Dynamic Effects of Fiscal Spending: A Panel Data Analysis of Selected South-Asian Countries

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CERTIFICATE

This is to certify that this thesis entitled: **"Dynamic Effects of Fiscal Spending: A Panel Data Analysis of Selected South-Asian Countries"** submitted by Mr. Muhammad Zaman is accepted in its present form by the Department of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of **Master of Philosophy in Economics**.

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IN THE NAME OF

ALLAH ALMIGHTY

The Most Beneficent

The Most Merciful

"To Allah belongs whatever is in the heavens and whatever is in the earth. Whether you show what is within yourselves or conceal it, Allah will bring you to account for it. Then He will forgive whom He wills and punish whom He wills, and Allah is over all things competent."

(Al-Baqarah, 2:284)

GOLDEN SAYING OF

THE HOLY PROPHET

(Peace and Blessings of Allah be Upon Him)

Reported by Hazrat Abu Huraira (R.A)

"Verily, Allah would say on the Day of Resurrection: Where are those who have mutual love for My Glory's sake? Today I shall shelter them in My shadow when there is no other shadow but the shadow of Mine.

(Al-Hadith)

Sahih Muslim

Book No.032

Hadith No. 6225

DEDICATED

TO

MY BELOVED PARENTS

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ABSTRACT

The role of fiscal policy to stabilize the economy and stimulate the economic activity has been a debatable issue among the scholars and policy makers. The following study characterizes the dynamic effects of fiscal spending on key macroeconomic variables; output, inflation and interest rate in four South-Asian countries for the time period of 1990-2015. In order to serve the purpose identification scheme by Blanchard and Perotti (2002) has been employed in panel structural vector autoregressive (SVAR) model. The main findings of the study can summarized as follows: Government expenditure shock have positive impact on output with multiplier less than one i.e. output increases less than increase in expenditure. In response to a fiscal spending expansion the interest rate raises which can ultimately cause private investment to crowd out. A positive fiscal spending stimulus induces a persistent rise in inflation, a result of rise in demand for goods and services in the economy. It is also found that the effect of a tax revenue shock on inflation is positive, on output is negative contemporaneously but it has positive impact on output dynamically. Finally, the response of interest rate to rise in public tax revenue is near neutral initially and becomes negative in long-term.

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LIST OF ACRONYMS

GDP: Gross Domestic Product

GNP: Gross National Product

SVAR: Structural Vector Auto Regressive

OLS: Ordinary Least Square

AIC: Akaike Information Criteria

SIC: Schwarz information criterion

HQ: Hannan-Quinn

LR: Likelihood ratio

ADF: Augmented Dickey Fuller test

LLC: Levin, Lin and Chu Test

IPS: Im, Pesaran, Shin Test

RBC: Real Business Cycle

NK: New-Keynesian

US: United States

OECD: Organization for Economic Co-operation and Development

DSGE: Dynamic Stochastic General Equilibrium

SAARC: South Asian Association for Regional Cooperation

CHAPTER I

INTRODUCTION

The role of fiscal policy to stabilize the economy and stimulate the economic activity has been a debatable issue among the scholars and policy makers since the evolution of macroeconomics. Scholars from Classical school of thought, the advocates of the of Laissez-faire[1] economy are of the view that markets perform efficiently when they are left alone to work, as the price mechanism acts as a powerful invisible hand to distribute resources to their most competitive ends also the self-motivated actions of individuals will lead the economy towards its natural equilibrium hence discretionary fiscal stimulus does not enhances output; rather some of the scholars even suggested that there exists a strong negative relationship between increased government spending and output growth (Landau, 1986; Engen and Skinner, 1992). Also the extended Classical Real Business model claims that increased government spending through negative wealth effect causes a decrease in consumption (Baxter and King, 1993).

However, Scholars from Keynesian school of thought argue that government play a key role in economic progress by providing public goods, boosting private investment and provide a socially optimal path for positive economic growth through increased government spending (Ram, 1986). In their standard IS-LM framework it is argued that the government expenditure shock induces a rise in aggregate demand in the economy hence increasing economic activity causing a crowding-in or multiplier effect; and the effect on interest rate is positive which causes private investment to crowd-out. The ultimate effect of an expansion results into an increment in consumption, total investment and output in the economy (Hebous, 2009).

[1] The doctrine which claims that there should be no government intervention and the economic system should be driven by the market forces only.

Fiscal policy can be expansionary or contractionary depending upon the prevailing economic conditions and the stage of business cycle. The variation in economic activity or output is either recession, recovery or a boom and this variation in economic activity is often called Business cycle. During recession economic activity falls and induces a decline in employment opportunities and also create gap between actual and potential output in the economy. In order to manage the fluctuations in business cycle and to minimize the output gap, monetary and fiscal policies have been extensively used over the time. Conventional Keynesian models suggest that fiscal policy should be counter cyclical; expansionary through recession while contractionary during boom. For Pakistan, Khalid *et al.* (2007) found pro-cyclical reaction of fiscal policy towards fluctuations in business cycle and suggested that the reaction is more in boom.

After recent persistent recession across the globe, many governments in North America, Europe and Asia have put forward plans of massive fiscal stimulus, which is usually defined as debt-financed consumer-oriented tax cuts and significant rise in fiscal expenditure to stimulate aggregate demand (Foster, 2009). As developed economies automatic stabilizers like progressive taxes in high economic activity regime and social safety nets or transfer payments in recession can act in a way to mitigate the fluctuations in economic activity. But, contrary to developed economies, the countries in South Asia lack automatic stabilizers or social safety nets that reduce the adversarial effects in economic slowdowns. Hence, South Asian policy makers have to find a way that how they can use discretionary fiscal measures in order to increase aggregate demand while ensuring economic growth, consistent with medium-term macroeconomic stability.[2]

[2] Ghani, (2009) "South Asia: Is There a Need for Counter-cyclical Fiscal Policy?" World Bank June 9, 2009

The key purpose of fiscal policy in South Asia was to increase economic growth meanwhile ensuring macroeconomic stability. Governments in South Asia have put forward plans of fiscal stimulus in order to stimulate economic activity in their respective countries. The central government expenditures as percentage of GDP in South Asia have been raised from 14 percent in 2002 to 27.7 percent in 2016. South Asia remains the fastest growing region in the world, with an economic growth forecasted to progressively accelerate from 7.1 percent in 2016 to 7.3 percent in 2017.[3] This significant growth in the region is primarily explained by thriving economic growth in India as it represents 82 percent of South Asian aggregate GDP. Pakistan, Bangladesh and Sri Lanka are the major contributors in regions GDP after India and these economies have also been experiencing economic improvements in recent years as a result of prudent fiscal policies.

As there exists disparity between different schools of thought regarding fiscal policy's effectiveness, the need for empirical evidence to clarify the issue stimulated a large body of new research. The empirical literature on fiscal policy can be classified into three groups. First, a cluster of economists concentrated solely on fiscal consolidations, to analyze the macroeconomic effect of huge cutbacks in the budget deficit.[4] The second group of researchers investigated the stabilizing competency of variables of fiscal policy.[5] Lastly, the dynamic effects of discretionary fiscal policy on various macroeconomic variables have been restored inside the framework of vector auto regressions in the work of Blanchard and Perotti (2002). This study focuses on this last aspect of research to estimate the dynamic effects of discretionary fiscal policy shocks in case of selected South Asian countries using structural panel VAR model.

