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Government Borrowing and Macroeconomic Dynamics of Pakistan Under New Keynesian Framework

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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 policies formulated by both 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 utilises a modified New Keynesian Model to study the impact of government borrowings on economic indicators like inflation, aggregate demand, interest rate and exchange rate. 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). 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. The results show that risk premium and cost push shocks are major sources of variations in government borrowing whereas none of the macroeconomic indicator is influenced significantly by government borrowing. Effective utilisation of the borrowings by the government is important for fiscal harmony and effective fiscal policy in the country.

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

1. INTRODUCTION

Reliance of Pakistan to meet its deficit on fiscal and external fronts remained on borrowing from domestic and foreign sources whereas the debt to GDP ratio remained more than 60 percent since last many years. It carries not only the debt stock but also the debt servicing hence a source of continuously increasing burden on the economy. Borrowing dynamics indicates that changes in exchange rate and interest rate not only impact the value of Pakistani rupees but also cause huge burden on the economy in terms of increase in total debt in terms of rupees. Further, in a situation where fiscal policy is sort of discretion based and effective utilisation of debt is ambiguous, significant positive influence of debt on macroeconomic dynamics is hard to manage. Debt to GDP ratio in

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1980 was around 80 percent which rises to 100 percent in 1999 however, it is still more than 64 percent.

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?

New Keynesian (NK) macroeconomic models are more suitable in explaining the economic growth, inflation and the effects of monetary and fiscal policies. Therefore, these models are treated as workhorse to understand the macroeconomic dynamics. These are suitable for policy simulation analysis as these are robust to address Lucas critique. Major developments have been taken place during the last three decades to formulate and estimate DSGE models through robust econometric modeling techniques. These models capture the uncertainty factors in the structure and the aggregate relationships are based on the optimal behavior of economic agents. It is cardinal to understand the complex realities of conducting monetary policy in emerging market economies where financial markets are less developed, vulnerable to external sources of uncertainty, large fluctuations in economic growth and relative prices and volatile capital flows. These models also provide the opportunity to include the forward-looking behavior on the part of individuals thus addressing the Lucas critique efficiently.

Another angle of discussion is the non-availability of macroeconomic aggregates at an appropriate frequency and for long time horizon for many of the emerging economies. It further restricts the scope of research to estimate the micro-foundation model for an emerging economy through some sort of likelihood function procedure. Structural VAR models having compatibility with the New Keynesian models are a good choice to investigate the macroeconomic dynamics when a shock, e.g. monetary shock, hits the economy.

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 20th 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 categorising 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 neutralises 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 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 maximisation 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 Kumhof, *et al.* (2008).

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

Equation 2.1 is in log-linearised 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 economic (fiscal and monetary) policies to stabilise 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)].[1] 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].

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

Above equation is for inflation that depends upon expected inflation, output gap, and cost push shocks. And further cost put shock can be $\epsilon_t^c = \mu\epsilon_{t-1}^c + \hat{e}_t$. 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, it may explain the empirical facts [Froot and Thaler (1990)]. McCallum (1994) explains the apparent empirical failure of uncovered interest rate parity

[1]Nawaz and Ahmed (2015) New Keynesian Macroeconomic Model and Monetary Policy in Pakistan. *The Pakistan Development Review* 54:1, 55.

with the hypothesis that 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.

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

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 and represents risk premium shock.

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 minimise the welfare losses. In Pakistan, fiscal authority dominates and know the reaction of monetary authority and makes decisions accordingly, that is, $\delta i_t/\delta g_t \neq 0, \delta i_t/\delta g_t \neq 0$. Thus, government expenditures are apart of interest rate rule but interest rate does not include in the fiscal authority rule. 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

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

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 stabilisation are two primary objectives of fiscal authority. We transform the lag of government spending into forward looking components, depicting the forward-looking behaviour 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:

$$g_t = \rho_1 g_{t+1} + \rho_2 b_t + \rho_3 x_t + \rho_4 s_t + \varepsilon_t^g$$

Parameters ρ_1 denotes the degree of fiscal smoothing. The greater the degree of fiscal smoothing, the less will be the response of government spending to output gap and debt. ρ_3 demonstrates the sensitivity of government spending to contemporary output gap. ε_t^g is independently and identically distributed government spending shock, which represent the non-systematic component of discretionary fiscal policy or discretionary exogenous deviations from the fiscal rule.

