Dynamic Effects of Fiscal Policy Shocks on Macroeconomic Variables: An Application of SVAR Methodology for Pakistan[26]

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Abstract

Change in government spending and tax has significant impact on main macroeconomic activities. This study aims to investigation dynamic effects of fiscal policy shocks on macroeconomic variables in Pakistan. The empirical results are carried out by using the structural vector autoregressive model. Two identification approaches, Blanchard and Perotti and recursive approach are used to identify the fiscal policy shocks. The analysis is conducted on quarterly data for the variables government spending, tax revenue, prices, private investment and GDP for the period 1975-2-14. The empirical results shows that government expenditure shock and tax revenue shock relatively highest on price and lowest on private investment. The government spending shocks decrease private investment and GDP, while tax revenue shock increase GDP and government spending. The results suggests that higher government spending have negative impact on private investment due to the large part of government consumption financing from the private sector. It is concluded that tax revenue shock increase the government spending, while government spending does not significant impact on the tax revenue. This result conform that expansion of fiscal policy increase the public debt services in Pakistan due to fiscal miss-management.

Key wards: Fiscal Policy Shocks, Macroeconomic Variables, SVAR Methodology

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1. Introduction

Fiscal policy is related to the decision of government spending on goods and services, taxes and revenue collection. The main objective of fiscal policy is to achieve certain macroeconomic goals such as macroeconomic stability, certain level of employment by utilizing the resources through the manipulation of income and spending power. Economic theories provide satisfactory explanation on dynamic effect of fiscal policy shocks on economic activities. "The existing theoretical literature on fiscal policy is divided into two broad categories such as Classical and Keynesian framework. The Classical economist argued that economies are stable inherently and economic capacity are determine by the available resources within economy. The available resources are including human capital and non-human capital, natural resources. with the sufficient resources the economy is adjust to full employment level and no need to any counter fiscal policy in the short and counterproductive in the long run.

Contrary to it, Keynesian economists argued that raise in government spending will have expansionary effect on economic activities. An increase in government spending increase aggregate demand and firms sell more output that ultimately increase income, consumption level and employment. However, the theoretical literature is well developed for the fiscal policy but there is no consensus regarding the role of fiscal policy among the Classical and Keynesian economists. The empirical facts are not support to the above arguments and opposing results. Javid and Arif (2009) highlighted the reasons of opposing results in empirical studies. They highlighted that outcome of fiscal policy may determine by the method of financing, taxes, borrowing from abroad and domestically and monetization of debt. First, the method of financing and taxes are not politically popular, therefore central bank accommodate the effectiveness of government which is highly depend on the government spending as a result crowding out in private spending.

Secondly, an increase in government spending is not matched by the equal increase in taxes, this can lead to create budget deficit. The deficit is financed by government debt and that is concerned with main macroeconomic activities in the economy. For example, an increase government debt need to higher degree of monetization, as a result increase the future expectations on taxes, decrease private consumption and offsetting the positive effect of government spending on aggregate demand. Similarly, government spending is financed by debt, that increase the demand for domestic credit and higher the interest rate. Thirdly, the government borrow credit form the domestic financial institution, this can decrease credit for the private sector investment. However, the main objective of fiscal policy is to achieve desirable

macroeconomic goals such as certain level of employment, stable prices, and desirable consumption level and income distribution. These objectives are achieved through the process of shaping taxation and public spending.

The fiscal policy plays a potential stabilizing role in the economy and concerned with the government expenditures and tax and non-tax revenues. The effective fiscal management is important to achieve the economic growth because growth causes to increase the employment opportunity, reduction in poverty, and increase in per capita income and living standard. The presence of macro-economic imbalances has posed serious threat to economic growth and development.

However, in Pakistan government spending on goods and services, tax rate, net deficit and tax revenues changed and presence the macroeconomic imbalance. Table 1 illustrate the historical trends of some important fiscal policy indicators with respect to GDP in Pakistan. The real GDP growth has been raised from 5.5 in 2006-07 to 6.8 in 2007-08 and its decrease from 5 in 2008-09 to 3.6 in 2015-15. The tax revenues are increased from 9.6 in 2006-07 to 10.2 in 2013-14". Historically total government expenditures has been trend more fluctuate from 2006-07 to 2014-15. On the other hand net deficit has been also increase from 4.1 in 2006-07 to 8 in 2012-13 and its decline 3.8 in 2014-15.

