demand. Another important implication of the change in interest rate is to affect the consumption smoothing pattern of households. Depending on the direction of change in interest rate, inter-temporal substitution in consumption play important role.

New Keynesian models have strong microeconomic foundations and derived through the behavior of individual households and firms. Households have two primary roles to play, one is the consumption and the other is the supply of labor services. Accordingly, the objective of household is maximization of lifetime utility, that is, any decrease (increase) in consumption (saving) in the current period ensures increase (decrease) in consumption (saving) in the next period. Therefore, forward looking output gap is a natural ingredient of the demand equation.

Looking at the consumption basket of the consumer in an open economy framework ensures the inclusion of imported goods in consumption. There is potential of influence of exchange rate changes on the demand if law of one price does not hold. Therefore, change in exchange rate is an important determinant of aggregate demand. However, the direction of influence is uncertain, that is, exchange rate can have either positive or negative influence on demand. It depends on the behavior of suppliers of imported goods whether they fully pass on the impact of exchange rate changes to the consumers or not.

Changes in fiscal policy stance through changes in government spending significantly affect the aggregate demand in the economy and leads to consumption led growth. Finally, the IS equation includes the aggregate demand shock originated through the structure of the economy and from the behavior of consumer. The IS equation closely resembles Clarida, Gali and Gertler (2001), Gali and Monachelli (2005) and Cebi (2012).

$$x_t = -\alpha_1[i_t - E_t\pi_{t+1}] + E_t x_{t+1} + \alpha_2 E_t(q_{t+1} - q_t) - \alpha_3 E_t(\Delta g_{t+1}) + \epsilon_t^{AD} \quad \dots (2.1)$$

Equation 2.1 is in log-linearized form. Output gap is obtained after subtracting potential output from the actual output which is actually the cyclic component of the output and represents deviation from the natural level of output. It is obtained through employing Hodrick Prescot filter, a built-in feature in Eviews 9. Deviation of the economy from the natural path depicts the presence of some sort of rigidities in the market thus calls for role of fiscal and monetary policies to stabilize the economy around the natural path, that is, the steady state. Real interest rate is what the Wicksell call it natural real rate of interest.

2.2 Aggregate Supply Function/Phillips Curve Equation

The nature of inflation dynamics, which is the most distinctive feature of the new Keynesian paradigm, is captured by the New Keynesian Phillips Curve, which is based on Calvo's (1983) model. According to this model, inflation is determined by expected future inflation and firm's real marginal costs. Two main issues highlighted include one, what measures needed to administer real activity. Two, expectations are a central part that can affect the results. Cost-push shock can be added with the marginal cost, which represents the imperfections in the labor market [Nawaz and Ahmed (2015)].[2] The increased government borrowing may also be financed through seigniorage which results in high inflation. According to Sargent and Wallace (1981), inflation is ultimately a fiscal phenomenon and not the monetary phenomenon. At the time of servicing the borrowing, higher dead weight losses will be witnessed in comparison to the losses witnessed at the time of accumulating the government borrowings. Political angle of the government borrowing is also very important as it reduces the fiscal flexibility of the government and the political dependence due to heavy reliance on international agencies like IMF (Wicksell, 1896; Feldstein, 1995 among others). Government borrowings may also shake the confidence of foreign investors. Government borrowing has large effect on life cycle consumers in the long run in the sense of crowding-out (Auerbach and Kotlikoff, 1987).

$$\pi_t = \beta_1 E_t \pi_{t+1} + \beta_2 x_t + \beta_3 q_t - \beta_3 \hat{g}_t + \epsilon_t^c \dots (2.2)$$

Above equation is for inflation that depends upon expected inflation, output gap, and cost push shocks. And further cost put shocks can be $\boldsymbol{\epsilon_t^c = \mu \epsilon_{t-1}^c} + \hat{e}_t$, it is short run trade off between inflation and output. This equation also infers that inflation is forward looking, that is, current inflation is dependent on forward looking expectations of inflation. It means that when producer sets the price future inflation is considered by him.

2.3 Uncovered Interest Parity

Assuming that the time-varying risk premium is negatively correlated with an expected depreciation may explain the empirical facts; see Froot and Thaler (1990). McCallum (1994) explains the apparent empirical failure of uncovered interest rate parity with the hypothesis that

[2] Nawaz and Ahmed (2015). New Keynesian macroeconomic model and monetary policy in Pakistan. *Pakistan Development Review*, *54*(1), 55.

central banks systematically manage interest rate differentials to avoid frequent changes in the exchange rate. So, it seems to be preferable to use more common approach to describe the relationship between interest rate and exchange rate. Following Ball (1999), it is proposed that we ease the uncovered interest parity condition and apply simple approach that just show the proportionate relation between real interest rate and exchange rate and a random shock which captures every exogenous variable that can affect the real exchange rate like foreign interest rate, confidence on the part of investors, and expectations etc.

$$q_t = E_t q_{t+1} - \omega_1(i_t - E_t\pi_{t+1}) + \epsilon_t^{rp} \dots (2.3)$$

A rise in real interest rate will leads to appreciation in real exchange rate, thus make domestic assets more attractive for the foreign as well as domestic investors. ϵ_t^{rp} is autoregressive term.

2.4 Taylor Rule

The primary role of the central bank is to ensure the stability of the economy through appropriately responding to inflation and output gap. The objective is primarily to minimize the welfare losses. Government borrowing many times in developing countries like Pakistan may result in significant welfare losses due to inflationary consequences for the economy that leads to lowering the purchasing power of the consumer. Therefore, an additional role of the central bank can be to prevent the economy from excessive government borrowing through increasing the interest rate. It discourages the government borrowing due to high cost of borrowing. According to fiscal Responsibility and Debt Limitation Act (2005) validated in 2012 by the parliament put State Bank of Pakistan responsible to control the government debt. Thus, presumably SBP respond to debt also along with responding to inflation and output gap. Kumhof et al (2008) include both inflation and debt in the interest rate rule. Accordingly, the interest rate rule will take the form as

$$i_t = \gamma_0 + \gamma_1 b_t + \gamma_2 E_t\pi_{t+1} + \gamma_3 x_t + \varepsilon_t^i \dots (2.4)$$

ε_t^i represents the monetary shock and is assumed as AR process. Any monetary surprises by the monetary authority can influence the macroeconomic indicators in an important direction to achieve the desired objectives.