The government issues nominal debt period-by-period in order to pay the principle and interest on its existing debt. The model is completed by fiscal constraint. Log linear solvency constraint can be written as:

$$b_{t+1} = \delta_1 r_t + \delta_2 b_t - \delta_3 \pi_t + \delta_5 g_t + \varepsilon_t^b$$

However, the fiscal constraint also includes the structural shock depicting that 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.

3. METHODOLOGY AND IDENTIFICATION OF RESTRICTIONS

In the previous section, we have discussed the theoretical foundations of the dynamics of government borrowing under New Keynesian framework 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.

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

$$x_t = E_t x_{t+1} - \alpha_1[i_t - E_t\pi_{t+1}] + \alpha_2 E_t(s_{t+1}) - \alpha_3 E_t(g_{t+1}) + g_t + \epsilon_t^{AD} \quad \ldots \quad (3.1)$$

$$\pi_t = \beta_1 E_t \pi_{t+1} + \beta_2 x_t + \beta_3 s_t + \beta_4 g_t + \epsilon_t^c \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.2)$$

$$s_t = E_t s_{t+1} - \omega_1(i_t - E_t\pi_{t+1}) + \epsilon_t^{rp} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.3)$$

$$i_t = \gamma_0 + \gamma_1 b_t + \gamma_2 E_t \pi_{t+1} + \gamma_3 x_t + \gamma_4 g_t + \varepsilon_t^i \quad \ldots \quad \ldots \quad \ldots \quad (3.4)$$

$$g_t = \rho_1 g_{t+1} + \rho_2 b_t + \rho_3 x_t + \rho_4 s_t + \varepsilon_t^g \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.5)$$

$$b_{t+1} = \delta_1 i_t + \delta_2 b_t - \delta_3 \pi_t + \delta_4 g_t + \varepsilon_t^b \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.6)$$

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

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

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

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

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

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

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

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

"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:"

$$\begin{bmatrix} y_t \\ y_{t-1} \\ y_{t-2} \\ \vdots \\ y_{t-q+1} \end{bmatrix} = \begin{bmatrix} A_1 & A_2 & \cdots & \cdots & A_q \\ I_n & 0_n & \cdots & \cdots & 0_n \\ 0_n & I_n & 0_n & \cdots & 0_n \\ \vdots & \vdots & \ddots & \ddots & \vdots \\ 0_n & \cdots & 0_n & I_n & 0_n \end{bmatrix} \begin{bmatrix} y_{t-1} \\ y_{t-2} \\ y_{t-3} \\ \vdots \\ y_{t-q} \end{bmatrix} + \begin{bmatrix} I_n \\ 0_n \\ 0_n \\ \vdots \\ 0_n \end{bmatrix} e_t \quad \dots \quad \dots \quad \dots \quad (3.7)$$

$$Y_t = AY_{t-1} + Qe_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.8)$$

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

$$E_t Y_{t+1} = AY_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.9)$$

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."

$r_x' = (1,0,0,\dots,0)$ for the output gap
$r_\pi' = (0,1,0,\dots,0)$ for inflation
$r_q' = (0,0,1,0\dots,0)$ 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 (3.9) with the above vectors results in the following expected values of forward looking output gap and inflation."

$$\left.\begin{aligned} E_t x_{t+1} &= r_x' A Y_t \\ E_t \pi_{t+1} &= r_\pi' A Y_t \\ E_t q_{t+1} &= r_q' A Y_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \\ E_t g_{t+1} &= r_g' A Y_t \\ E_t \tau_{t+1} &= r_\tau' A Y_t \\ E_t b_{t+1} &= r_b' A Y_t \end{aligned}\right\} \quad (3.10)$$

By appropriate substitution:

$$\varepsilon_t^{AD} = e_t^x - r_x' AQe_t + \alpha_1 e_t^i - \alpha_1 r_\pi' AQe_t + \alpha_2 r_q' AQe_t - \alpha_2 e_t^q + \alpha_3 r_g' AQe_t - \alpha_3 e_t^g$$
$$\varepsilon_t^c = e_t^\pi - \beta_1 r_\pi' AQe_t - \beta_2 e_t^x - \beta_3 e_t^q - \beta_4 e_t^{\,g}$$
$$\varepsilon_t^{rp} = e_t^q - r_q' AQe_t + \omega_1 e_t^i - \omega_1 r_\pi' AQe_t$$
$$\varepsilon_t^i = e_t^i - \gamma_1 e_t^b - \gamma_2 r_\pi' AQe_t - \gamma_3 e_t^x$$
$$\varepsilon_t^g = e_t^g - \rho_g r_g' AQe_t - \delta_1 r_x' AQe_t - \delta_2 e_t^b$$
$$\varepsilon_t^\tau = e_t^\tau - \rho_\tau r_\tau' AQe_t - \mu_1 r_x' AQe_t - \mu_2 e_t^b$$
$$\varepsilon_t^b = e_t^i - \varphi_1 e_t^b + \varphi_1 e_t^\pi - \varphi_2 e_t^\tau + \varphi_2 e_t^x - \varphi_3 e_t^g + \varphi_3 e_t^\tau$$

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

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.