Table 1.1: Fiscal Indicators (as percentage of GDP at Market Price)

		Revenue			**Expenditures**			
Year	Real GDP	Total	Tax	Non -Tax	Total	Current	Development	Net Deficit
2006-07	5.5	14	9.6	4.4	18.1	14.9	4.6	4.1
2007-08	6.8	14.1	9.9	4.2	21.4	17.4	4	7.3
2008-09	5	14	9.1	4.9	19.2	15.5	3.7	5.2
2009-10	0.4	14	9.9	4.1	20.2	16	4.4	6.2
2010-11	2.6	12.3	9.3	3	18.9	15.9	2.8	6.5
2011-12	3.7	12.8	10.2	2.6	19.6	15.6	3.7	6.8
2012-13	4.4	13.3	9.8	3.5	21.5	16.4	5.1	8.2
2013-14	3.6	14.5	10.2	4.3	20	16	4.9	5.5
2014-15		9.8	7.5	2.3	13.6	11.7	2.2	3.8

Source: Economic Survey of Pakistan (2014-15)

The growing public spending, net deficit and taxes have significant impact on the macroeconomic activities. The spending and taxation can change the pattern of demand for the goods and services and affect the macroeconomic economic activities. The present study investigate dynamic effects of fiscal policy shocks on macroeconomic variables in Pakistan.

The empirical results are carried out by using the structural vector Autoregressive (SVAR) model. SVAR model is appropriate

methodology which identified the fiscal policy shocks. Furthermore, impulse response function are presented to analyze the transmission mechanism for the variables government spending, tax revenue, private investment, prices and GDP. This study contribute to the existing literature on dynamic effects of fiscal policy shocks on macroeconomic variables in Pakistan. The remaining study is organized into following sections, in section two briefly discusses empirical and theoretical literature on dynamics effect of fiscal policy. Section three presents model specification, data and methodology, section four presents empirical result and finally, conclude study in fifth section.

2. Literature Review

The dynamic effect of public spending and taxes have been well documented in previous literature. Economic theories and empirical studies guide regarding the dynamic effects and implication of shocks to public spending and taxes. "The effect is depend on the nature of simultaneous change in policy variables as well as financing method and taxes through which increase public spending. The empirical literature on dynamic effect of fiscal policy shocks on economic activities are divided into three parts. The first part is concerned with the response of fiscal policy or fiscal multiplier and interpretation of historical facts. The second part is concerned with the response of fiscal policy shocks on economic activities within framework of vector autoregressive (VAR) model. In third part VAR as a standard methodology is developed into more advance models which simulate fiscal shocks like dynamic stochastic general equilibrium model (DSGE) and real business cycles (RBC) models. However, our study related to the second part, we used the structural vector autoregressive (SVAR) model to investigate dynamic effects of fiscal policy shocks on macroeconomic variables.

The first empirical research on fiscal policy shock within framework of vector autoregressive (VAR) methodology conducted by Ramey and Shapiro (1998). Following Ramey and Shapiro identified the exogenous fiscal policy shocks with onset of military buildups. The military buildup associated with exogenous large and persistent increase in national defense expenditures. They concluded that fiscal dummy variables are associated with exogenous change in fiscal policy. Furthermore, Ramey and Shapiro (1998) identification of fiscal policy shocks method is called narrative or event study approach. The narrative approach is used frequently in most recent empirical studies in contemporary research to identify the fiscal policy chocks (Romer and Romer 2007)

Secondly, empirical study on fiscal policy was conducted Blanchard and Perotti (2002) by using the structural vector autoregressive (SVAR) model. Blanchard and Perotti (2002) used

information about the institutional elements of fiscal system to identify the VAR model. They set restriction on the automatic reaction of government revenues and expenditures to economic activities. Their study is based on quarterly data of government spending, net tax revenues and GDP of the United States. In a most recent studies the method of Blanchard and Perotti (2002) is used as benchmarked model. However, Latter the method is extended by Perotti (2005), adding short term interest rate and price level. The author concluded that positive shocks in government spending have positive effect on economic activity, while in positive tax shocks have cause negative effect. In addition author concluded that consumption shocks and increase tax have a negative impact on the private investment.

Third, sign restriction approach proposed by Uhlig and Mountford (2002) and used to identify the vector autoregressive (VAR) model. In this approach identify fiscal policy shocks via restriction on the impulse response. The sign restriction approach does not required the number of shocks to be equal to the number of variables and does not impose linear restrictions on the contemporaneous relation between reduced form and structural disturbances. Mountford and Uhlig (2009) imposed direct restrictions on the shape of impulse response. They identify four shocks, government spending shock, tax shock, business cycle shocks and monetary policy shock.

Finally, recursive approach introduced by Sims (1980) and apply to study fiscal policy shock by Fatas and Mihov (2000) and Favero (2002). The structural innovations can be obtained from reduced innovation using the Cholesky factorization. In the recursive approach order of endogenous variables are important, because order implicitly change the relationship structure. In practice first variable should be that whose future period variance is best explained by its own structural innovation, therefore required significant effort to determine optimal order (Bahovec and Erjavec 2009). Furthermore, Caldara and (Caldara and Kamps 2007, Caldara and Kamps 2008) compared all four identification approaches. They concluded that recursive approach and conventional structural VAR approach are almost identical, while most significant difference arise from the narrative approach.