2.5 Fiscal Policy Rule

Output and debt stabilization are two primary objectives of fiscal authority. Following basic form of fiscal rules (government spending and tax rules) adopted by Cebi (2012), we transform the lag of government spending and taxes into forward looking components, depicting the forward-looking behavior on the part of fiscal authority to smooth the economy. Therefore, fiscal smoothing is assumed to be a part of objective of the fiscal authority. The forward-looking form of fiscal policy reaction function in log linear form is as under:

$$g_t = \rho_g g_{t+1} + (1-\rho_g)\left[g_y E_t x_{t+1} + g_b b_t\right] + \varepsilon_t^g \ldots (2.5)$$

$$\tau_t = \rho_g \tau_{t+1} + (1-\rho)\left[\tau_y E_t x_{t+1} + \tau_b b_t\right] + \varepsilon_t^\tau \ldots (2.6)$$

Parameters ρ_g and ρ_τ denote the degree of fiscal smoothing. The greater the degree of fiscal smoothing, the less will be the response of government spending and taxes to output gap and debt. Parameters g_y and τ_y demonstrate the sensitivities of government spending and tax to past value of output gap. Parameters g_b and τ_b correspond to feedback coefficients on unobservable debt stock and $\in_t^g$ and $\in_t^\tau$are i.i.d. government spending and tax shocks, which represent the non-systematic component of discretionary fiscal policy or discretionary exogenous deviations from the fiscal rules.

The government issues nominal debt period-by-period in order to pay the principle and interest on its existing debt and to fund any discrepancy between its spending and its tax revenues. The model is completed by fiscal constraint. As in Cebi (2012), log linear solvency constraint can be written as:

$$b_{t+1} = i_t + \frac{1}{\beta}\left[b_t - \pi_t + (1-\beta)(\tau_t - x_t) + \frac{\bar{C}}{\bar{B}}(g_t - \tau_t)\right] A + \varepsilon_t^b \ldots (2.7)$$

However, the fiscal constraint also includes the structural shock depicting any surprise increase in fiscal deficit can influence the debt and through debt to other macroeconomic indicators. It resembles a situation where fiscal authority enjoy debt over and above the maximum limit of debt as is the case of Pakistan in the presence of fiscal dominance. In this state of affairs, the role of monetary authority is critically important. Any lack in fiscal-monetary coordination leads to welfare losses. Where, $\hat{b_t} = ln\,(B_t = ph{:}\, t_1), B_t$ is nominal debt stock, $\bar{B}$ and $\bar{C}$ denote the debt to GDP ratio and consumption to GDP ratio at steady state respectively.

3. METHODOLOGY AND IDENTIFICATION OF RESTRICTIONS

In the previous section, we have discussed the theoretical foundations of the impact of government borrowing on the macroeconomic dynamics along with representation of the theoretical equations which adopted to estimate.

Critique by Lucas in 1976, during the period when Orthodox Keynesian models proved fail, proved as a revolutionary step in the area of macroeconomic modelling on one hand and the unacceptable econometric models on the other hand. It was actually the rebirth of Macroeconomics. As a result, more strong models having microeconomic foundations started evolving and the innovation of econometric models soon after the inception of VAR models have been witnessed. Since then VAR models have been the prime models for making policy analysis. The transformation of VAR models into structural VAR models further strengthen the body of literature on econometric modelling. Structural VAR models incorporate the economic theory

through a compatible mode. The basic point of caution to use structural VAR models for policy analysis is equal number of equations and structural shocks, according to Gali (1999). The procedure developed by Keating (1990) is used to identify the Rational Expectation restrictions. This procedure has the feature to not put restrictions on the lag dynamics of the model. Recently, this procedure is used by Nawaz and Ahmed (2015) and Leu (2011) to estimate the parameters.

3.1 Identification of Restrictions

DSGE model conforming NK framework in closed economic environment derived in the previous section is reproduced below.

$$x_t = -\alpha_1[i_t - E_t\pi_{t+1}] + E_t x_{t+1} + \alpha_2 E_t(q_{t+1} - q_t) - \alpha_3 E_t(\Delta g_{t+1}) + \epsilon_t^{AD} \dots 3.1$$

$$\pi_t = \beta_1 E_t\pi_{t+1} + \beta_2 x_t + \beta_3 q_t - \beta_4 g_t + \epsilon_t^{c} \dots 3.2$$

$$q_t = E_t q_{t+1} - \omega_1(i_t - E_t\pi_{t+1}) + \epsilon_t^{rp} \dots 3.3$$

$$i_t = \gamma_0 + \gamma_1 b_t + \gamma_2 E_t\pi_{t+1} + \gamma_3 x_t + \varepsilon_t^{i} \dots 3.4$$

$$g_t = \rho_g g_{t+1} + \big(1 - \rho_g\big)\big[g_y E_t x_{t+1} + g_b b_t\big] + \varepsilon_t^{g} \dots 3.5$$

$$\tau_t = \rho_g \tau_{t+1} + (1 - \rho)\big[\tau_y E_t x_{t+1} + \tau_b b_t\big] + \varepsilon_t^{\tau} \dots 3.6$$

$$b_{t+1} = i_t + \frac{1}{\beta}\Big[b_t - \pi_t + (1-\beta)(\tau_t - x_t) + \frac{\bar{C}}{\bar{B}}(g_t - \tau_t)\Big]A + \varepsilon_t^{b} \dots 3.7$$

Subtracting all the variables in the above equations from their expected value at time $(t-1)$ yields the following set of equations:

$$x_t - E_{t-1}x_t = -\alpha_1(i_t - E_{t-1}i_t) + \alpha_1(E_t\pi_{t+1} - E_{t-1}\pi_{t+1}) + (E_t x_{t+1} - E_{t-1}x_{t+1}) + \alpha_2(E_t q_{t+1} - E_{t-1}q_{t+1}) - \alpha_2(q_t - E_{t-1}q_t) - \alpha_3(E_t g_{t+1} - E_{t-1}g_{t+1}) + \alpha_3(g_t - E_{t-1}g_t) + \epsilon_t^{AD}$$

$$\pi_t - E_{t-1}\pi_t = \beta_1(E_t\pi_{t+1} - E_{t-1}\pi_{t+1}) + \beta_2(x_t - E_{t-1}x_t) + \beta_3(q_t - E_{t-1}q_t) - \beta_4(g_t - E_{t-1}g_t) + \epsilon_t^{c}$$

$$q_t - E_{t-1}q_t = (E_t q_{t+1} - E_{t-1}q_{t+1}) - \omega_1(i_t - E_{t-1}i_t) + \omega_1(E_t\pi_{t+1} - E_{t-1}\pi_{t+1}) + \epsilon_t^{rp}$$

$$i_t - E_{t-1}i_t = \gamma_1(b_t - E_{t-1}b_t) + \gamma_2(E_t\pi_{t+1} - E_{t-1}\pi_{t+1}) + \gamma_3(x_t - E_{t-1}x_t) + \varepsilon_t^{i}$$

$$g_t - E_{t-1}g_t = \rho_g(E_t g_{t+1} - E_{t-1}g_{t+1}) + \delta_1(E_t x_{t+1} - E_{t-1}x_{t+1}) + \delta_2(b_t - E_{t-1}b_t) + \varepsilon_t^g$$

$$\tau_t - E_{t-1}\tau_t = \rho_g(E_t \tau_{t+1} - E_{t-1}\tau_{t+1}) + \mu_1(E_t x_{t+1} - E_{t-1}x_{t+1}) + \mu_2(b_t - E_{t-1}b_t) + \varepsilon_t^\tau$$

$$\begin{aligned} E_t b_{t+1} - E_{t-1}b_{t+1} \\ &= i_t - E_{t-1}i_t + \varphi_1(b_t - E_{t-1}b_t) - \varphi_1(\pi_t - E_{t-1}\pi_t) + \varphi_2(\tau_t - E_{t-1}\tau_t) \\ &\quad - \varphi_2(x_t - E_{t-1}x_t) + \varphi_3(g_t - E_{t-1}g_t) - \varphi_3(\tau_t - E_{t-1}\tau_t) + \varepsilon_t^b \end{aligned}$$

"In the above equations, $y_t - E_{t-1}y_t$ for all the variables represent the respective residual which are residuals of reduced form VAR residuals. However, $(E_t y_{t+1} - E_{t-1}y_{t+1})$ are the forward-looking components in the model.