Table 4.1

Results of Unit Root Test

Variable	At	t-statistic	Prob	Order of Integration
Output gap	Level	–3.32	0.0775	
	1st difference	–6.68***	0.000	I(1)
Inflation	Level	–1.379	0.1533	
	1st difference	-2.70***	0.0083	I(1)
Exchange Rate	Level	–0.529	0.8745	
	1st difference	–4.45***	0.0010	I(1)
Interest Rate	Level	–2.51	0.1215	
	1st difference	–5.02***	0.0002	I(1)
Government Expenditure	Level	–1.87	0.6492	
	1st difference	–7.77***	0.000	I(1)
Government Borrowing	Level	–1.61	0.7695	
	1st difference	–4.51***	0.0047	I(1)

Note: '*', '**', '***' shows the significance level at 10 percent, 5 percent and 1 percent respectively.

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.

Table 4.2

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	49.12366	NA	4.16e-09	–2.269666	–2.011100	–2.177670
1	250.7448	328.9609*	7.00e-13*	–10.98657	–9.176606*	–10.34260*
2	288.2305	49.32320	7.49e-13	–11.06476	–7.703400	–9.868815
3	325.5948	37.36434	1.06e-12	–11.13657*	–6.223810	–9.388647

* indicates lag order selected by the criterion.

For analysing long run relationship empirically among the macroeconomic variables used in our model we adopted Johansen and Juselius' (1990) system of cointegration test. The Unrestricted Cointegration Rank test (Trace) statistics showed that there are two cointegrating equations at 0.05 level. Thus, long run association exists among all the variables and we can apply VAR model without transforming the variables into stationary form.

Table 4.3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.643829	126.0326	103.8473	0.0008
At most 1 *	0.559588	85.77113	76.97277	0.0091
At most 2	0.431152	53.78942	54.07904	0.0531
At most 3	0.381320	31.78786	35.19275	0.1114
At most 4	0.207038	13.06134	20.26184	0.3590
At most 5	0.097807	4.014136	9.164546	0.4100

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level.

*Denotes rejection of the hypothesis at the 0.05 level.

**MacKinnon-Haug-Michelis (1999) p-values.

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.[2] VAR model is primarily used to analyse 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, ρ_3 representing the impact of output gap on inflation, interest rate and government expenditures respectively. Results show that aggregate demand positively affect inflation however its impact on interest rate and government expenditures is insignificant at 95 percent level of confidence. Real interest rate has insignificant impact on aggregate demand meaning thereby that any changes in real interest rate do not affect the expenditure behavior of either the household or the investor which is close to the reality. Expected changes in exchange rate positively affect the aggregate demand which is channelised through exports and imports. 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 needed for the economy and exports are much vulnerable to the factors other than price. Further, the expected changes in government expenditures result in increase in aggregate demand in the contemporaneous period. α_3 indicates that with the expected rise in government expenditures in the next period, aggregate demand in the current period decreases.

Both the forward-looking inflation and aggregate demand positively affect the inflation in the current period. 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. However, exchange rate and government expenditures do not contribute significantly toward inflation. Increase in real interest rate cause appreciation in exchange rate, that is any changes in real interest rate attract capital in the country.

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 stabilise the economy or achieving the

[2]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.

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). Monetary authority only responds to inflation with more than one-to-one adjustment and fails to respond increase in government borrowing, aggregate demand and government expenditures. Fiscal policy rule suggest that expected increase in government expenditures and exchange rate leads to increase in government expenditures in the current period. Increase in debt and inflation in the current period leads to increase and decrease in the debt in the next period respectively.