[3] Asian development outlook by Asian Development Bank 2007-17

[4] See for example, Bertola and Drazen (1991), Giavazzi and Pagano (1990), or Perotti and Alesina (1995)

[5] This classification consists of papers on fiscal federalism along with provision of insurance by the tax and transfer system e.g. Sorensen, Yosha and Asdrubali (1996), von Hagen (1995).

1.1 Research Question

To analyze that how fiscal spending shock effects other macroeconomic variables contemporaneously and dynamically by employing Blanchard and Perotti (2002) identification scheme in structural vector autoregressive *(*SVAR) model by taking the panel data for selected South-Asian countries for the time period of 1990 to 2015.

1.2 Objectives of the Study

Following are the two main objectives of the study:

1. To estimate dynamic effects of fiscal spending shock on key macroeconomic variables in selected South-Asian countries.
2. To compare our empirical findings to the predictions of the Real Business Cycle model and also to the predictions of New-Keynesian model.

1.3 Hypothesis of the Study

Fiscal policy has positive and long lasting effects on macroeconomic variables; output, inflation and interest rate.

1.4 Significance of the Study

South Asia occupies only 3.4 percent of the world's total land area and is home to nearly one fourth of world's total population making it the most densely populated place on earth.[6] Though the region is included in the bracket of economically developing countries but in recent years the region has shown a significant improvement in its economic indicators. Despite slowdown in global economic growth South Asian regions GDP has grown at an average growth rate of 7.5 percent per year since 2003. Also South Asia is economically the world's fastest

[6] "Database profile on macroeconomic and HRD Indicators in the SAARC Region", 2008

growing region since April, 2015 and still region is expected to grow at a rate of 7.3 percent in 2018.[7] As fiscal policy plays a significant role in developed as well as developing countries, while hoping that fiscal spending shock will enhance economic activity in the country the countries in South Asia have increased their public spending over the time. The central government expenditures as percentage of GDP in South Asia have been increased from 14 percent in 2002 to 27.7 percent in 2016.[8] Therefore, it is important to investigate that how much the increase in public spending has contributed towards the significant economic growth of the region.

1.5 Plan of the Study

The study consists of six chapters. Chapter one contains the introduction of the topic along with the objectives and significance of the study. In second chapter fiscal policy in South Asia has been discussed in detail. Third chapter explains the existing theoretical as well as empirical literature on macroeconomic effects of fiscal policy. Chapter four comprises of methodological structure, estimation technique, and description of variables and data sources. Chapter five contains the estimated results along with their interpretations. Finally, sixth chapter contains the conclusion and policy recommendations. The robustness of the study is also presented in appendix (A).

[7] "Asian development outlook" by Asian Development Bank 2007-17
[8] "Asian development outlook" by Asian Development Bank 2007-17

CHAPTER II

FISCAL POLICY IN SOUTH ASIA

According to Samuelson (1982)

"Fiscal policy is concerned with all those measures which are adopted by government to collect the revenue and to make expenditure in such a way to attain macroeconomic stability leaving inflation to be unchanged".

2.1 The Rise and Fall of Fiscal Activism

After the great depression in 1930s, the unemployment remained quite high. The unemployment remained at two-digit level until 1941. The start of World War II and the lend lease program urged the government to start massive military spending stimulus. Economists at that time perceived the favorable effect of government spending on unemployment as an example of the power of Keynesian fiscal policy. But after the war, empirical research pointed that the Keynesian multipliers were smaller than the prediction of previous analysis. The reason was attributed to the crowding out of investment due to rise in interest rate which increased because of the rise in demand for money. It also had long term implications for national debt. Furthermore, the multiplier reduced due to the reduction of demand through imports along with the effect of fiscal expansion on exchange rate. The focus of counter cyclical policy shifted from fiscal policy to monetary policy due to the failure of Keynesian fiscal strategy in 1960s when simultaneous rise in unemployment and inflation was observed (Feldstein, 2009).

So economists came to the conclusion that monetary policy could be adjusted quickly and it could be effective in moderating aggregate demand through multiple channels. Low inflation rate and decreased cyclical volatility in the 1980s justified relying on monetary policy. But the

fall of 2007 was different from previous crises because previous economic crises originated after the central bank had raised interest rates sharply and recovery was possible by lowering the interest rates. But the financial crises of 2007 originated because of sharp decline in interest rates and reversal of policy was not enough in order to recover the economy. The huge number of mortgage defaults resulted in decline of mortgage securities like homes and this immense destruction of household wealth directed to a severe decline in consumer spending. At the same time fall in business investment and commercial real estate values contributed further to the crises. Hence in order to start recovery and inducing a rise in aggregate demand government decided to use fiscal policy as a tool by decreasing taxes (Feldstein, 2009).

Fiscal policy is also useful for two reasons. One reason is that the interest rate had already hit the zero lower bound and more decrease in interest rate was not possible. So, fiscal policy was the only way to initiate recovery. Secondly even though there are conventional lags in implementation of fiscal stimulus, it could give positive results and stabilize the economy because economy was expected to have long lasting recessionary phases (Hayat and Qadeer, 2016).

2.2 Fiscal Policy in South Asia

Fiscal policy can play an important role in economic growth of a country. Like many other developed and developing economies, fiscal policy plays multiple key roles in the economies of South-Asian countries which includes; stabilization of national income and output, redistribution of income and resources while ensuring efficiency in production and trade of goods and services, financing of current and development budget expenditure of the government, mobilization of resources in order to finance those expenditures, and finally the role of the fiscal policy is to sustain the gap between revenue and expenditures in such a way that the debt to GDP

ratio does not goes beyond the prescribed limits and also that the debt is serviced efficiently. In the short run, during cyclical downturns the counter-cyclical fiscal expansion has the tendency to boost aggregate demand and similarly, fiscal contraction can be used to aggravate an economy which is growing at an unsustainable rate. In the past, advanced economies have used government spending and taxes in order to smooth the fluctuations in business-cycle (Jha, 2010).

Similarly, fiscal policy affects medium-term and long-term economic growth and this is right in the case of developing economies. In most of the developing economies private sector happens to be comparatively weak. Public expenditure on physical infrastructure has effects on the productivity of firms and industries, and therefore the economy. Contrary to that, taxes affect growth negatively because they distort the economic incentives and behaviors. Fiscal policy can affect both the short-run and long-run growth in Developing Asia but use of counter-cyclical fiscal policy is limited compared to advanced economies (Abdon *et al.,* 2014). On the other hand, during 2008 financial crisis, governments in developing Asia released huge fiscal impetus programs that helped out the region hold off recession. Therefore in 2008–09 global financial crises, South Asia has survived much better than the expected. The decline in growth of regional GDP in developing Asia was least prominent compared to the decline of 13% in Europe, 5% in East Asia and 8% in Latin America (Dasgupta *et al*., 2010).