The procedure to calculate these forward looking components is elaborated as follows:"

$$\begin{bmatrix} y_t \\ y_{t-1} \\ y_{t-2} \\ \vdots \\ y_{t-q+1} \end{bmatrix} = \begin{bmatrix} A_1 & A_2 & \cdots & \cdots & A_q \\ I_n & 0_n & \cdots & \cdots & 0_n \\ 0_n & I_n & 0_n & \cdots & 0_n \\ \vdots & \vdots & \ddots & \ddots & \vdots \\ 0_n & \cdots & 0_n & I_n & 0_n \end{bmatrix} \begin{bmatrix} y_{t-1} \\ y_{t-2} \\ y_{t-3} \\ \vdots \\ y_{t-q} \end{bmatrix} + \begin{bmatrix} I_n \\ 0_n \\ 0_n \\ \vdots \\ 0_n \end{bmatrix} e_t \qquad (3.8)$$

$$Y_t = AY_{t-1} + Qe_t \qquad (3.9)$$

"One step conditional expectation of equation (4.8) can be written in form as follows."

$$E_t Y_{t+1} = AY_t \qquad (3.10)$$

"It may be considered that the expected value of residuals is equal to zero, i.e. $E_t(e_t) = 0$.

As Y vector consists of all the endogenous variables, therefore to locate the variable of interest (output gap and inflation), there is need to introduce vectors of length nq where n denotes the number of endogenous variables and q denotes their lag order."

$r_x' = (1,0,0,\ldots,0)$ for the output gap

$r_\pi' = (0,1,0,\ldots,0)$ for inflation

$r_q' = (0,0,1,0\ldots,0)$ for Exchange Rate

$r_g' = (0,0,0,0,0,1,0\ldots,0)$ for government expenditures

$r_\tau' = (0,0,0,0,0,1,0\ldots,0)$ for taxes

$r_b' = (0,0,0,0,0,0,1,0,\ldots,0)$ for debt

"Pre-multiplying equation (3.10) with the above vectors results in the following expected values of forward looking output gap and inflation."

$$E_t x_{t+1} = r_x' A Y_t$$
$$E_t \pi_{t+1} = r_\pi' A Y_t$$
$$E_t q_{t+1} = r_q' A Y_t$$
$$E_t g_{t+1} = r_g' A Y_t$$
$$E_t \tau_{t+1} = r_\tau' A Y_t$$
$$E_t b_{t+1} = r_b' A Y_t \qquad (3.11)$$

By appropriate substitution:

$$\varepsilon_t^{AD} = e_t^x - r_x' A Q e_t + \alpha_1 e_t^i - \alpha_1 r_\pi' A Q e_t + \alpha_2 r_q' A Q e_t - \alpha_2 e_t^q + \alpha_3 r_g' A Q e_t - \alpha_3 e_t^g$$

$$\varepsilon_t^c = e_t^\pi - \beta_1 r_\pi' A Q e_t - \beta_2 e_t^x - \beta_3 e_t^q - \beta_4 e_t^g$$

$$\varepsilon_t^{rp} = e_t^q - r_q' A Q e_t + \omega_1 e_t^i - \omega_1 r_\pi' A Q e_t$$

$$\varepsilon_t^i = e_t^i - \gamma_1 e_t^b - \gamma_2 r_\pi' A Q e_t - \gamma_3 e_t^x$$

$$\varepsilon_t^g = e_t^g - \rho_g r_g' A Q e_t - \delta_1 r_x' A Q e_t - \delta_2 e_t^b$$

$$\varepsilon_t^\tau = e_t^\tau - \rho_\tau r_\tau' A Q e_t - \mu_1 r_x' A Q e_t - \mu_2 e_t^b$$

$$\varepsilon_t^b = e_t^i - \varphi_1 e_t^b + \varphi_1 e_t^\pi - \varphi_2 e_t^\tau + \varphi_2 e_t^x - \varphi_3 e_t^g + \varphi_3 e_t^\tau$$

Mostly macroeconomic variables are non-stationary. So, standard Ordinary least square cannot conclude results correctly. So, to avoid these problems in estimation at first the stationarity of the variables is checked through augmented Dickey-Fuller test. Further, to see the long run association between the variables we use Johansen cointegration (1991) test. An argument has been produced by Sims, Stock and Watson (1990), that in case of data integrated, then there is no need to transforming the series into stationary cointegrated one for VAR model whereas Garatt et al. (1998) kept insisting on converting them into as a stationary cointegrated in order to avoid misspecification. One can estimate by involving variables at level in case of cointegration test confirm the long run association for variables (Sims et al., 1990; Sims, 1992).

4. ESTIMATION RESULTS AND ANALYSIS

In this section, we estimate the New Keynesian model which is derived in above section. The method for estimation procedure is SVAR which is appropriate to achieve our objectives. Estimation is performed in Eviews 9 enterprises edition. Firstly, to check the stationarity of variables we used unit root test, after that based on the results of unit root test we estimated the long run association between the dependent and independent variables. The stationarity of the variables is checked and found all the variables stationary at first order of integration. The results are reported below in the table 4.1.

For analyzing long run relationship empirically among the macroeconomic variables used in our model we adopted Johansen and Juselius' (1990) system of cointegration test. The Trace test statistics showed that there are seven coingtegration equations at 0.05 level are rejected the null hypothesis of no long run association among variables. Whereas, Max-eigenvalue test indicates five cointegration equations at the 0.05 level and rejecting the null hypothesis of no long run association among variables. The results are reported in Appendix as table A-4.1 and A-4.2.