Table 4.4

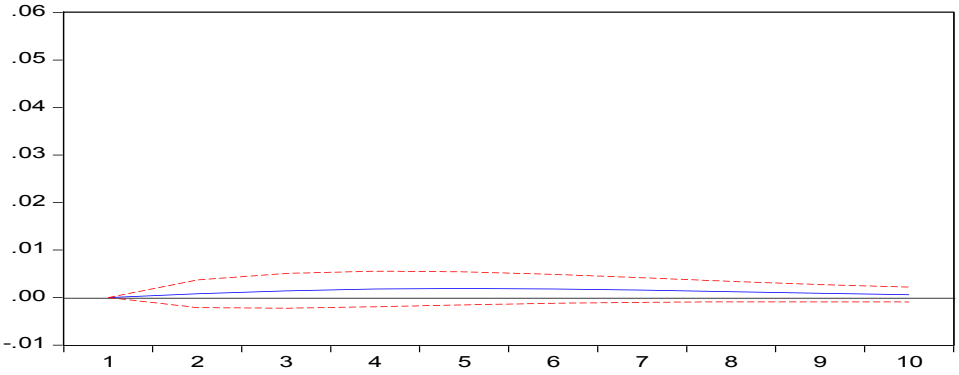
Estimates of Structural Parameters

	Coefficient	Std. Error	z-Statistic	Prob.
IS/Aggregate Demand Equation				
α_1	–0.010184	0.024794	–0.410732	0.6813
α_2	–2.725085	0.400376	–6.806321	0.0000
α_3	0.261726	0.151973	1.722194	0.0850
Phillips Curve/Aggregate Supply Equation				
β_1	1.809459	0.176686	10.24109	0.0000
β_2	4.227851	0.399119	10.59296	0.0000
β_3	0.448597	0.311300	1.441045	0.1496
β_4	–0.113394	0.453992	–0.249771	0.8028
UIP Equation				
ω_1	–0.057226	0.017718	–3.229803	0.0012
Interest Rate Rule				
γ_1	–0.393768	1.395599	–0.282150	0.7778
γ_2	1.014622	0.338993	2.993049	0.0028
γ_3	1.934708	1.273228	1.519530	0.1286
γ_4	–0.792662	1.210452	–0.654848	0.5126
Fiscal Policy Rule				
ρ_1	2.447004	2.338248	1.046512	0.2953
ρ_2	–0.751100	0.193221	–3.887263	0.0001
ρ_3	2.151003	2.273663	0.946052	0.3441
ρ_4	1.468897	0.324979	4.519970	0.0000
Debt Equation				
δ_1	0.045695	0.062539	0.730657	0.4650
δ_2	1.011575	0.030653	33.00033	0.0000
δ_3	–0.024244	0.012528	–1.935208	0.0530
δ_4	–0.028596	0.122191	–0.234027	0.8150

4.2. Response of Macroeconomic indicators to Government Borrowing Shock

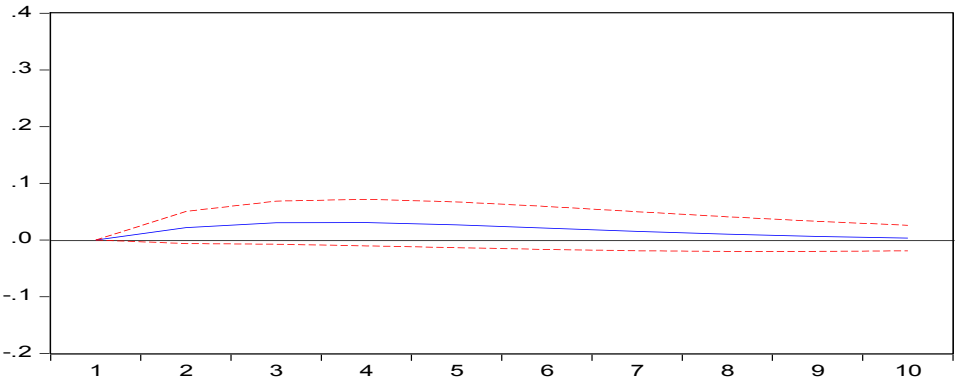
The government borrowing is availed in respect of access of government expenditure. Due to the increase in the government borrowing the aggregate demand increase through investment and consumption channel in the economy but insignificantly.

Fig. 4.1. Response of Output Gap to Borrowing Shock



As due to the increase in the government borrowing, the supply of money increases 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.