The empirical results are differ from country to country and there is no conscience on single point that response of macroeconomic variable to fiscal policy shocks. Hutchinson and Schumacher (1997) investigated relationship between government expenditures and economic growth for the 16 Latin American economies. They used quarterly data from 1972 to 1991. Their results revival that expenditure on public goods and transfer payments are positively related with economic growth. In addition further they concluded that government inefficiency in term mismanagement has negative impact on overall economic growth. Similarly, Gupta, Clements et al. (2005) studied

whether fiscal improvement have impact on economic growth or not? They found that in the low income countries significant relationship between fiscal adjustment and per capita income.

Furthermore, Aregbeyen (2007) investigate the relationship between government expenditures, revenue and economic growth. The empirical results shows there is positive relationship between economic growth and government expenditures. Kofi Ocran (2011) examine dynamic effect of fiscal policy on economic growth. The empirical results are carried out within the framework of structural vector autoregressive methodology. They found that effect of fiscal policy on economic growth is limited but persistent. Samargandi, Fidrmuc et al. (2014) examine the relationship between fiscal policy and economic growth for Iran within framework of vector auto regression (VAR) model. The empirical results shows that tax and government investment spending have positive impact on economic growth. According to the Alm and Rogers (2010) taxes have no consistent effect on economic growth but expenditure have consistent impact on economic growth. Similarly, Babalola and Aminu (2011) investigate relationship between government expenditure on health, education and economic growth in Nigeria. They found that there is positive relationship between economic growth and expenditures on health and education.

It is necessary to mentioned review the domestic's literature within context of the dynamic effect of fiscal policy shocks on macroeconomic variables, which can help to construct theoretical framework and identification of literature gap for this study. However, in case of Pakistan empirical work on fiscal policy can be structured in several directions. First direction focus on the macroeconomic effect of reduction in budget deficit. The second is focus on the stabilizing and capabilities of fiscal policy variables on economic growth. The third group focuses on the dynamic effect of fiscal policy on macroeconomic variables within the framework of vector autoregressive method by extending the work of Blanchard and Perotti (2002).

In Pakistan, several empirical studies investigate dynamic effect of fiscal policy on economic activates, Shabbir, Mahmood et al. (1992) and Khilji, Mahmood et al. (1997) concluded that fiscal deficit is one of the main variable that effect economic activity. Contrary to it, (Haq 2003) argued that fiscal deficit do not effect on key macroeconomic variables. Furthermore, impact of fiscal policy on economic growth also be demonstrated through transmission mechanism. Fiscal policy effect economic growth via demand and supply. However, fiscal policy is considered dynamic transmission mechanism and it has different impact on key macroeconomic variables Khalid, Malik et al. (2007). Javid and Arif (2009) investigate dynamic effect of change in government spending in Pakistan. They provide the evidence that consumption and output respond is negative to the innovation in government spending.

They argued that effect of government spending vary with the sources of financing. The most recent study conducted on fiscal policy by Shaheen and Turner (2012) they investigate dynamic effect of fiscal policy shocks on Pakistan economy within the framework of SVAR methodology". The empirical results shows government spending shocks have positive effect on output and inflation. In the light of above discussion of theoretical and empirical literature, it is found that in the case of Pakistan studies on fiscal policy is still infancy and inadequate. Therefore need to study dynamic effect of fiscal policy shocks on macroeconomic variables. We developed model below as an attempt to account for the dynamic effect of fiscal policy shocks on macroeconomic variables for Pakistan.

3. Data and Methodology

In order to investigate dynamic effect of fiscal policy shocks on macroeconomic variables in Pakistan, quarterly time series for the period 1975:1 to 2012:4 taken from the quarterly published reports on national account by the State Bank of Pakistan and International Financial statistics (IFS- CD ROM, 2014). The structural vector autoregressive methodology is used to obtain the empirical results. The study include following variables, government spending (G), tax revenue (T), price (P), private investment (I) and GDP.