Table 4.1: Results of Unit Root Test

Variable	At	t-statistic	Prob	Order of integration
Output gap	Level	-1.53	0.512	
	1st difference	-9.49***	0.000	I(1)
R	Level	-2.01	0.06	
	1st difference	-5.63***	0.000	I(1)
Q (Risk premium)	Level	-2.36	0.120	
	1st difference	-4.90***	0.000	I(1)
Inf	Level	-2.41	0.144	
	1st difference	-10.2***	0.000	I(1)
Revenue gap	Level	-3.10	0.112	
	1st difference	-4.57***	0.000	I(1)
Expenditure gap	Level	-0.11	0.410	
	1st difference	-5.33***	0.000	I(1)
Debt gap	Level	-2.33	0.04	
	1st difference	-4.31***	0.00	I(1)

Note: '*', '**', '***' shows the significance level at 10%, 5% and 1% respectively.
Critical values at 1%, 5% and 10% level of significance are: -4.521,-3.521 and -3.213

Various lag length criteria are used to obtain the optimal level of lag length for the VAR model. The results show that the efficient lag length range is one as per AIC and all the diagnostic tests

are clear such as there is no evidence of serial correlation, heteroscedasticity and normality in VAR (1, 1) model and given at appendix.

Table 4.4: lag Order Selection by the Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	405.6163	NA	3.13E-18	-22.501	-20.14327*	-20.33473
1	486.4243	128.4640*	6.37e-19*	-22.60828*	-19.68434	-21.21599*
2	529.8	53.38547	1.09E-18	-20.44186	-17.30579	-20.17765
3	594.8615	56.72028	1.02E-18	-21.78461	-16.03934	-20.2514

* indicates lag order selected by the criterion

4.1 Analysis of Parameters Estimation

Conventionally, the main focus of studies remains around the simulation analysis to explore the transmission mechanism. Very few studies estimated the structural parameters especially the studies based on New Keynesian model[3]. VAR model is primarily used to analyze the monetary and fiscal policies. The reason to estimate the structural parameters is to check the scale of impact of different independent variables on dependent variables. It helps to identify the strength of relationship. The transformation of variables is in-line with the DSGE literature however, the estimation of parameters is largely different from previous studies especially in case of Pakistan except Nawaz and Ahmed (2015) who worked in closed economy framework.

All the parameters, except β_2, γ_3, μ_2 representing the impact of output gap on inflation, interest rate and government expenditures respectively, have significantly different from zero. In the Aggregate Demand equation where the dependent variable is output gap, α_1, showing the negative impact of real interest rate $[i_t - E_t\pi_{t+1}]$ on output gap, reflect that with the decrease in real interest rate, output gap (or the aggregate demand) increases. α_1 shows the elasticity of household's intertemporal substitution in consumption and its absolute value is not greater than zero. The estimated parameter is found to be in feasible range. The significant proportion of consumption is deferred by the households (Gali and Gertler, 2007). α_2 shows the significant impact of exchange rate on output gap which suggest that depreciation in the local currency or expected rise in exchange rate (rupee in terms of foreign currency), results in negative impact on aggregate demand. Theory on international macroeconomics reveals that rise in exchange rate would result in rising exports, accordingly the aggregate demand. However, negative sign shows that imports are more influential in impacting the aggregate demand which is possible in consumeristic society. It can be possible for a developing country where imports are much

[3] According to Joiner (2002), this is due to the underlying feature of the impulse responses to reflect the dynamic response of macroeconomic variables due to structural shocks and structural parameters do not reflect the same.

needed for the economy and exports are much vulnerable to the factors other than price. α_3 indicates that with the expected rise in government expenditures in the next period, aggregate demand in the current period decreases.

Table 4.5: Parameters Value with SVAR

	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
Aggregate Demand Equation				
α_1	-0.0117	0.0006	-20.8941	0.0000
α_2	-2.2257	0.0257	-86.7065	0.0000
α_3	-0.3489	0.0068	-51.5630	0.0000
Phillips Curve Equation				
β_2	0.5993	1.2683	0.4725	0.6366
β_3	3.2477	0.8890	3.6534	0.0003
β_4	0.6659	0.3148	2.1153	0.0344
UIP Equation				
ω_1	0.0285	0.0004	81.1189	0.0000
Taylor Rule				
γ_1	-0.1518	0.0311	-4.8878	0.0000
γ_2	0.0023	0.0011	2.0030	0.0452
γ_3	0.0646	0.0631	1.0243	0.3057
Fiscal Policy Rule				
Government Expenditure Equation				
ρ_g	2.8740	0.0275	104.5036	0.0000
δ_1	5.1037	0.0778	65.5748	0.0000
δ_2	-1.3633	0.0260	-52.4896	0.0000
Revenue Equation				
ρ_τ	1.9270	0.1059	18.1975	0.0000
μ_1	-6.1009	0.5874	-10.3866	0.0000
μ_2	0.1239	0.1354	0.9148	0.3603
Solvency Constraint				
φ_1	0.0295	0.0065	4.5228	0.0000
φ_2	-0.2211	0.0200	-11.0309	0.0000
φ_3	-0.0362	0.0118	-3.0775	0.0021

The impact of output gap on inflation is insignificant whereas the role of forward-looking expectations is positively significant showing the forward-looking behavior on the part of firms in deciding current period's prices. It also depicts that inflation is primarily a cost-push phenomenon in the country. The reason is obvious, that is, increasing cost of raw material, energy and the imported goods used in the production process are the major reasons. The impact of exchange rate on inflation is positively significant. It further strengthens the cost push nature of inflation in the country as exchange rate being the component of marginal cost theoretically. Government expenditures positively influence the inflation which shows that fiscal policy's impact on economic growth has cost of inflation for the economy. ω_1 shows significant positive

impact of interest rate on exchange rate. Taylor (1993) provided a framework for rule based monetary policy wherein he developed a response function depicting the response of interest rate to inflation and demand changes. The parameters of interest rate rule show that State Bank of Pakistan has not followed the Taylor rule during the period of investigation. This is something critical and alarming in nature which due to inconsistency, involvement of time lag in response or political factors results in failing to stabilize the economy or achieving the targeted levels of macroeconomic indicators. Negative sign of debt parameter the reverse response of SBP, that is, instead of increasing the interest rate to discourage the borrowing by the government, SBP decreases the interest rate which confirms the fiscal dominance and the failure of implementation of FDLA. However, as a matter of fact, SBP never claimed to follow the rule based policy as also contended by Malik and Ahmed (2010).

With the increase in debt by the government, government expenditures decrease which is evident from negative sign of δ_2. If the government expect that aggregate demand is increase in the next period, it increases the expenditures in the current period which is reflection of growth strategy of the government. It is depicted by the positive sign of δ_1. On the other hand, tax revenue increases in response to increase in debt by the government which is evident from positive sign of μ_2. With the increase in real debt in the current period, debt in the next period also increase. Increase in tax- aggregate demand difference results in decreased debt in the next period. Increase in fiscal deficit causes debt to decrease in future.