2.2.1 Revenue Profile of South Asian Countries

Given the extensive responsibilities lied down in fiscal policy it is important to note that the resources available for fiscal policy are relatively insufficient in South Asian countries in particular and developing countries in general as compared to the developed countries. There are multiple reasons for this lackluster performance in revenue mobilization sector of the region. Firstly, the large proportion of the South Asian economies is undocumented and informal; hence

that huge part of the economy cannot be taxed directly, therefore in total tax revenue the share of indirect taxes is higher than direct taxes as the convenience (in the sense of being easy to tax) rather than efficiency concerns often guide the tax decisions.. Secondly, the extensive tax exemptions and concessions, narrow tax base, hurdles in revenue administration, and little taxpayer compliance and underreporting of formal earning results in extensive loss of tax revenue comparative to the country's tax potential. Though many developing countries fight with similar challenges in their respective economies, the situation in Pakistan is more complex due fragmentation in revenue administration. Finally, the huge subsidies provided on goods and services and massive losses in public sector enterprises financed by the public sector further reduces the avenues where these economies can create a better fiscal space.[9]

An OECD (2012) report stated that, taxation plays a key part in promoting sustainable economic growth and decline in poverty as in developing countries it provides predictable and stable fiscal atmosphere to stimulate growth and in financing their social and physical infrastructural requirements. Along with economic growth, it decreases long-run dependence on aid and guarantees good governance by encouraging the accountability. Global experience institutes that in order to effectively implement its development and public expenditure strategies a country needs to mobilize its tax revenues. Certainly, it is argued that in order to fulfill one of the key conditions to become a developed economy a country should be able to collect taxes between 25% and 35% of its GDP. As, Kaldor (1963) claims that, the developed countries collect taxes 25% to 30% of their GNP, while the underdeveloped economies usually collect only 8% to 15. Similarly, Martin and Lewis (1956) proposed that to provide a not better than average standard of services an under-developed economy should be able to raise the revenue of near 17% to 19% of GNP. Yet, at present countries in South Asia are far from this aim.

[9] "Unlocking Pakistan's revenue potential" by Cevik IMF, 2016.

In 2011 in Asia and the Pacific region, only seven developing countries in the region collected tax revenues more than 20% of GDP, of which four were resource-rich. In contrast, tax-to-GDP ratios were close to, or in, single-digit levels in several other countries like in Afghanistan, Bangladesh and Pakistan the magnitudes were close to, or at, single-digit levels. The total government revenue and it division in tax and non-tax revenues for South Asian countries is depicted in table 2.1 below

Table 2. 1: Revenues in South Asian Countries (As percentage of GDP)

Country	Total Revenue		Tax Revenue		Non-Tax Revenue	
	2000	2016	2000	2016	2000	2016
Pakistan	13.4	15.3	10.6	12.6	2.8	2.7
India	9.5	9.8	6.3	7.2	1.7	2.6
Bangladesh	8.5	10	6.8	8.8	1.7	1.2
Sri Lanka	16.4	14	14.2	11.9	2.2	2.1

Source: "Key Indicators for Asia and the Pacific", Asian Development Bank", 2017

There is marginal improvement in tax-to-GDP ratio in South Asian countries. In Pakistan, tax-to-GDP ratio increased from 10.6 percent in 2000 to only 12.6 percent in 2016, showing an improvement of two percentage points. The situation in other countries is also not very much different; the improvement in India is of 0.9 percentage points, in Bangladesh its two percentage points, while in Sri Lanka the situation is more worse as the ratio has deteriorated with a decrease of 2.1 percentage points. In terms of tax-to-GDP ratio South Asian economies are far behind as compared to developed economies e.g. in 2016 the tax-to-GDP ratio in New Zealand was 35.5 percent.[10] There are certain reasons for these low tax-to-GDP ratios in developing countries. Some of these common reasons of low tax-to-GDP ratios include; low GDP per capita hence lesser chances of getting more taxes on individuals incomes, large agriculture and informal sector of the economy, existence of non-monetized sector, low tax base and existence of enormous tax exemptions and concessions, tax rates are generally high which increases the

[10] "Key Indicators for Asia and the Pacific", Asian Development Bank", 2017

chances of tax evasion and tax avoidance, inefficient tax system and finally the lack of good governance.[11]

2.2.1 Expenditure Profile of South Asian Countries

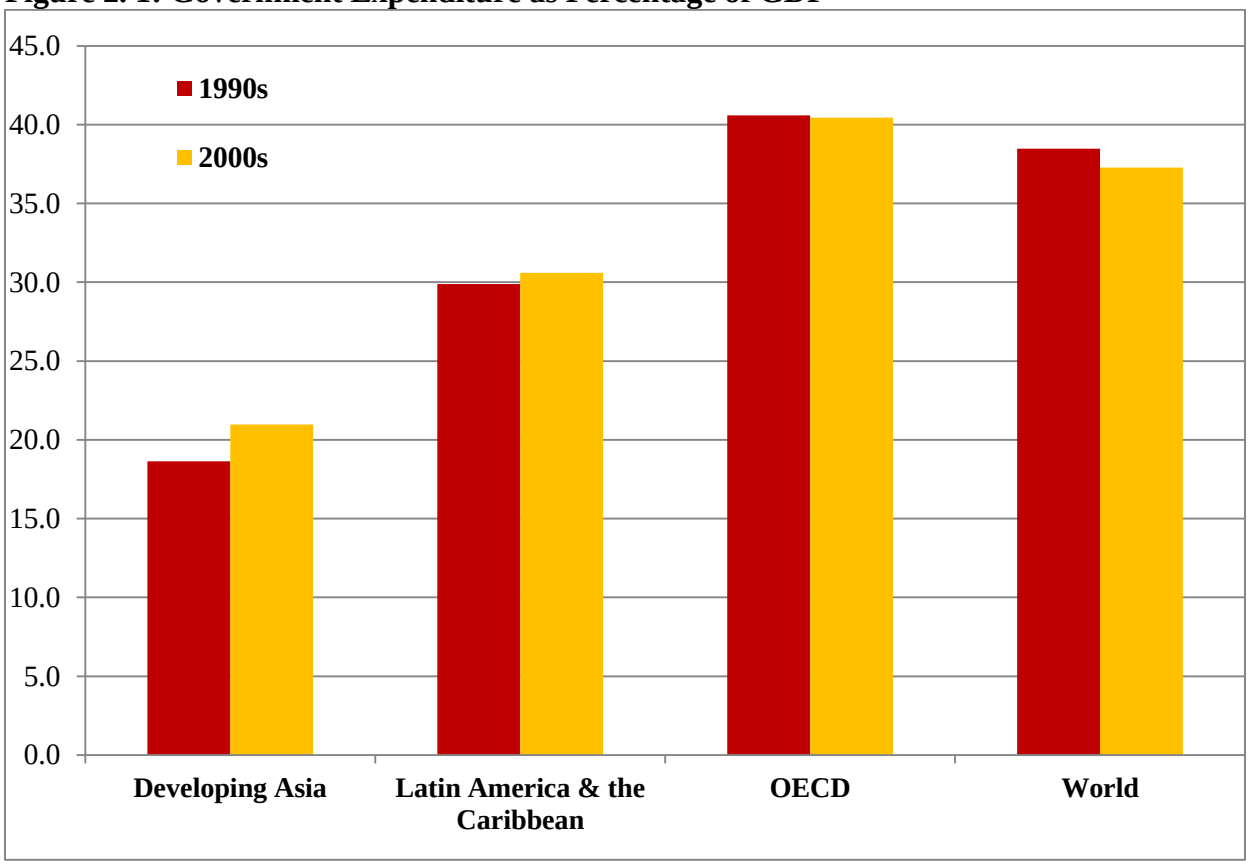
Fiscal policy consists of public expenditure packages and how the revenue is safeguarded to finance them. We can divide public expenditures in two main categories. First are the current expenditures that pay for regular costs such as salaries for police, teachers, and other civil servants and second are the capital expenditures which include the investments to finance the construction of new roads, ports or other projects. Keynesian school of thought is of the view that government plays a key role in economic progress by providing public goods, boosting private investment and provides a socially optimal path for positive economic growth through increased government spending (Ram, 1986). In their standard IS-LM framework it is argued that the government expenditure shock induces a rise in aggregate demand in the economy hence increasing economic activity causing a so called crowding-in or multiplier effect. There is another law of public expenditures known as Wagner's Law (1893) which works against Keynesian theory. The law postulates that there is a long-run inclination for the public sector to grow comparative to national income. Musgrave (1969) interpreted Wagner's Law of increasing state activity in following way; As advanced countries industrialize, the share of public sector in their national economy grows persistently. The rise in Government expenditure is essential because of three main reasons. Wagner himself identified these reasons as: i) Social activities of the state; the state social functions expand over time like retirement insurance, unemployment allowances, transfer payments etc. ii) Administrative and protective actions; modernization and industrialization would lead to substitution of public to private activity and in this multifaceted