Model Specification

The first step is to construct benchmark reduced form VAR model, then discussed how to implement different identification approaches. "The reduced form model can be written as following.

$$Y_t = A_0 + A_1 t + D(L)Y_{t-1} + U_t \dots\dots\dots\dots (1)$$

Where Y_t denoted vector of endogenous variables, A_0 is constant, t is linear time trend $D(L)$ is lag polynomial of L and U_t is a k-dimensional vector of reduced form residuals which is in general non zero correlation. The exogenous error terms are unknown structural shocks and capturing the unexpected shocks to the dependent variables. The structural relationship between variables can be written as following.

$$BY_t = A_0 + A(L)Y_{t-1} + \epsilon_t \dots\dots\dots\dots\dots\dots (2)$$

B is a square matrix of $(n \times n)$ where n is the number of variable and contain the structural parameter of the contemporaneous endogenous variables. The first step of structural VAR analysis is the estimation of reduced form VAR. The coefficients in a matrix of equation (2) are unknown and variables have contemporaneous effect on each other it means that the model is not completely identified, therefore the above equation (2) transformed into reduced form by multiplying both side of the equation by B^{-1}.

$$Y_t = A_0 + D(L)Y_{t-1} + \varepsilon_t \dots\dots\dots\dots (3)$$

Where $A_0 = B^{-1}A_0, D(L) = B^{-1}A(L), \varepsilon_t = B^{-1} \in_t$

We adopt the Blanchard and Perotti (2002) approach and deterministic trend other than constant term, linear tie trend, seasonal dummies coefficient consider by Blanchard and Perotti (2002) turn out to be insignificant thus we drop them. The reduced form disturbance are correlated with each other and do not have any economic interpretation, therefore it is necessary to model the contemporaneous relationship between reduced form disturbances $\in_t$ and structural innovations $\varepsilon_t$with an economic interpretation based on the identifying restrictions. If the reduced form disturbance terms $\in_t$ is white nice process than structural innovations ε_t will also follow white nice. Hence the VAR model can be viewed as the reduced form of general dynamic structural model. If assume that the matrix of structural parameter A_0 is exactly equal to the matrix B^{-1} than orthogonalised innovations would coincide with the structural disturbance. The instantaneous relationship between structural and reduced form is written as

$$AU_t = Be_t$$

This model is known as A and B model (Lütkepohl 2005). In order to identify the AB model required $2k^2 - \frac{1}{2k}(k+1)$ constraints. However, restriction on relationship among the parameter are valid only for the initial period. Latter the effect is transmitted through VAR, it depend on the specification of VAR. Furthermore, in this paper two identification approaches such as recursive approach and Blanchard and Perotti approach are used to identify the fiscal policy shocks.

Recursive approach

The structural innovations can be obtained from the reduced form innovation using the Cholesky decomposition. Recursive approach restrict the B to k-dimensional identify matrix and A to a lower triangular matrix with percent diagonal. The order of endogenous variable is important because order of variable implicitly change the relationship between structures of innovations. In this paper we used five dimensional structural VAR model, we follow the order of variables suggested by Shaheen and Turner (2012) and Caldara and Kamps (2008). The government spending (G) is ordered first because it do not react contemporaneously to shocks to other variables of the model, in second order tax revenue (T) is placed because it only contemporaneously react to the government spending and do not react to other variables of the model, in third ordered price (P) is placed because prices contemporaneously reacts to public expenditures and tax revenue, in fourth ordered private investment (I) that suggests private investment contemporaneously reacts to government spending, tax

revenue, and price". In fifth we placed GDP (Y) which reacts contemporaneously to all variables of the model. The specification is as below:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -\alpha_G^T & 1 & 0 & 0 & 0 \\ -\alpha_G^P & -\alpha_T^P & 1 & 0 & 0 \\ -\alpha_G^I & -\alpha_T^I & -\alpha_I^P & 1 & 0 \\ -\alpha_G^Y & -\alpha_T^Y & -\alpha_P^Y & -\alpha_I^Y & 1 \end{bmatrix} \begin{bmatrix} \mu_t^G \\ \mu_t^T \\ \mu_t^P \\ \mu_t^I \\ \mu_t^Y \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \epsilon_t^T \\ \epsilon_t^G \\ \epsilon_t^P \\ \epsilon_t^I \\ \epsilon_t^Y \end{bmatrix} \dots\dots\dots\dots (4)$$

The lag of the model is selected on the bases of Akaike information criterion (AIC) and Schwarz information criterion (BIC).

Blanchard and Perotti Approach

The Blanchard and Perotti (2002) identification approach relies on institutional information about taxes and government expenditures, the timing of taxes and expenditures. The restrictions are imposed to identify the automatic response of taxes and government expenditures towards the economic activity. In a first step the institutional information is used to estimate the cyclically adjusted taxes and government expenditures and in the second step estimate fiscal shocks. In this study follow the Perotti (2005) identification scheme for the five variables VAR model. The relationship between reduced form disturbances u_t and structural innovation e_t can be written as following

$$u_t^g = a_{gy}u_t^y + a_{gp}u_t^p + a_{gi}u_t^i + \beta_{gt}e_t^t + e_t^g \dots\dots (5)$$
$$u_t^t = a_{ty}u_t^y + a_{tp}u_t^p + a_{ti}u_t^i + \beta_{tg}e_t^g + e_t^t \dots\dots (6)$$
$$u_t^p = \alpha_{pg}u_t^g + \alpha_{py}u_t^y + \alpha_{pt}u_t^t + e_t^p \dots\dots\dots\dots (7)$$
$$u_t^i = \alpha_{ig}u_t^g + \alpha_{it}u_t^t + e_t^i \dots\dots\dots\dots\dots\dots\dots\dots (9)$$
$$u_t^y = \alpha_{yg}u_t^g + \alpha_{yt}u_t^t + \alpha_{yp}u_t^p + \alpha_{yi}u_t^i + e_t^y \dots\dots (9)$$