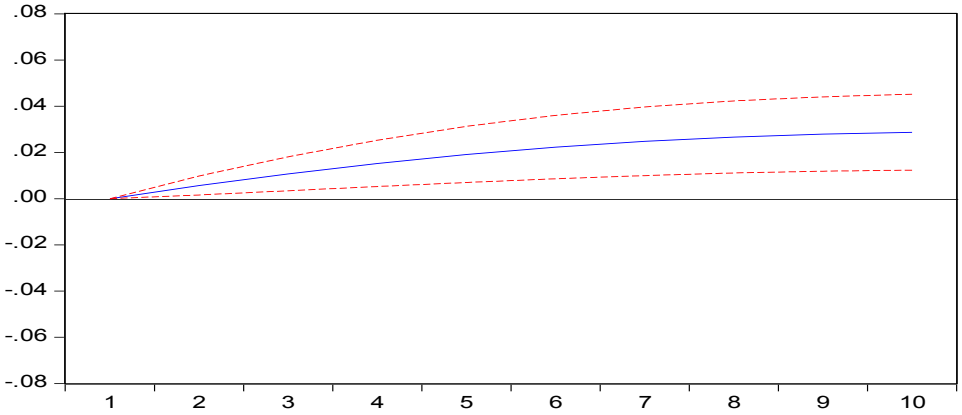
Fig. 4.2. Response of Inflation to Borrowing Shock



In Figure 4.2, 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 then this increase in money supply creates inflationary pressure in the economy [Yasmin, *et al.* 2013)]. It shows the positive behaviour of inflation to the government borrowing shock in the long run.

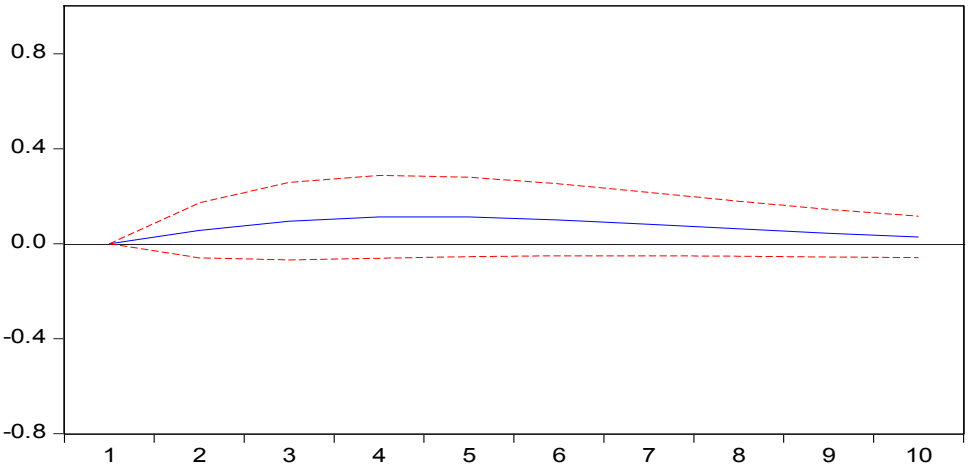
The impulse response of exchange rate to government borrowing shock is of explosive nature. At third periods, its moves upward from the steady state level and for further four periods it has a positive impact. It shows that the any shock to government borrowing destabilises the economy in terms of depreciation in exchange rate.

Fig. 4.3. Response of Exchange Rate to Borrowing Shock



As due to increase in the government borrowing the interest rate creases 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 analysed for first two periods in case of Pakistan through impulse response function given in the Figure 4.4 below:

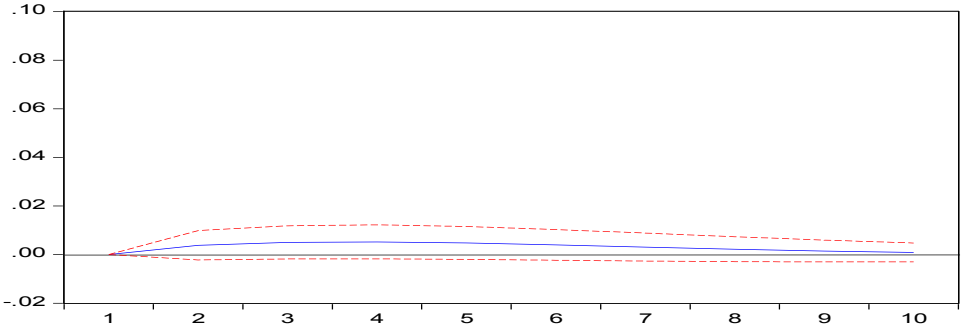
Fig. 4.4: Response of Interest Rate to Borrowing Shock



The impulse responses of interest rate 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. Kinoshita (2006) 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.

Fig. 4.5. Response of Government Expenditures to Borrowing Shock



4.3. Response of Government Borrowing to Structural Shocks

Government Borrowing do not respond significantly to the aggregate demand shock for the first four periods however, afterwards it remained below the steady state path. When cost push shock hits the economy, it leads to significant positive response of government borrowing. In response to risk premium shock, government borrowing increase significantly during the first period and then starts decreasing after 3 periods. When economy faces monetary shock, instead of decrease in government borrowing, the economy witnesses increase in government borrowing. Due to shock in government expenditures, government borrowing increases.