[11] "Economic and Social Survey of Asia and Pacific", UNESCAP, 2014

society the requirement for public protective as well as regulative activity would grow. iii) Welfare functions; the growth in real income would facilitate rise in welfare expenditure, education and health in particular.

Governments often try to stimulate economic growth through different tools. Public expenditure has conventionally been an instrument of the State to influence the economic growth. The size of the public sector plays a key role in determining the state of an economy. Governments with large public sector are endowed with more fiscal space and can look for the avenues where they can invest to make it contributor towards national income but governments of Asia in general and of South Asia in particular are lagging far behind in terms of their public expenditure-to-GDP ratios. The size of the public sector depends upon the sources of revenues as the expenditures made by the governments are to be financed by those revenues. These revenues can be classified into tax and non-tax revenues. Tax revenues in general are considered to be the major contributor in total government revenues. But we have seen that tax revenue as percentage of GDP are close to single digit levels which is the major reason for smaller size of public sectors in South Asian economies. Government expenditures as percentage of GDP in developing Asia are lesser by international standards and even much less than in the progressive countries, Latin America or the world at large which can be seen in graph 2.1.

Figure 2. 1: Government Expenditure as Percentage of GDP



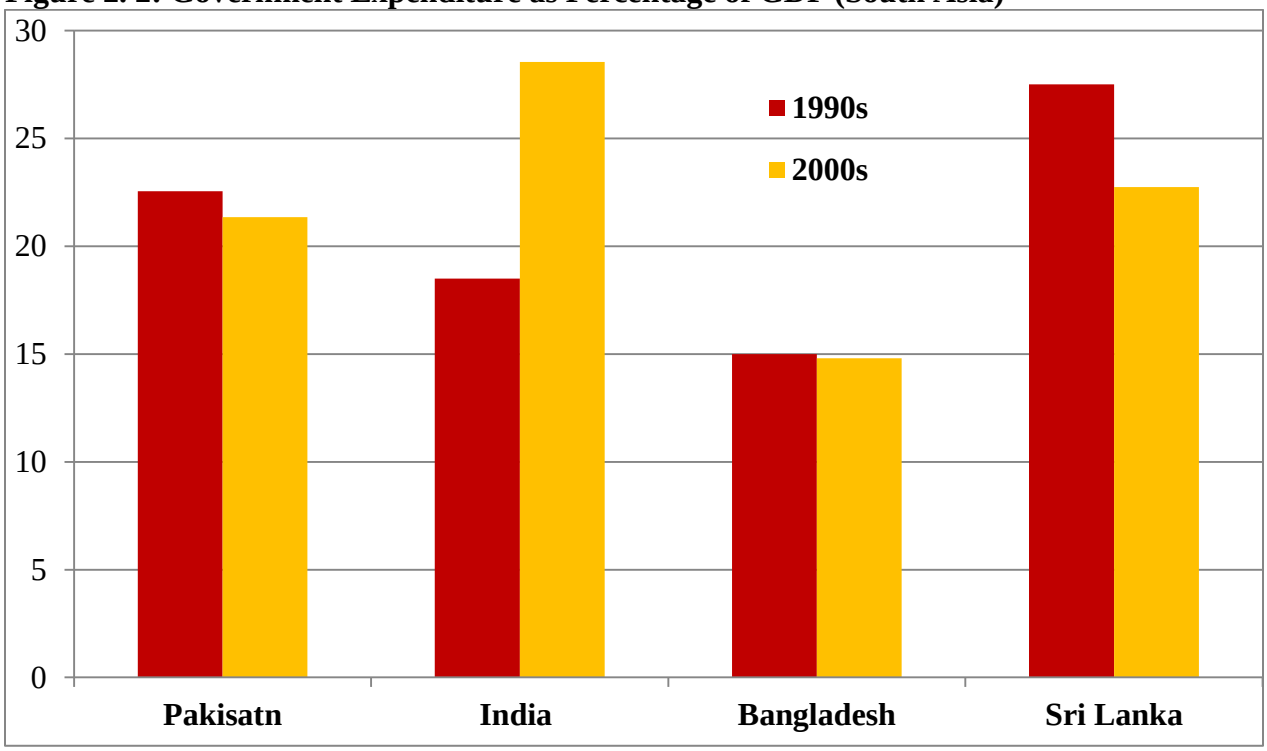
OECD = Organization for Economic Co-operation and Development.
Source: ADB estimates based on IMF, World Economic Outlook Database, October 2013

Government expenditure in developing Asia is lesser than worldwide criterions. Public Expenditure are much less in Asia as compared to OECD advanced economies, Latin America (which is comparable with developing Asia in terms of development and income), or the world as a whole (Figure 2.1). Somewhat, this simplification replicates the region's strong custom of fiscal prudence, as Asian governments have, generally, survived inside their means and avoided unsustainable fiscal expansion. The countries in Asia are therefore left with smaller fiscal space and lesser opportunities to use fiscal instruments in to stimulate the economic activity. The fiscal policy's role in Asia has been to nurture economic growth by ensuring macroeconomic stability and growth conducive investment in education and physical infrastructure.[12].

[12] "Asian Development Outlook" by Asian Development Bank, 2014.