Where a correspond to elasticity, the term β correspond to the cross reaction of the variables of the fiscal policy. Note that the above system of equations (5-9) are not identified, the variance covariance matrix of reduced form disturbance has ten distinct elements and 17 free parameters. In order to identify the model first find the elasticity of output elasticity with respect to tax revenues a_{ty}, and inflation elasticity of tax revenues a_{tp}. Set output elasticity of government spending a_{gy} equal to zero. Find inflation elasticity of government spending a_{gp}. In addition set output elasticity of private investment α_{yi} and elasticity of

tax revenues to government spending is equal to zero. Finally set β_{gt} equal to zero, this implies that government spending decision are taken before decision on revenues.

The Elasticity of Government expenditure and Tax Revenue

To achieve the full identification of SVAR, the elasticity of government spending and total tax revenues to change in macroeconomic variables are estimated by using Blanchard and Perotti (1999), Lozano and Rodríguez (2011) and Ravnik and Žilić (2011) as shown in table 3.1. This elasticity's measured the contemporaneous effect of GDP, price and private investment on fiscal variables.

The SVAR model used in the analysis of fiscal shocks is called the AB model (Lütkepohl 2005) with the following appearance: so it is possible to construct A and B matrices:

$$A\mu_t \begin{bmatrix} 1 & 0 & n_P^{GT} & 0 & 0 \\ -\alpha_G^Y & 1 & -\alpha_T^I & -\alpha_T^Y & 0 \\ -\alpha_G^P & -\alpha_Y^P & 1 & -\alpha_T^P & 0 \\ -\alpha_G^I & n_Y^I & n_P^I & 1 & 0 \\ -\alpha_G^Y & -\alpha_T^Y & -\alpha_P^Y & -\alpha_I^Y & 1 \end{bmatrix} \begin{bmatrix} \mu_t^G \\ \mu_t^T \\ \mu_t^P \\ \mu_t^I \\ \mu_t^Y \end{bmatrix}$$

$$= Be_t \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ \beta_G^T & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \epsilon_t^G \\ \epsilon_t^T \\ \epsilon_t^P \\ \epsilon_t^I \\ \epsilon_t^Y \end{bmatrix} (10)$$

The variance covariance matrix of the above equation of the reduced form disturbance has ten different elements where 17 unknown parameters, we cannot estimate these parameters and elements here because these parameters are not identified. The Blanchard and Perotti (2002) suggest some additional restrictions on these unknown parameters.

In the first stage we have not fixed the diagonal coefficient of the matrix A and B due to economic theory constraints. If we suppose that the innovation does not influence the other one side then we attribute a zero value to coefficient. On the other hand, if the innovation does influence other side then attribute the value. The values of coefficient are determined by estimating the elasticity between two innovations on the bases of institutional information.

This study applies following restrictions to identify the structural shocks. Government spending entirely under the control of economic policy which cannot react in the same period and effect is not automatic because it is a variable which dynamic is slowly influenced by government decisions price elasticity of government spending is 0.05.

finally, following SVAR model is identified by using the method of Caldara and Kamps (2008), Lozano and Rodríguez (2011).

$$A\mu_t \begin{bmatrix} 1 & 0 & 0.5 & 0 & 0 \\ -\alpha_g^Y & 1 & 0 & -\alpha_T^Y & 0 \\ -\alpha_G^P & -\alpha_Y^P & 1 & -\alpha_T^P & 0 \\ -\alpha_G^P & -0.68 & -0.94 & 1 & 0 \\ -\alpha_G^Y & -\alpha_T^Y & -\alpha_P^Y & -\alpha_I^Y & 1 \end{bmatrix} \begin{bmatrix} \mu_t^G \\ \mu_t^T \\ \mu_t^P \\ \mu_t^I \\ \mu_t^Y \end{bmatrix}$$

$$= Be_t \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ \beta_G^T & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \epsilon_t^G \\ \epsilon_t^T \\ \epsilon_t^P \\ \epsilon_t^I \\ \epsilon_t^Y \end{bmatrix} (11)$$

4. Empirical Results and Discussion

This study is based on time series data, it is essential to test the properties of time series data and ensure that whether data is stationary or not. The variables of the study include government consumption, tax revenues, price level, private investment and GDP. The augmented dickey fuller test unit root test were applied to test the data stationary, at level and difference. The ADF test is based on the model with an intercept and with an intercept and trend as shown in table 4.1. The results shows all the variables are stationary at difference. In the second step estimate the structural vector autoregressive model by using the two approaches Recursive Approach and Blanchard and Perotti Approach. In the next section estimated coefficients of t SVAR model is reported from both approaches.