Fig. 4.6. Response of Government Borrowing to Aggregate Demand Shock

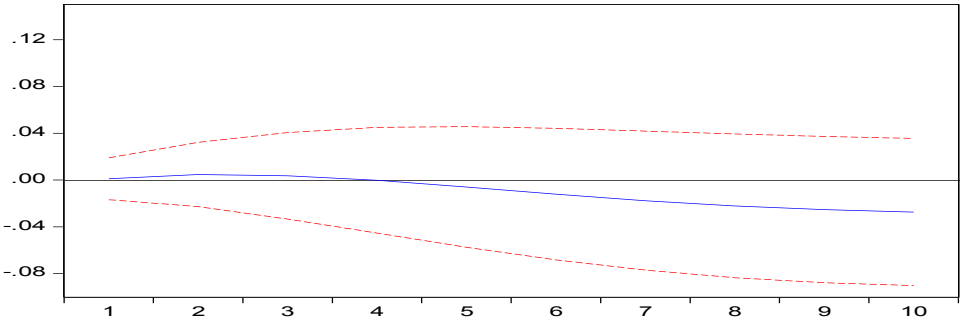


Fig. 4.7. Response of Government Borrowing to Cost Push Shock

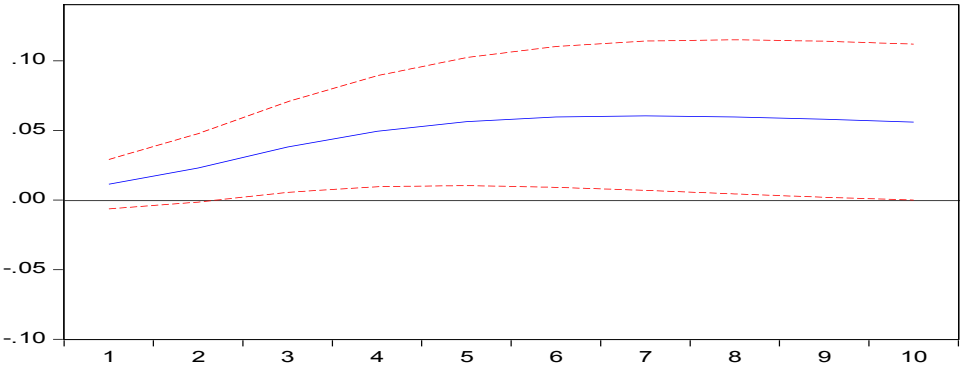


Fig. 4.8. Response of Government Borrowing to Risk Premium Shock

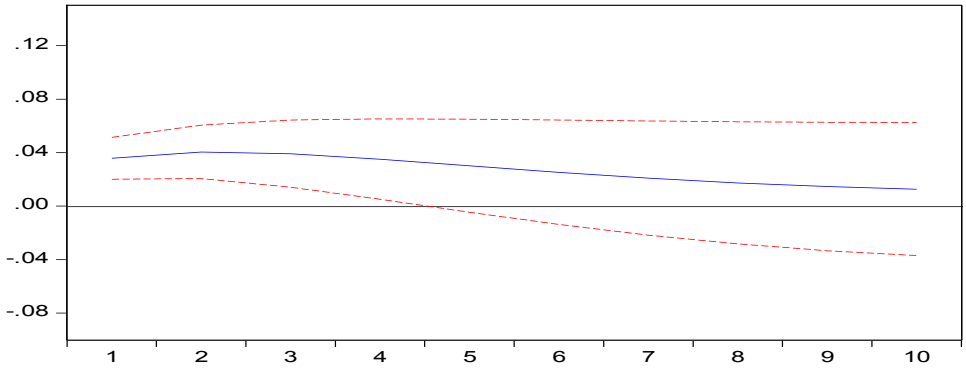


Fig. 4.9. Response of Government Borrowing to Monetary Shock

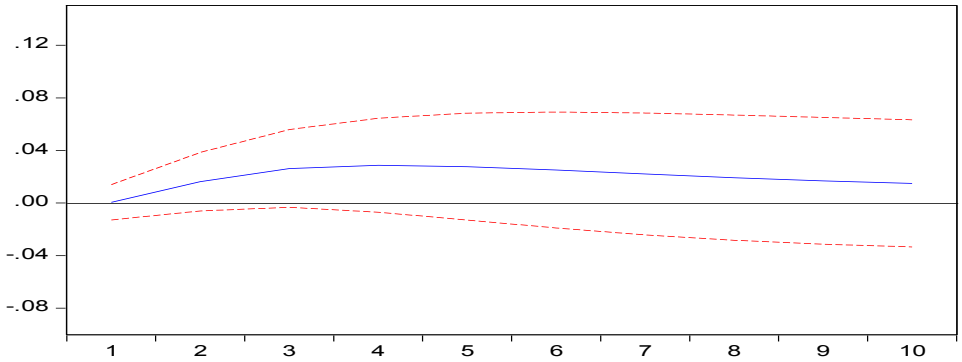
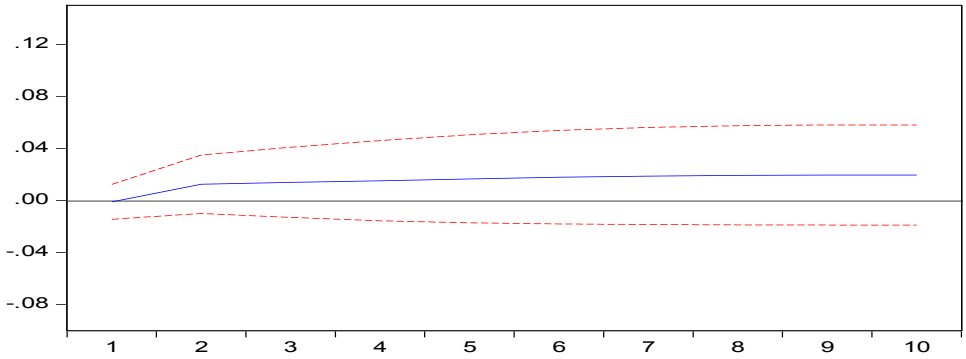


Fig. 4.10. Response of Government Borrowing to Government Expenditures Shock



4.4. Generalised Forecast Error Variance Decomposition Analysis

In Table 4.5, it can be observed that variations in output gap are primarily demand driven whereas cost push and monetary shocks also cause variations in output gap. However, the is no role of government borrowing and government expenditures in deriving output gap in the economy which also depicts failure of fiscal policy in achieving growth rate targets.

Table 4.5

Variance Decomposition of Output Gap

Period	S.E.	Aggregate Demand	Cost Push	Risk Premium	Monetary	Government Expenditures	Government Borrowing
2	0.04	91.37	3.30	0.08	5.10	0.11	0.04
3	0.04	85.21	7.53	0.08	6.94	0.11	0.14
4	0.04	81.65	10.55	0.23	7.16	0.11	0.29
5	0.05	79.79	12.04	0.56	7.01	0.14	0.47
6	0.05	78.86	12.50	0.94	6.91	0.17	0.62
7	0.05	78.37	12.50	1.29	6.91	0.20	0.73