The expenditure profile of developing Asia has been discussed in general and in particular the situation in South Asian economies is not very much different. Though over the time government expenditures as percentage of GDP have been increased in South Asian countries but still they are not able to meet the standard expenditure to GDP ratio of developed OECD economies. In fact they are much less than the standard criterion as depicted in figure 2.2.

Figure 2. 2: Government Expenditure as Percentage of GDP (South Asia)



Source: "Asian Development Outlook" by Asian Development Bank, 1995-2013.

Government expenditures as percentage of GDP in selected four South Asian economies show that in 1990s on average the expenditure to GDP ratios in three countries Pakistan, Bangladesh and Sri Lanka was more as compared to expenditure to GDP ratio in 2000s except India, which has remarkably increased its spending over the time. The reason for this marginal decrease in expenditure to GDP ratio in three of the economies is that since 2002 these economies are experiencing high economic growth but their expenditure did not increased the same way due to problems in resource mobilization and prudent fiscal policies. Though relative

share of expenditures have decreased in these countries but the absolute share of expenditure has increased enormously. The highest expenditure to GDP ratio in 2016 in the region is 27.9 in India in 2016 followed by Sri Lanka and Pakistan 19.7 and 19.6 respectively. There is strong need that governments in South Asia should look for the avenues where they can mobilize resources to attain standard expenditure to GDP ratio in order to meet the criterion of being a developed country.

CHAPTER III

LITERATURE REVIEW

A body of theoretical as well as empirical literature exists regarding the issue, that whether fiscal spending are able to enhance economic activity or not. Despite this, both in short and long-run there exists no agreement on the effects of government expenditure on macroeconomic variables neither from an empirical nor from theoretical perspective (Furceri and Sousa, 2011). The lack of consensus among economists led the issue towards the emergence of different school of thoughts regarding the role of fiscal spending's to enhance economic activity. How the consumer will behave in response to changes in government spending is the possible reason for the disparity (Javid and Arif, 2009). The first part of this chapter contains the theoretical review and second part contains review of empirical studies and this second part is further divided into two sections; one section reviews time series data studies while the other reviews panel data studies.

3.1 Theoretical Review

Regarding the effectiveness of fiscal policy economic theory has offered different predictions depending upon the characteristics of the economy being considered. In Classical model where wages and prices are full elastic and the supply curve is vertical, the change in fiscal policy is internalized in a way that fiscal policy's role becomes redundant. The Classical school of thought was of the view that markets perform efficiently when they are left alone to work, as the price mechanism works as a powerful invisible hand to distribute means to their most competitive ends also the self-motivated actions of individuals will lead the economy towards its natural equilibrium. If the gap between potential and actual output exists it will disappear by the automatic adjusting tendency of the economy. They were of the view that high

fiscal spending results into high interest rate and inflation and crowding out of private investment due to increased interest rate. After the great depression of 1929 Keynesians model demonstrated by IS-LM framework which assumes that prices and wages are sticky and current consumption depends upon present disposable income and there is no role of future expected income, predicted that an expansionary fiscal policy can enhance economic activity by increasing output with multiple effects. Keynesian school of thought faced criticism that they did not incorporated micro-foundations in their model. New-Classical school of thought endorsed the belief of the noninterventionist classicals by incorporating micro foundations and agents with rational expectations in their DSGE models and predicted that aggregate demand stimulus policies are only effective in short run if the policies are unanticipated. New-Classical models were extended by Christiano and Eichenbaum (1990), Baxter and King (1993) and Ohanian (1997) to Real Business Cycle models, which assume perfect competition and flexible prices and that the fluctuations in business-cycle to a large extent are explained by real shocks for instance technology and preferences. They found that in a small open economy, there is a minor role of fiscal shock in explaining output volatility (Cardia, 1991). Therefore, they believe that governments should focus on long-run structural policy changes and should not intervene through discretionary monetary or fiscal policy (Abel and Bernanke, 2003).

The DSGE framework by RBC later on adopted by Neo-Keynesians to derive micro-founded aggregate relations but assumed monopolistic competition and rigidities in wages and prices because of efficiency wages, insider-outsider model Assar and Snower (1984), menu costs Blanchard and Kiyotaki (1987) and bounded rationality, concluded that full level of employment may not be achieved in the economy. Which provided a rationale for government to intervene, that can generate a more efficient result as compared to laissez faire policy. The predictions of

standard Neo-Keynesian model are generally similar to prediction of RBC model; a rise in output and a decline in consumption (Rotemberg and Woodford, 1992; Linnenmann and Schabert, 2003). The decrease in consumption is because of negative wealth effect generated by fiscal expansion which results due to forward looking behavior of rational individuals considered in both type of models.

3.2 Empirical Review

A vast body of literature exists in which the relationship between government spending and macroeconomic variables like output, inflation, consumption and interest rate have been gauged. The studies are carried out by employing different techniques using time series or panel data for different regions and countries, like in theoretical perspective the disparity exist in empirical studies as well. The difference in results might be due to difference in regional dynamics, data or the methodology used to evaluate the relationship. The empirical review section is divided into two subsections: the first section includes the studies which have used time series data and the second section includes the studies which have used panel data in their analysis.

3.2.1 Empirical Review of Time Series Data Studies

The role of fiscal and monetary policy in macroeconomic stability of a country has been a widely debated issue among the economists. Regarding the effects of fiscal policy on macroeconomic variables the pioneered work done by Hall (1980), Barro (1981), Aschauer and Greenwood (1985) in which they developed a Neo-Classical framework and argued that changes in aggregate government consumption can significantly alter aggregate economic activity. These models revealed that government expenditures expansion yields a negative wealth effect for household which causes reduction in consumption and increase in the labor supply. Also the rise

in labor supply causes real wage to fall and interest rate to increase. The Neo-Classical growth model were further protracted later on by Aiyagari, Christiano and Eichenbaum (1992) and Baxter and King (1993) and found that the effect on output, interest and employment of a persevering change in government consumption go beyond that of a transitory change. By introducing market imperfections, monopolistic and oligopolistic completion as well as increasing return to scale Rotemberg and Woodford (1992) and Devereux *et al*., (1996) claimed that the government spending shock increase demand of goods which in turn increases demand for labor and hence real wages. The government spending has positive impact on output however taxes have adverse effects on investment spending (Rotemberg and Woodford, 1992). The New-Keynesian model was extended by Gali *et al*., (2007) by incorporating consumers having consumption equal to their labor income and they don't reduce their consumption in reaction to a positive government spending shock. A positive government expenditure shock can enhance productivity, consumption and wages. Boskin (1988) found that fiscal policy has more effect on good and services than that of private sector. His literature suggested that the spending by the government have positive effect on output however the decrease in taxes has strong negative effect on investment spending (Rotemberg and Woodford, 1992).