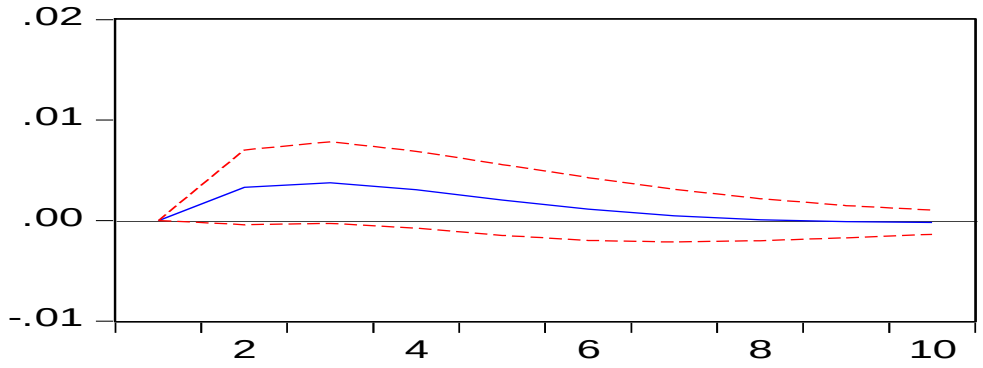
4.2 Impulse Response Analysis

In order to see the impulse responses in our model of different variables to output gap, it is given the cholesky one S.D. innovations +/-2 S.E shock to dependent variables. At first, by giving the shock to innovation in the aggregate demand equation output gap is dependent variable and government borrowing shock affect the output gap. It depicts that the response of output gap is increasing positively till one and a half year, then it tends to decline and after eight periods its positive impact vanishes, showing no change in the output gap. The output gap is showing positive behavior towards government borrowing shock. The impact of output gap to government borrowing shock is as similar to the literature that government in order to meet the budget deficit tends to take borrowing and it would lead to the aggregate demand that ultimately results of increase the output gap of the country Schclarek.(2004).

4.2.1 Response of Macroeconomic indicators to Government Borrowing Shock

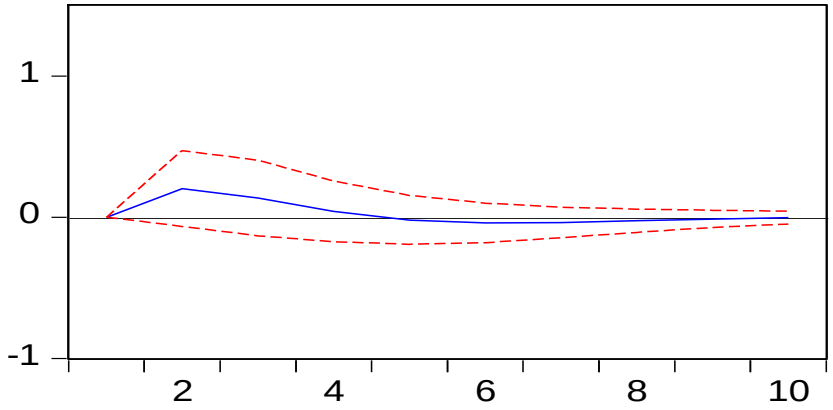
The government borrowing is availed in respect of access of government expenditure. Due to the increase in the government borrowing the aggregate demand increase through investment and consumption channel in the economy.

Figure 1: Response of output gap to borrowing shock



As due to the increase in the government borrowing, the supply of money is increase in the economy; if borrowing is done through printing of money, and it would ultimately lead to increase in the inflationary pressure in the economy. Now, in context of Pakistan, the government borrowing shows a positive relationship for first few years and then it soon reaches to the steady state level and shows no impact over inflation in the economy.

Figure 2: Response of inflation to Borrowing shock

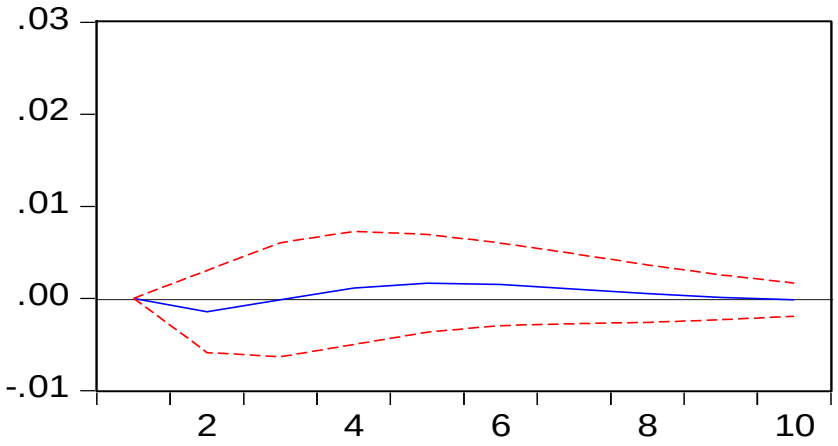


In Figure 2, inflation is also showing increasing trend due to the government borrowing shock at first year and after that it tends to decrease and reaches to the steady state level at fourth year. The response of inflation to government borrowing shock is similar to the theory. Due to the government borrowing the supply of money would increase in the economy. If borrowing is through printing of money and this increase in money supply is create the inflationary pressure in the economy (Yasmin et. al, 2013). It shows the positive behavior of inflation to the government borrowing shock in the long run.

The impulse response of risk premium to government borrowing shock is negatively related at first two periods. The risk premium goes down to the steady state level for first two periods. At third periods, its moves upward from the steady state level and for further four periods it has a positive impact. It shows that the any shock to government budget borrowing is responsible

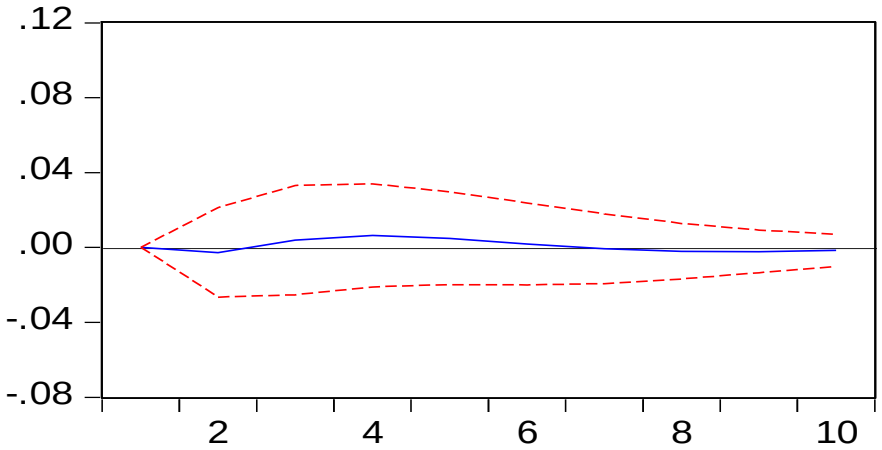
negative association to the risk premium and it also validated by the literature that with the increase in the government budget borrowing there happens two-fold impacts, at first the exchange rate declines and the second one is inflation advances forward.