Recursive approach

In this section we estimate the structural vector autoregressive model by using the recursive approach suggested by the Sims (1980). The estimated coefficients of the model are reported in table 4.2. The results shows contemporaneous effect of tax revenue to shock in government spending (α_G^T) is positive and statistically significant. This indicate that one percent positive shock in government spending lead to increase the indirect taxes by 0.36 percent. The results is theoretically consistent, because an increase in taxes lead to increase in output level and this reflects long term multiplier effect of government spending. The positive value of price to shocks in government spending (α_G^P) indicate that one percent positive shock in government spending increase the price level and it is statistically significant. The contemporaneous effect

of price to shock in tax revenue (α_T^P) is also positive and significant. This indicate that one percent positive shock in tax revenue increase the price level by 0.57 percent. The coefficients of private investment to shock in government spending (α_G^I) and tax revenue (α_T^I) are positive but statistically insignificant and theoretically inconsistent. The positive value of price to shock in private investment (α_I^P) and GDP to shock in government spending (α_G^Y) indicate that one percent positive shock lead to increase the price level and GDP but it is insignificant. The coefficient of GDP to shock in tax revenue (α_T^Y) and price level (α_P^Y)is positive and statistically significant, the results are theatrically consistent. This indicate that most the tax revenues are come from the indirect taxes. On the other hand direct relationship between GDP and inflation. This indicate that one percent positive shocks in tax revenue increase GDP by 1.6 percent. Finally, the GDP to shock in private investment (α_I^Y) is positive, this indicate that one percent positive shock in private investment increase GDP by 0.03 percent.

Blanchard and Perotti Approach

In this section "we estimate the structural vector autoregressive model by using the Blanchard and Perotti (2002). The estimated coefficients of the model are reported in table 4.2. The results shows contemporaneous effect of shock in government spending to GDP (α_G^Y) is positive and highly significant. The results suggests that one percent positive shock in government spending increase GDP by 0.22 percent. The contemporaneous effect of shock in tax revenue to private investment (α_T^I)is negative and statistically significant. This implies that one percent positive shocks in tax revenue the private investment decrease by 0.32 percent. The coefficient of tax revenue to GDP (α_T^Y) is positive and highly significant. The results reflect that one percent positive shock in tax revenue the GDP is increase by 12 percent. The coefficient of price to shock in government expenditure (α_G^P) is positive but statistically insignificant. The contemporaneous effect of price level to shock in GDP (α_Y^P) is positive, the result reflect that one percent positive shock in GDP increase the price level. The result is theoretically consistent, because higher GDP contribute to higher inflation. The coefficient of price to shock in tax revenue (α_T^P) is positive but it is statistically insignificant. The contemporaneous effect of government spending on private investment (α_G^I) is negative. The results indicate that one percent positive shock in government spending private investment decrease by the 6.3 percent. The results are theoretically consistent. The contemporaneous effect of GDP to shock in government spending (α_G^Y) is negative and statistically significant.

The results shows one percent positive shock in government spending decrease the GDP by 6.8 percent and it is theoretically

consistent because results shows the crowding out effect. The contemporaneous effect of GDP to shock in tax revenue (α_T^Y) is negative, this implies that on percent positive shock in tax revenue the GDP is decrease by 0.24 percent but statistically insignificant. The coefficient of price to GDP (α_T^Y) is positive and statistically significant. The results indicate that one percent positive shock in price increase GDP by 1.03 percent. The contemporaneous effect of GDP to shock in private investment (α_I^Y) is positive but it is statistically insignificant. The effect of tax revenue to shock in government spending (β_G^T) is positive in short run. The result shows one percent positive shock in government spending tax revenue increase by 12 percent. The high value of indicate s that taxes are more responsive to government expenditures.

Dynamic Effects of Fiscal Policy shocks - Impulse Response Function

The impulse response function (IRF) refer to the reaction of any dynamic change in response to some external changes. The effect of exogenous shock or innovations are measure through the IRF. This section presents the IRF's for the SVAR model identified by Cholesky decomposition including government spending and tax revenue shocks.