While investigating that whether fiscal policy changes can have non-Keynesian effects in case of Sweden Giavazzi and Pagano (1995) by applying OLS on Swedish data analyzed that fiscal policy changes –both contraction and expansion- can have non-Keynesian effects if they are sufficiently large and protracted and these effects can result not only from public sector consumption but also from changes government taxes and transfer schemes. The observed non-Keynesian effects they observed were that in response to decrease in net taxes the private domestic demand fell dramatically and the fiscal expansion might have actually depressed the

private consumption. Ramey and Shapiro (1997) accounting for the compositional effects of government spending demonstrated that effect on output may be magnified, interest rate may fall, consumption and employment may rise. By adopting the extended version of Ramey-Shapiro (1997) approach Edelberg *et al*., (1999) investigated the consequences of an exogenous shock in US government expenditures. Their main findings were that in reaction to expansionary government spending shock the total government consumptions, employment, output and nonresidential spending increase while real wages, residential investment may decrease (Ramey and Shapiro, 1997).

In general equilibrium framework of fiscal policy Weber (1999) estimated the long run fiscal multiplier by applying cointegression and error correction model on US economy data and his results validated the predictions of the general equilibrium model of fiscal policy that if resource input don't respond to changes in government spending which is possible in short run the multiplier will be less than one and if resource inputs respond to changes in government spending which is possible in long run the multiplier will be greater than one (Baxter and King, 1993). The dynamic effects of fiscal policy shocks were gauged by using OLS and different other mathematical techniques like general equilibrium model of fiscal policy shock. Blanchard and Perotti (2002) were among the pioneer analysts to employ the vector auto regression identification approach, which previously was casted-off to find the effects of monetary policy shock. By using quarterly data of US postwar era they analyzed the dynamic effects of government spending shock on economic movement. Consistent with the slandered wisdom they found that when government expenditure is raised the output rises, when taxes raise the output falls. Regarding the effects on other macroeconomic variables they found that following a

spending shock private consumption increases, private investment is crowded-out to a significant extent and imports and exports fall.

In order to study the impact of fiscal policy shock Fatas and Mihov (2001) investigated the effects of a fiscal policy shock on macroeconomic variables and compared their findings with the estimates of the real business cycle model. By using the Blanchard and Perotti (1999) vector auto regression identification on US data found that the increase in government expenditure are expansionary with a multiplier greater than one, i.e. that increase in output is more than the increase in spending and this increase in output is primarily driven by increase in private consumption. Their findings also demonstrate that in response to a spending shock there is not significant impact on investment. The macroeconomic effects of a fiscal policy shock depend upon number of assumptions so different empirical findings present different results like in their analysis Fatas and Mihov (2001) found some contradictory results when compared to the forecasts of the RBC model and the larger discrepancy they found between the model and their empirical results was response of consumption. Similarly, the real business model predicts positive impact on employment due to increase in spending but empirical finding witnessed the opposite. Therefore, they suggested that modifications in the real business cycle models are essential if someone wants to bring the model to the reality.

A body of diversified literature has been developed over the time and assumptions play a key role like Linnenmann and Andreas (2003) in environment of sticky prices investigated the effects of fiscal policy and demonstrated that output, employment, real wage and private consumption rise but only for a limited number of periods following the shock. They concluded that even if there are sticky prices and monetary authority which targets interest rates, fiscal policy has no aggregate demand effect in their model. Mountford and Uhlig (2009) tried to

address the question that whether fiscal spending is effective if they financed through government debt, through deficit tax-cut financing or by balanced budget spending by increasing taxes. In order to serve the purpose they applied vector autoregressive model on US quarterly data. They come up with the results that any of the adopted policy option for fiscal spending shock has a crowding-out effects for investment. The decrease in tax rate does not cause crowding-out due to interest rate. Their key conclusion is that the finest fiscal policy to fuel the economy is an unanticipated deficit financed tax-cut policy. In case of Spain, Castro and Cos (2007) reported that although there is positive correlation between government spending and output in short-term, but in medium-term and long-term the expansionary fiscal spending shock only results in lower output and higher inflation.

Like many other developing countries Pakistan is facing huge budget deficit for years, aggregate expenditure made by the government might lead toward demand pull inflation which is a fiscal driven monetary phenomenon (Rozina and Paul, 2010). Fiscal policy in Pakistan has dynamic effects on macroeconomic variables, in reply to shock in government spending the consumption and output responds negatively, the real exchange rate tend to appreciate (javid and Arif, 2009; Memon and Niaz, 2014). The role public investment to enhance output which ultimately is going to be translated into economic growth has been explored by Ghani and Din (2007) and their findings suggest that the growth in output is largely motivated by private investment rather than public investment. Public investment has a negative however insignificant impact on output. The detrimental consequences of the public investment might be because of misallocation of resources to unproductive capital expenses at the expense of current expenditure (Devarajan *et al.,* 1996).

The government spending shocks have positive impact on inflation and interest rate (Javid and Arif, 2009; Shahen and Turner, 2010; Memon and Niaz, 2014; Rehman *et al*., 2015). As Pakistan is running budget deficit therefore in order to finance its spending government must take loans and to repay these loans government will have to increase taxes which leads to rise in inflation in the country (Rehman *et al*., 2015). As interest rate rises in face of expansionary fiscal policy it causes the private investment to crowd out Ghani and Din (2007), and this crowding out is reinforced by the growing risk of default or growing inflation risk due to accumulation of debt by the government (Javid and Arif, 2009). The current or non-development expenditure like defense expenditure and debt servicing supports the crowding out prediction of classicals; however the development spending like infrastructure, education, health and social welfare programs validates the crowding in hypothesis of Keynesians (Hussain *et al*,. 2009). The standard neoclassical model predicts that in response to fiscal expenditure shock the output responds negatively and the prediction of their model holds in case of Pakistan (Javid and arif, 2009; Memon and Niaz, 2014). But, contrary to the results predicted by the neoclassical model Shaheen and Turner (2010) found that that government expenditure shocks have positive impact and output in case of Pakistan (Rehman *et al*., 2015).

3.2.2 Empirical Review of Panel Data Studies

As, the question of concern for the study is to analyze the dynamic effects of fiscal spending on macroeconomic variables, the results vary across countries in time series analysis may be due to different circumstances, characteristics and choice of different policy option as per requirement of the country. So there is need to evaluate the effectiveness of the policy by taking panel of countries. Using the economic theories of growth Solow (1956) Cass and Coopsman (1965) Romer (1990) as guide Barro (1991) gauged some empirical some empirical regularities

of growth by using cross section of 98 countries. The major results of the study were that the consumption made by the government creates distortions like high level of taxes and output growth is negatively associated with the share of government consumption in GDP. It predicts that negative impact on economic growth is expected in countries in which the size of the government sector is beyond certain benchmark (Slemrod *et al*., 1995). By taking the data of 43 developing economies over 20 years Devarajan *et al*. (1996) derived a condition in which a change in the structure of public expenditure leads towards higher steady state growth of the output in the economy. They found that a rise in share of current expenditure made by the governments have significant impact on economic growth.

In order to identify the association between government size and growth in output Folster and Henrekson (2006) using the sample of rich countries found that there is inverse connection between economic growth and public expenditure in rich countries. An increase in the government expenditure by 10 percentage point induces a decrease in economic growth by 0.7-0.8 percentage point. When they extended the sample of rich countries to non-OCED countries the results were not different, the association between public expenditures and economic growth was negative. Agel *et al*. (2006) crirticised the work done by Folster and Henrekson (2006) by claiming that their regressions are flawed because they failed to control for the simultaneity in valid manners, so by incorporating the factors of the criticism in their model the results they were almost similar the Folster and Henrekson (2006) that if there is an increase in the government expenditure by 10 percentage points it induces a fall in economic growth by 1.1 percentage point.