Figure 3: Response of Risk Premium to Borrowing Shock



As due to increase in the government borrowing the interest rate is crease making crowding out effect. This has negative impact over output gap as due to increase in the interest rate the aggregate demand would shrink. And similar effect can be analyzed for first two periods in case of Pakistan through impulse response function given in the Figure 4 below:

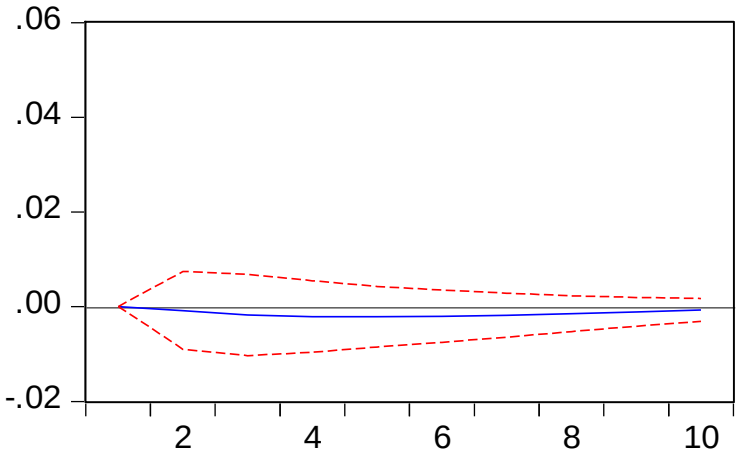
Figure 4: Response of Interest Rate to Borrowing Shock



The impulse responses of interest rate are to government borrowing shock is at first neutral and remained at steady state level. In second period, the interest moves upward showing increasing trend it lasts till fourth periods then it increases with decreasing return and would finally reaches at steady state level at seventh period. Kinoshita, (2006). It shows that due to shock to the government borrowing the interest rate keeps no movement instantly but positively after a year.

The increase in the government borrowing, government becomes able to finance its expenditure in the economy. So, as due to the increase in the government borrowing the government expenditure would increase positively in the economy. Contrary to it, in case of Pakistan, it is showing negative relationship between government expenditure to borrowing shock and government expenditure going below the steady state level with the increase in the borrowing shock as given below in Figure 5:

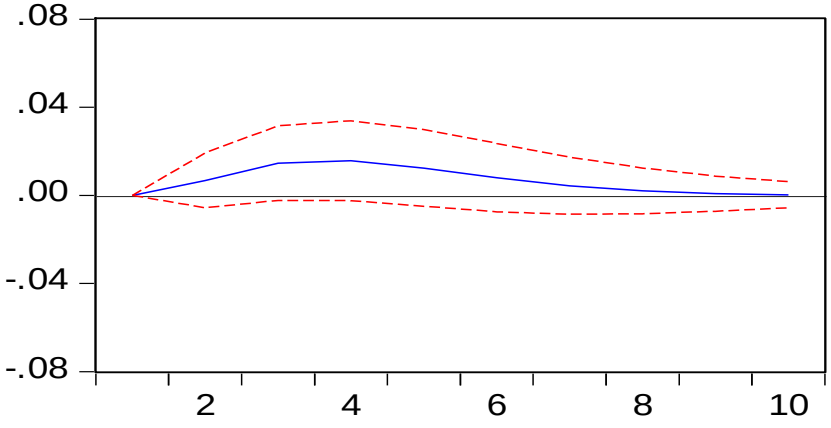
Figure 5: Response of Government Expenditure to Borrowing Shock



Next, government expenditures are showing reverse behavior with the government borrowing shock. The impulse responses of government expenditures to government borrowing remain below the steady state level from the beginning, it has a constant negative behavior to the government borrowing shock and showing no sign to moves back to the steady state level.

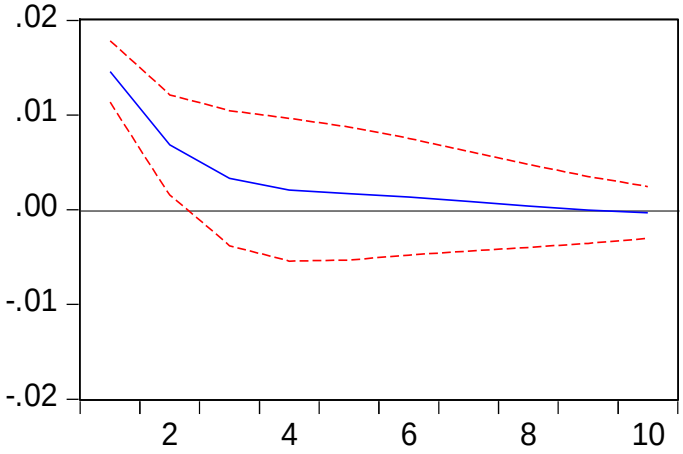
The tax revenues are to government borrowing shock showing positive impulse responses. The tax revenues tend to increase to government borrowing shock and it continuo to increase as a increasing return till fourth period and after that it increases as a decreasing return and reach to the steady state level in the tenth period. The impulse responses showing a positive relationship between the tax revenues and government borrowing shock and its peak is in fourth period.

Figure 6: Response of Revenue to Borrowing Shock



The impulse responses of government borrowing to its self is showing the reverse relationship, as any shock to government borrowing would be responsible for deterioration to government borrowing. Before shock, the government borrowing is positive and start with decreasing return very promptly for first two periods and then it shows a constant decrease for next three periods and finally reaches at the steady state level.

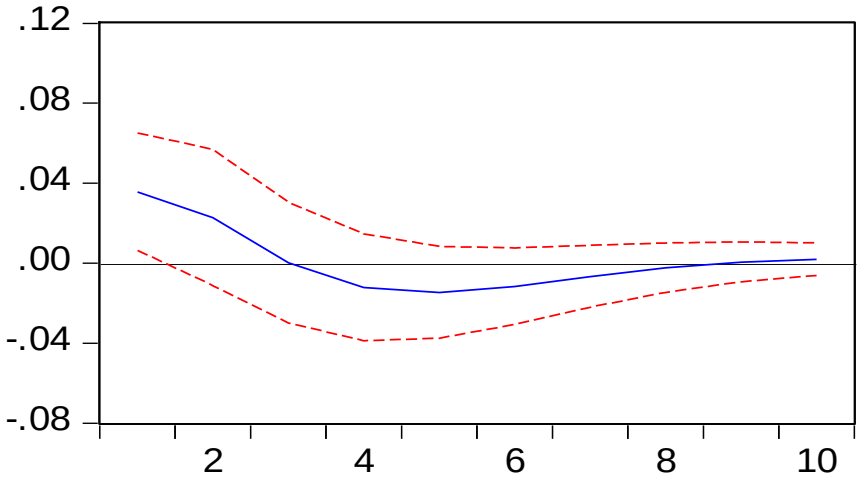
Figure 7: Response of Government Borrowings to Borrowing Shock