8	0.05	78.08	12.39	1.56	6.97	0.21	0.80
9	0.05	77.88	12.32	1.73	7.03	0.21	0.83
10	0.05	77.74	12.30	1.83	7.08	0.21	0.84

Table 4.6 shows comparative significance of the structural shocks in describing inflation in Pakistan. The results show that inflation is primarily the cost push phenomenon in Pakistan with due share of aggregate demand in affecting inflation. However, all other shocks including the government borrowing shocks are least influential in affecting inflation in the country.

Table 4.6

Variance Decomposition of Inflation

Period	S.E.	Aggregate Demand	Cost Push	Risk Premium	Monetary	Government Expenditures	Government Borrowing
1	0.35	12.79	87.21	0.00	0.00	0.00	0.00
2	0.41	9.85	88.74	0.26	0.01	0.86	0.29
3	0.44	11.97	84.87	1.03	0.13	1.28	0.72
4	0.46	14.75	80.13	1.96	0.59	1.46	1.11
5	0.47	16.79	76.42	2.73	1.17	1.52	1.37
6	0.48	17.95	74.11	3.23	1.65	1.52	1.53
7	0.49	18.49	72.92	3.51	1.97	1.52	1.60
8	0.49	18.68	72.40	3.64	2.14	1.51	1.63
9	0.49	18.73	72.22	3.69	2.22	1.50	1.64
10	0.49	18.72	72.18	3.70	2.25	1.50	1.64

Risk premium shock is the primary reason for variations in exchange rate however aggregate demand and cost push shocks are also the contributing factors for exchange rate. However, government borrowing and interest rate influence exchange rate in the long run whereas government expenditures have minimum role to play.