Growth effects of a fiscal policy have extensively been discussed in literature, the empirical evidence does not fully support the prediction of any of the existing schools of thought

neither from time series data analysis nor from cross-section or panel data analysis. Apart from the growth effects, fiscal policy has effects on other macroeconomic variables which play a key role in macroeconomic stability of the country. The effects on these macroeconomic variables have been discussed for time series analysis, how these macroeconomic variables respond to fiscal policy change in case of panel data analysis; Roberto Perotti (2004) estimated these dynamic effects of fiscal spending on GDP, interest rate and inflation in five OECD countries. The main findings of the study indicate the effects of government spending shock and tax-cuts on GDP and other macroeconomic variables tend to be small, because of rise in interest rate in response to government spending shock investment declines (Furceri and Sousa, 2007) and effects on inflation are small.

How the consumer will react in response to positive government expenditure shock has important implications regarding the effectiveness of fiscal spending stimulus. Coenen and Straub (2005) examined the effects of positive spending shock in a New-Keynesian DSGE model featuring non-Ricardian household for euro area. In general, if household react in non-Ricardian fashion consumption rises, but the results revealed that chances of consumption crowding-in are fairly small. Similarly, Furceri and Sousa (2007) investigated that whether government spending has crowding-in or crowding-out effects by taking panel sample of 145 countries. Their results suggested that a positive government expenditure shock negatively effects private consumption and yields important private investment crowding-out effect. In their attempt to gauge the relationship between public spending and private investment for 14 OECD countries Argimon *et al*. (2010) findings suggest that public investment induces crowding-in effects for private investment, while government consumption causes crowding-out of private investment (Furceri and Sousa, 2007; Roberto Perotti, 2004). By employing panel cointegration

technique Pradhan (2011) inspected the nexus between government spending shock and output growth in South Asian countries and established that there exists long-run relationship between government spending and economic growth. The increased government expenditure is both cause and consequence of increased economic growth.

Expansionary fiscal policies were adopted by governments of industrialized countries after financial crisis in 2008 in order to stabilize their economies. Afonso and Sousa (2011) provided a detailed assessment of the macroeconomic effects of these fiscal policy shocks in four industrialized economies.[13] The empirical evidence suggested that in response to public spending shock the effect on GDP is positive but small, this positive spending shock also results in crowding-out effects (Roberto Perotti, 2004; Furceri and Sousa, 2007; Argimon *et al*., 2010). In order to analyze the effects of fiscal policy shock on macroeconomic variables in selected SAARC[14] countries Nawaz *et al*. (2012) tested fiscal theory of price level and found that the net results of a demand side shock, which is the result of increased government spending are that the price level rises with no change in output or real spending and fiscal theory of price level does not hold in these selected South Asian countries.

This chapter has provided an overview of theoretical as well as empirical literature concerning the macroeconomic effects of a fiscal policy shock. The results show that there exists disparity regarding the macroeconomic effects of fiscal policy shock theoretically as well as empirically. The reasons for these conflicting outcomes include difference in assumptions, methodology and finally how the consumer will behave in response to a fiscal policy shock. An extensive time series and some panel data literature have investigated the effects of fiscal policy

[13] Four economies are US, UK, Germany and Italy.
[14] *"South Asian Association for Regional Cooperation"*

shock, but to the best of my knowledge for South Asia representing one fourth of the world population and world's fastest growing region economically has received less attention in literature. Though there are some empirical studies related to panel data analysis for SAARC countries like Nawaz et al. (2012) gauged the legitimacy of fiscal theory of price level in selected SAARC countries, which deals mostly with the price dynamics of fiscal policy shock. But the panel data analysis for macroeconomic effects of fiscal policy shock needs further attention as the empirical findings are not supportive in discriminating between the Real Business Cycle model and New- Keynesian model.

CHAPTER IV

DATA AND METHODOLOGY

4.1 Background of the Methodology

The dynamic macroeconomic effects of fiscal policy can be investigated through different models that run from single equation to the system of simultaneous equations. In simultaneous equations models there exists bidirectional causality between the variables because dependent variable is treated as independent and independent variable as dependent, making the system jointly dependent. In order to avoid this joint dependency problem in simultaneous equations model one have to determine that which variable is dependent and which is independent. However, Sims (1980) rejected this concept of differentiating between variables and stressed out the necessity to model all endogenous variables together rather than equation at a time. This paved a path towards the development of vector autoregressive models commonly known as VAR models. In VAR model there is system of Equations wherein each variable is function of its own lagged values and lagged values of other included variables.

The VAR models have been somehow successful as data description tools and forecasting of variables but for structural inference and policy analysis they have been widely criticized (Cooley and Leroy, 1985) because parameters of VAR model cannot be interpreted therefore they are commonly known as “atheoratic” models. In order to overcome this problem the structural vector autoregressive or SVAR models evolved after 1986 imposed Additional identifying assumptions based on institutional knowledge and strong economic theory and other additional external constraints necessary for the structural interpretation of VAR model (Bernanke, Watson and Sims,1986). Structural VAR models are applied in order to find the average response of model variables to a given one time structural shock. The SVAR model has

been widely used in monetary policy and recently revived for fiscal policy within the framework of Blanchard and Perroti (2002). Suppose that if one wants know the effects of fiscal spending on the economy and following set of events took place that government anticipating decrease in demand increased its spending which caused budget deficit to rise and output continues to decline for some time. The wrong conclusion one can draw that public spending worked endogenously and caused output decline but this is not proper to know the effects of fiscal spending on economic activity. Actually we cannot measure the impact of monetary or fiscal policy when policy variable is reacting to movements of the other variables.in order to know the effects of fiscal policy we must identify purely exogenous policy shock to be able to trace out its dynamic effects which are shown by impulse responses.

4.2 Panel Structural Vector Autoregressive (SVAR) Model

The structural vector autoregressive (SVAR) technique has been used in this study due to following reasons. First, they have been widely used to examine the average response of model variables to a given one time structural shock through impulse response functions. Second, we can construct the forecast error variance decompositions which compute the average influence of a given structural shock to the variability of the data. Finally, they are particularly suitable for unfolding the dynamic behavior of economic and financial time series; also useful for the structural inference. We are to estimate the effects of one time unanticipated structural shock in fiscal policy on major macroeconomic variables which are output, inflation and interest rate. The fiscal policy shock can either occur due to change in net taxes or due to change in central government expenditures. The set of endogenous variables in the our structural VAR consists of final government consumption expenditure g_t, total tax revenue T_t, inflation P_t, output (GDP) Y_t and lending interest rate R_t. Annual data has been used instead of quarterly data which has a