4.2.2 Response of Interest Rate to Structural Shocks

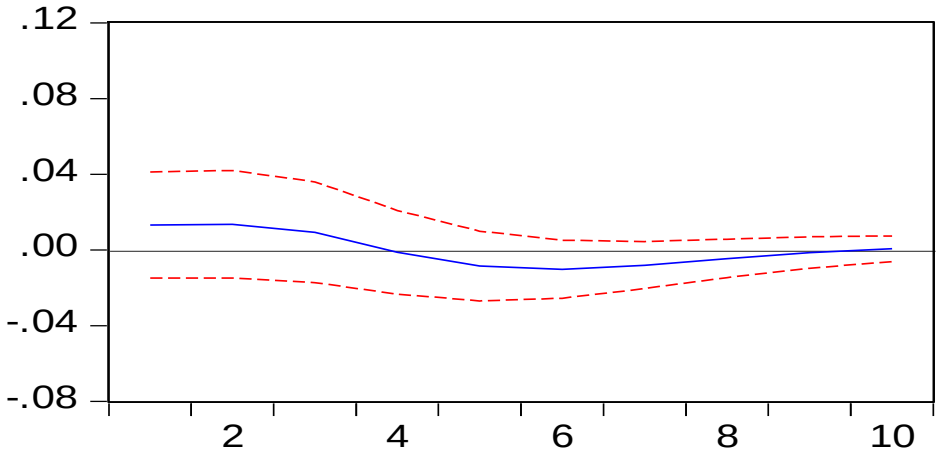
The impulse responses of interest to demand shock is showing a positive decrease for first three periods. After the third periods interest becomes negative and it shows reverse relationship with demand shock for further six periods and then reaches to the steady state level. In first two years interest rate is positive but showing a negative association to the demand shock. Murphy and Walsh (2015)

Figure 8: Response of Interest Rate to Demand Shock



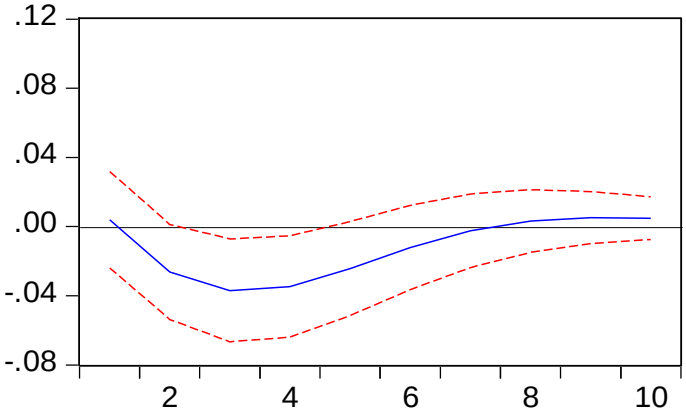
There is a trade-off between interest rate and inflation, as due to increase in the interest rate the aggregate dement would shrink and it would lead to decrease in the investment and consumption. The interest rate to inflation impulse responses showing a constant positive relationship for first four periods and then it reaches to the steady state level. In the fifth period, the response of interest rate becomes negative to inflation shock and it moves similarly till ninth periods and then shows no variation.

Figure 9: Response of Interest Rate to Inflation



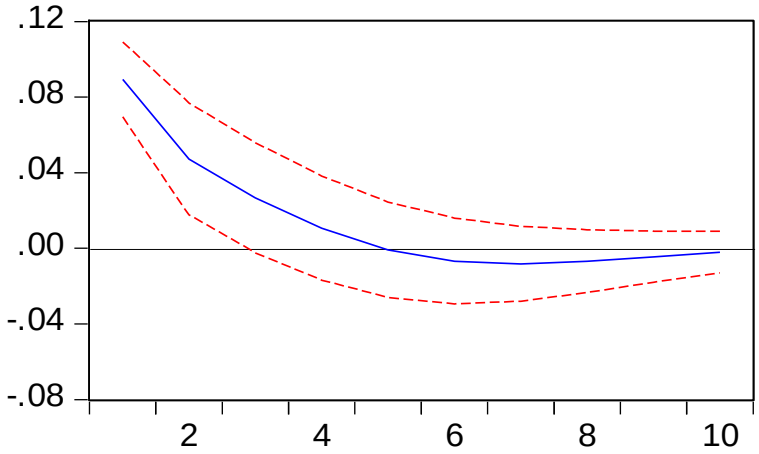
The interest rate to risk premium shocks impulse responses are showing a negative association for first seven periods. The peak of negative association of interest rate to risk premium shock is at third period and afterward it fosters to the steady state level.

Figure 10: Response of Interest Rate to Risk Premium Shock



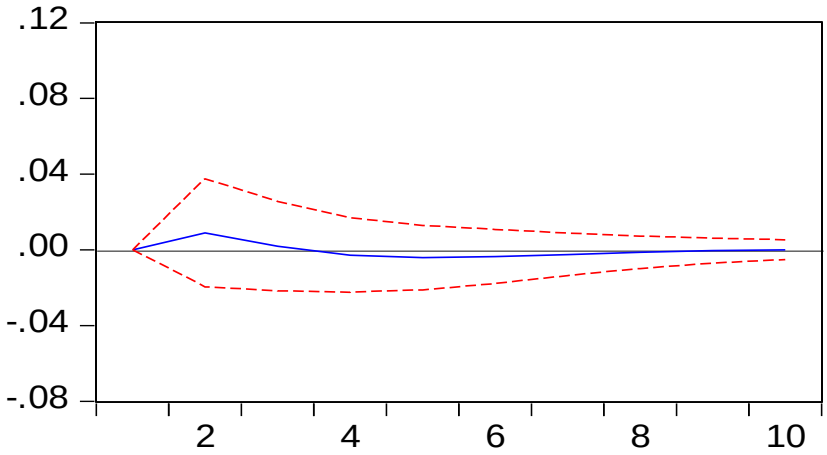
The interest rate to interest rate shock is showing a negative association between them. The impulse responses show that due to the shock in interest rate, the interest rate declines continuously till fifth periods and then becomes steady state level and instantly goes down to this level and shows a negative association in the six periods till tenth period.

Figure 11: Response of Interest Rate to Interest Rate Shock



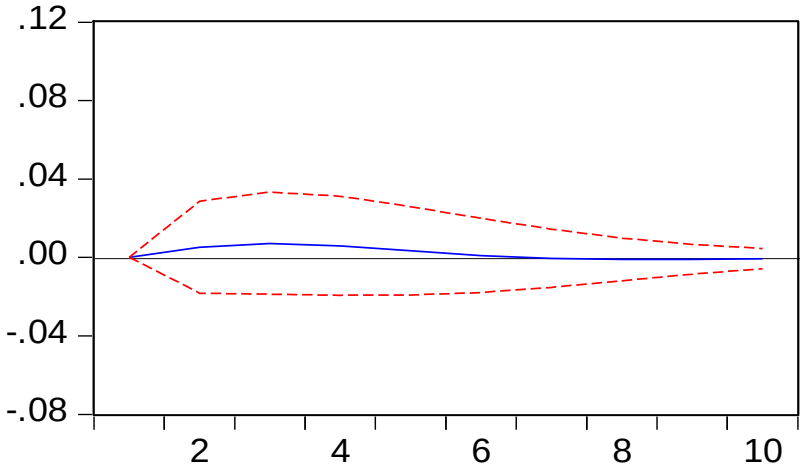
The impulse responses of interest rate to government expenditures show a positive association for first two periods and then it becomes neutral in third period. Further in the fourth period it becomes negatively associated to government expenditures till eight periods and then instantly reach at steady state level.