Table 4.7

Variance Decomposition of Exchange Rate

Period	S.E.	Aggregate Demand	Cost Push	Risk Premium	Monetary	Government Expenditures	Government Borrowing
1	0.05	4.96	1.67	93.38	0.00	0.00	0.00
2	0.07	7.37	2.70	85.42	3.18	0.68	0.64
3	0.09	8.17	6.12	75.69	7.22	0.88	1.92
4	0.10	7.77	10.96	66.70	9.88	1.03	3.66
5	0.11	6.76	16.11	58.98	11.18	1.23	5.73
6	0.12	5.72	20.76	52.47	11.56	1.47	8.02
7	0.13	4.98	24.52	47.02	11.38	1.72	10.37
8	0.14	4.62	27.32	42.47	10.93	1.98	12.69
9	0.15	4.60	29.26	38.69	10.36	2.22	14.88
10	0.16	4.79	30.53	35.56	9.79	2.43	16.90

Variations in interest rate are primarily due to monetary, cost push, aggregate demand and risk premium shocks respectively. Government borrowing has insignificant role to cause variations in interest rate.

Table 4.8

Variance Decomposition of Interest Rate

Period	S.E.	Aggregate Demand	Cost Push	Risk Premium	Monetary	Government Expenditures	Government Borrowing
1	1.45	13.66	16.34	5.52	64.47	0.00	0.00
2	1.73	13.03	27.62	4.01	55.19	0.04	0.10
3	1.85	11.55	34.29	3.65	50.10	0.06	0.36
4	1.91	11.24	36.97	3.91	47.04	0.16	0.68
5	1.95	11.92	37.26	4.44	45.14	0.25	0.99
6	1.98	12.86	36.64	4.98	44.00	0.31	1.21
7	2.00	13.63	35.94	5.39	43.35	0.34	1.36
8	2.01	14.10	35.47	5.65	42.99	0.35	1.44
9	2.02	14.34	35.23	5.80	42.80	0.35	1.47
10	2.03	14.43	35.14	5.88	42.71	0.35	1.48

Except government borrowing shock, all other structural shocks cause variations in government expenditures.

Table 4.9

Variance Decomposition of Government Expenditures

Period	S.E.	Aggregate Demand	Cost Push	Risk Premium	Monetary	Government Expenditures	Government Borrowing
1	0.08	0.00	2.47	6.93	1.86	88.74	0.00
2	0.09	2.06	13.89	5.49	9.48	68.88	0.20
3	0.09	3.26	19.05	5.25	9.12	62.84	0.49
4	0.09	4.71	20.39	5.58	8.69	59.84	0.79
5	0.09	6.12	20.28	6.01	8.63	57.94	1.02
6	0.09	7.15	19.89	6.37	8.72	56.71	1.17
7	0.10	7.77	19.61	6.59	8.83	55.94	1.26
8	0.10	8.07	19.50	6.72	8.91	55.49	1.30
9	0.10	8.20	19.48	6.78	8.96	55.26	1.32
10	0.10	8.24	19.51	6.80	8.99	55.14	1.33

In addition to its own reason, risk premium, cost push and monetary shocks are primary reasons for variations in government borrowing.

Table 4.10

Variance Decomposition of Government Borrowing

Period	S.E.	Aggregate Demand	Cost Push	Risk Premium	Monetary	Government Expenditures	Government Borrowing
1	0.06	0.04	4.03	39.78	0.01	0.03	56.13
2	0.09	0.31	8.50	37.63	3.39	2.02	48.15
3	0.12	0.27	15.27	32.30	6.90	2.54	42.73
4	0.14	0.17	21.66	27.16	8.47	2.77	39.76
5	0.17	0.25	26.73	22.90	8.81	2.98	38.33
6	0.19	0.59	30.37	19.52	8.54	3.18	37.80
7	0.21	1.16	32.78	16.87	8.03	3.37	37.79
8	0.23	1.89	34.26	14.79	7.47	3.54	38.06
9	0.25	2.67	35.09	13.17	6.93	3.68	38.46
10	0.27	3.43	35.51	11.88	6.45	3.80	38.94

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.

Exchange rate and government expenditures play prominent role in determining aggregate demand in Pakistan whereas increase in real exchange rate do not cause reduction in aggregate demand. Inflation is forward looking phenomenon in Pakistan meaning thereby that majority of the producers are profit maximisers. Relation between exchange rate and interest rate changes is not one-to-one. One of the most important source of variations in government borrowing is risk premium shock followed by cost push and monetary shocks. It reflects that public debt increases due to rise in foreign component of debt and non-favourable changes in exchange rate. Government borrowing do not cause significant changes in the any of the macroeconomic indicators except to exchange rate in the long run.

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. 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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