Effect of Government Spending Shocks

Figure 1 represents impulse response function (IRF) of the endogenous macroeconomic variables tax revenue, inflation, private investment and GDP to shock in government spending. Each figure shows the effect of one time shock to measure of government spending shock on current and future value of each macroeconomic variable. The response of government spending to its own shock have strong negative and persistent. This result is similarly related to the Blanchard and Perotti (2002). The response of tax revenue to shock in government spending is positive in first quarter and trend to decrease in 2nd quarter. One of the possible explanation is that government in first quarter is better in managing their revenue by investing to the economy, after first quarter due to miss management of fiscal resources tax revenues are trend to decrease. The response of inflation to shock in government spending is negative until 3rd quarter and increase in 4th quareter. The results reflect that one percent positive shock in government spending decrease inflation up to second quarter and and its follow increasing trend after the second trend. The response of private investment to shock in government spending positive until 2nd quater.

The result shows one percent positive shock in government shock private investment increase up to first quarter and its decrease after the first quarter. This implies crowing out effect of government

spending on private investment. The result indicate that offsetting positive effect of government spending on private investment as as results increase the tax burden, its lead to reduced labor wages and increase labor supply. Similarly, response of GDP to shock in government spending is negative until 2nd quarter and positive up to 3rd quarter, it again follow negative trend from 3rd to 4th quarter, this indicating that government spending shock have negative effect on GDP. The finding is consistent with the neoclassical and new Keynesian analysis, which suggested that higher government spending have negative impact on private investment due to the large part of government consumption financing from the private sector and large tax burden on consumer. The empirical results are support to the studies of Lozano and Rodríguez (2011), Shaheen and Turner (2012).

Effect of Tax Revenue Shocks

Figure 2 represents impulse response function (IRF) of the endogenous macroeconomic variables to shock in tax revenue. The response of tax revenue to its own shock have strong negative and persistent. The response of inflation to shock in tax revenue is positive, the result implies that positive shock in tax revenue increase price level. The response of tax revenue to shock in government spending is positive until 3rd quarter and follow the decreasing trend after 3rd quarter. The response of tax revenue to shock in private investment is initially negative and following positive trend after 4th quarter. In addition, response of GDP to shock in tax revenue is negative and it is theoretically inconsistent.

5. Conclusion

This study evaluate dynamic effect of fiscal policy shocks on macroeconomic variable in Pakistan using the structural vector autoregressive methodology for the period 1975:1 to 2012:4. The quarterly data is taken from the quarterly published report of state bank of Pakistan and international financial statistics. The fiscal policy shocks government spending and tax revenue shocks are identified by employee the recursive approach and Blanchard and Perotti approach. The Recursive identification scheme is based on Cholesky decomposition.

In addition to the implied coefficients of the benchmark identification approach, exogenous elasticities are computed to achieve full identification. These elasticities measure the automatic response of fiscal variables to a change in economic activity. In addition, impulse response function are used to check the transmission mechanism of fiscal policy shocks. The empirical results shows contemporaneous

effect of tax revenue to shock in government spending, price and GDP is positive and statistically significant".

The empirical results are theoretically consistent, because an increase in taxes lead to increase in output level and this reflects long term multiplier effect of government spending. Higher GDP contribute to the higher level of inflation. On the other hand government expenditure shock are negatively related to the private investment, GDP and positively related to the price level and tax revenue. These results are theoretically consistent with the neoclassical and new Keynesian analysis, which suggested that higher government spending have negative impact on private investment due to the large part of government consumption financing from the private sector and large tax burden on consumer.

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Appendix

Table 3.1: Elasticity of Government spending and Tax Revenues

1	government expenditures to price $a_p^g = \sum \frac{d^g/_g}{dp/_p}$	0.5
2	tax revenues to price $a_p^t = \sum \frac{d^\tau/_\tau}{dp/_p}$	0.68
3	tax revenues in relation to output $a_y^t = \sum \frac{d^\tau/_\tau}{dy/_y}$	0.94

4.1 Results of Augmented Dickey Fuller (ADF) Unit Root Test

	Level		First Difference	
Variables	**Constant**	**Trend +Constant**	**Constant**	**Trend +Constant**
Gov Spending	-1.397107	-3.328326	-9.679652*	-9.735619
Tax Revenue	-2.086357	-1.926050	-4.038268*	-4.430401**
Price	-1.135711	-4.544971	-3.826606*	-3.875386
Private Investment	-2.196280	-4.000219	-6.440270*	-6.628698**
GDP	0.045106	-2.520869	-3.817607*	-3.654479

**, ** indicate the significance level at 1% and 5 % respectively*

Table 4.2: Estimated Coefficients of SVAR Model through Recursive Approach

	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
α_G^T	0.358544	0.082761	4.332309	0.0000*
α_G^P	0.143835	0.083027	1.732393	0.0832***
α_T^P	0.571734	0.151544	3.772716	0.0002*
α_G^I	0.151664	0.106265	1.427231	0.1535
α_T^I	0.080270	0.082761	0.969911	0.3321
α_I^P	0.157155	0.150985	1.040864	0.2979
α_G^Y	0.009470	0.106262	0.089116	0.9290
α_T^Y	1.525876	0.082761	18.43724	0.0000*
α_P^Y	0.804620	0.082808	9.716653	0.0000*
α_I^Y	0.033971	0.082761	0.410473	0.6815