Figure 12: Response of Interest Rate to Expenditure Shock



The interest rate to revenue shock, impulse responses are showing a bit positive association between them. It shows that the shock in revenue gap would lead to increase in the interest rate and it lasts for further six periods then reaches at steady state level as showing no variation.

Figure 13: Response of Interest Rate to Revenue Shock



4.6 Generalized Forecast Error Variance Decomposition Analysis

In table 4.6, it can be observed that government borrowing is main contributor for variation in output gap. Which is almost 10.02% for up to 6 years. It is very important to notice that with the government borrowings government borrowing is increase but demand will be increased. As a result of this shock output remain above steady state for almost 2 years. Then it tends to decline and after eight periods its positive impact vanishes. Risk premium is the second biggest contributor of accounting 6.73% of the forecast error variance. After that we can also see that risk premium and inflations are showing 7.47% and 6.73 respectively.

Table 4.6 Variance Decomposition of Output Gap (X):

Period	S.E.	X	INF	Q	R	GGAP	TGAP	BGAP
1	0.01476	100	0	0	0	0	0	0
2	0.01702	84.138	5.79791	0.0898	3.74269	0.57884	1.90392	3.74887
3	0.01841	72.4905	6.73067	1.97063	7.77472	0.78689	2.85979	7.38682
4	0.01927	66.2103	6.23904	4.64293	9.68921	0.84785	3.1101	9.26057
5	0.01973	63.3629	6.01364	6.55756	10.1907	0.85579	3.11208	9.90735
6	0.01993	62.3026	6.08241	7.47096	10.1926	0.85004	3.07316	10.0282

Table 4.7 shows comparative significance of the structural shocks in describing inflation in Pakistan. The results show that in the short run output gap is most important for the explaining variations in inflation. An increase in output gap causes inflation to fall immediately below steady state level which is unable to recover till 6th period. It can be also seen that government borrowing explaining 3.81 % variation in inflation. When there is an increase in government borrowings money supply will also increase and it will create inflationary pressure in the economy.

Table 4.7 Variance Decomposition of INF:								
Period	S.E.	X	INF	Q	R	GGAP	TGAP	BGAP
1	1.07643	3.10E-05	100	0	0	0	0	0
2	1.19935	4.62976	85.8065	5.04451	0.71837	0.91034	0.04902	2.8415
3	1.25082	7.54628	79.3485	7.50506	0.66346	1.0968	0.04509	3.79485
4	1.27154	8.44283	78.0927	7.55187	0.95292	1.09898	0.08499	3.77576
5	1.28001	8.4996	77.6621	7.52929	1.31359	1.08684	0.16061	3.74796
6	1.28522	8.43079	77.1262	7.83171	1.49523	1.07813	0.22063	3.81731

Above table is showing the variance decomposition of government borrowing it shows the variation in borrowing is mostly explain by government borrowing which means that with increase in government borrowing the will be variation in government borrowing almost 6 to 8 years are needed to get back on steady state level. After government borrowings, risk premium shock is major source of explanation for variation in government borrowings

Table 4.8 Variance Decomposition of BGAP:								
Period	S.E.	X	INF	Q	R	GGAP	TGAP	BGAP
1	0.02047	3.52109	0.92025	43.6725	0.77016	0.16989	0.11639	50.8298
2	0.02676	10.9236	0.54692	44.2354	4.30636	3.64686	0.07438	36.2665
3	0.0305	14.4735	1.54402	38.9719	10.3267	5.50474	0.06803	29.1111
4	0.03253	14.9726	2.83849	34.4246	15.6942	6.00399	0.0598	26.0063
5	0.03359	14.3633	3.32895	32.8498	18.7761	5.97402	0.06327	24.6446
6	0.03418	13.8799	3.29781	33.1923	19.7768	5.82516	0.07118	23.9569

5. CONCLUSION AND POLICY RECOMENDATIONS

Like other developing countries, Pakistan is also facing the problem of government borrowing. To pay this debt government have to borrow from available sources (internal source or external source). In order to access the effect of government borrowings on macroeconomic stability the model developed in this study taking into account the perspective of New Keynesian Model. It is very important for policy maker to make policy according to expectations of economic agents. Because policy responses under the given situation of debt are not as per objectives of policies.

All the parameters, except β_2, γ_3, μ_2 representing the impact of output gap on inflation, interest rate and government expenditures respectively, have significantly different from zero. In the Aggregate Demand equation where the dependent variable is output gap, α_1, showing the negative impact of real interest rate $[i_t - E_t\pi_{t+1}]$ on output gap, reflect that with the decrease in real interest rate, output gap (or the aggregate demand) increases. α_1 shows the elasticity of household's intertemporal substitution in consumption and its absolute value is not greater than zero (Gali and Gertler, 2007). The results of estimates of parameters show the expenditure led

growth in the economy which show the positive influence of fiscal policy but monetary policy seems to be ineffective to meet the targets set by the fiscal authority.

To analyze the dynamic response of macroeconomic variable to government borrowings estimation results are derived using maximum likelihood estimation procedure through Structural Auto Regressive (SVAR) Model. Problem of interpreting VARs is solved with the SVARs by including restrictions sufficient to identifying the underlying shocks. The results of SVAR is shown that government borrowing has negative effect on economy.

The dominant role of fiscal authority can be a point of criticism up to extent that there must be independence of the monetary authority on one hand and there should be some defined framework of the monetary policy. An appropriate framework that can be built through some sort of Taylor type rule is necessary. Further to it, an effective monetary-fiscal coordination effort is need of the time that may also ensure the applicability of FDLA in its true spirit. Debts are normally treated as necessary phenomenon for the developing economies but the expenditure preferences and the revenue optimality are necessary ingredients which seems to be missing in Pakistan during the period of investigation.

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Appendix

Table A-4.2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.987992	390.0656	125.6154	0.0000
At most 1 *	0.839463	213.1791	95.75366	0.0000
At most 2 *	0.802536	140.0098	69.81889	0.0000
At most 3 *	0.576144	75.12179	47.85613	0.0000
At most 4 *	0.433970	40.78737	29.79707	0.0019
At most 5 *	0.237491	18.02303	15.49471	0.0204
At most 6 *	0.164257	7.177376	3.841466	0.0074

Trace test indicates 7 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table A-4.3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.987992	176.8865	46.23142	0.0000
At most 1 *	0.839463	73.16927	40.07757	0.0000
At most 2 *	0.802536	64.88803	33.87687	0.0000
At most 3 *	0.576144	34.33442	27.58434	0.0058
At most 4 *	0.433970	22.76434	21.13162	0.0292
At most 5	0.237491	10.84565	14.26460	0.1621
At most 6 *	0.164257	7.177376	3.841466	0.0074

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values