, * indicate the significance level at 1% and 10 % respectively*

Table 4.3: Estimated Coefficients of SVAR Model through Blanchard and Perotti Approach

	Coefficient	Std. Error	z-Statistic	Prob.
α_G^Y	0.225065	0.084323	2.669072	0.0076*
α_T^I	-0.32974	0.087124	-3.78474	0.0002*
α_T^Y	120.7474	7.047223	17.13404	0.0000*
α_G^P	0.002055	0.089289	0.023011	0.9816
α_Y^P	7.143275	0.425794	16.77636	0.0000*
α_T^P	0.031483	0.599593	0.052508	0.9581
α_G^I	-6.34301	4.964537	-1.27766	0.2014
α_G^Y	-6.85414	0.416329	-16.4633	0.0000*
α_T^Y	-0.24669	4.950357	-0.04983	0.9603
α_P^Y	1.030056	0.581390	1.771712	0.0764
α_I^Y	0.044474	0.579562	0.076738	0.9388
β_G^T	120.8152	7.047796	17.14227	0.0000*

*, *** *indicate the significance level at 1%*

Figure 1: Effect of Government Spending Shocks on Macroeconomic Variables

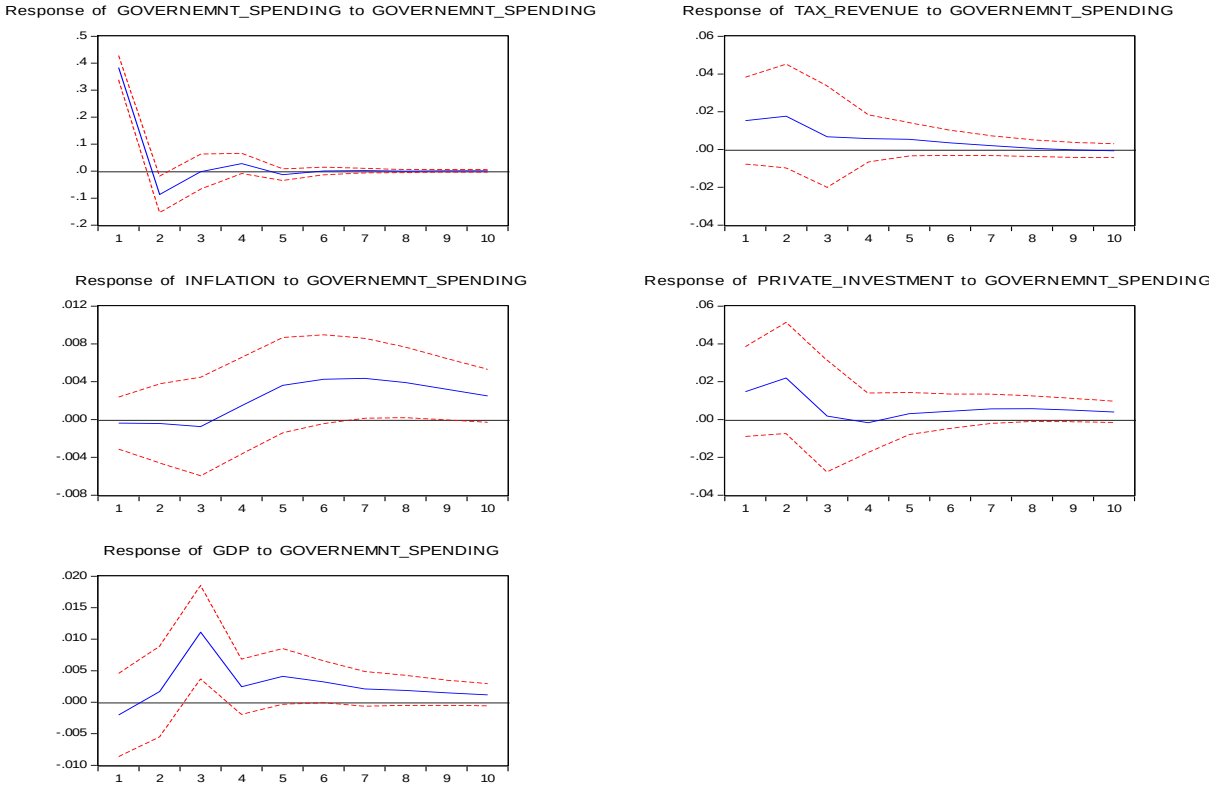

Figure 2: Effect of Tax Revenue Shocks on Macroeconomic Variables