number of advantages. First, the shocks we discover with annual data might be closer to the actual shocks, since new fiscal impulses don't usually occur quarterly but more probably in the new budget and perhaps in mid-year budgetary revisions. Furthermore, the effects of the potential expectation of fiscal policy variations should be less important, since the uncovered shocks are more likely to be actually unanticipated. Nevertheless, a given policy shock is less likely to be predicted one year before it actually takes place than one quarter before it actually takes place. Moreover, with quarterly data, it is more likely that decisions on expenditures take place in another quarter than when the actual expenses are made. This increases the chance that the identified shocks are wrongly dated. Finally, possible seasonality effects are absent from the annual data. A drawback of using annual data is that there are smaller numbers of observations available. Therefore, to get more accurate estimates, we estimate the VAR model in a panel format i.e. observations are pooled for four countries over a given sample period. But we face a new disadvantage that it requires to impose cross-country homogeneity on the relationships among the variables. Rather than assuming cross-sectional homogeneity some measure has been taken in our SVAR model in order to tackle the issue of cross-sectional heterogeneity. The simple vector autoregressive model for each cross-sectional unit 'i' can be written in functional form as

$$G_{it} = f(T_{it}, Y_{it}, P_{it}, R_{it}, G_{it-l}, T_{it-l}, Y_{it-l}, P_{it-l}, R_{it-l}) + e_{it}^{g} \quad (1)$$

$$T_{it} = f(G_{it}, Y_{it}, P_{it}, R_{it}, G_{it-l}, T_{it-l}, Y_{it-l}, P_{it-l}, R_{it-l}) + e_{it}^{t} \quad (2)$$

$$Y_{it} = f(P_{it}, G_{it}, T_{it}, R_{it}, G_{it-l}, T_{it-l}, Y_{it-l}, P_{it-l}, R_{it-l}) + e_{it}^{y} \quad (3)$$

$$P_{it} = f(R_{it}, Y_{it}, G_{it}, T_{it}, G_{it-l}, T_{it-l}, Y_{it-l}, P_{it-l}, R_{it-l}) + e_{it}^{p} \quad (4)$$

$$R_{it} = f(Y_{it}, T_{it}, P_{it}, G_{it}, G_{it-l}, T_{it-l}, Y_{it-l}, P_{it-l}, R_{it-l}) + e_{it}^{r} \quad (5)$$

Where i=1…4, as we have included four cross-sectional units in our model and *l* represents number of lags to be included in model. There is a basic difference in simple VAR

and structural VAR model which is constructed in above equations that in simple VAR model there does not exist contemporaneous relationship among variables but in structural VAR there exists contemporaneous relationship among the variables depicted by matrix A in which there are coefficients for the variables with current time period t. In vector form SVAR model in panel form can be represented as

$$AX_{it} = BX_{it-l} + \varepsilon_{it} \qquad \varepsilon_{it} \sim iid(0, \sum_{\varepsilon}) \quad \text{For each 'i'} \qquad (6)$$

$$\text{With} \qquad A = \begin{bmatrix} 1 & \alpha_{g,t} & \alpha_{g,y} & \alpha_{g,p} & \alpha_{g,r} \\ \alpha_{t,g} & 1 & \alpha_{t,y} & \alpha_{t,p} & \alpha_{t,r} \\ \alpha_{y,g} & \alpha_{y,t} & 1 & \alpha_{y,p} & \alpha_{y,r} \\ \alpha_{p,g} & \alpha_{p,t} & \alpha_{p,y} & 1 & \alpha_{p,r} \\ \alpha_{r,g} & \alpha_{r,t} & \alpha_{r,y} & \alpha_{r,p} & 1 \end{bmatrix}$$

Here $X_{it} = (G_{it}, T_{it}, Y_{it}, P_{it}, R_{it})$ is the vector of endogenous variables i.e. government expenditure, net tax revenue, output, inflation and interest rate for each cross-sectional unit 'i'. Matrix A with 1 at diagonal and non-zero elements otherwise shows the contemporaneous relationship between variables. Later on in the process of identification we are going to some restrictions based on the economic theory and will set some of its elements equal zero and will put some values i.e. elasticities. Finally, X_{t-i} represents vector X_t with l^{th} number of lags, B represents its respective matrix of coefficients and ε_{it} is vector of error terms with zero mean and constant variance and uncorrelated with each other for each unit of the cross-section and *iid* means identically and independently distributed. These error terms are actually the structural shocks for their respective variables.

In SVAR models all the included variables are normally treated as endogenous, both in dynamic and static sense but some exogenous variables can also be included in the model as Ramey and Shapiro (1998) were the pioneers to introduced dummy variable in their model. In

our model along with endogenous variable an exogenous constant term dummy is $\sum_{i=1}^{3} \beta_i D_i$ is introduced in our model for the shock of government expenditures g_t as in our discussion on fiscal policy of South Asia we have seen that there is difference in government spending and taxes as percentage of GDP in each country. As we are analyzing the effects of shock in government spending hence these shocks are different for each cross-section indicating that there exists cross-sectional heterogeneity in our panel. Also when we draw a graph of g_t series there are significant spikes from one cross-section to another indicating heterogeneity. Therefore in order to remove this problem of heterogeneity we have introduced a dummy as intercept for government spending series. We have generated three country specific dummies as first spike appears at the end of first cross-section. This dummy takes value of one where there is a significant spike in the series and zero otherwise in a specific cross-section. It is done only for a specific series because all the structural shocks are orthogonal therefore applying restrictions for just one shock can serve the purpose. Beetsma *et al.* (2011) have performed the same exercise by adding country-specific constant terms and country-specific linear time trends into the regression to deal with heterogeneity while investigating the effects of government purchases shock in a panel of European countries. We can rewrite (6) in reduced form with an addition of country-specific constant term

$$X_{it} = B_i(L)X_{it-1} + \sum_{i=1}^{3} \beta_i D_i + \mu_{it} \qquad (7)$$

Where $B_i(L)$ is an autoregressive lag polynomial, vector μ_{it} contains the reduced form residuals which will have non zero correlation for each unit of the cross-section, $\sum_{i=1}^{3} \beta_i D_i$ term is introduced to deal with cross-sectional heterogeneity by following the representation by Crichton *et al.* (2016), finally μ_{it} is vector of reduced form residuals and the structural fiscal shocks are retrieved from these residuals. Hence, to retrieve those exogenous fiscal shocks we

need to identify our model in order to estimate the dynamic effects of fiscal spending shock on macroeconomic variables.

4.2.1 Identification

As stated by Sims (1986)

> *"Identification is the interpretation of historically observed variation in data in a way that allows variations to be used to predict the consequences of an action not yet undertaken"*

So, now we find the reduced form residuals which are linear combinations of structural shocks and these structural shocks are correlated. The basic purpose of this identification process is that we transform data which correlated into uncorrelated. We make sure that the correlation between the structural shocks is zero and for that we have to impose additional identifying restrictions on reduced form model in order to get structural model parameters and structural shocks. In order to serve the purpose of identification we have two methods of imposing restrictions; one is triangular and the other is non-triangular. When we use non-triangular restrictions method we can impose restriction optionally either above or below the diagonal and we can turn coefficients into zero based on economic theory and institutional information in order to identify the model; however, when we use triangular restrictions method we replace all above or below the diagonal coefficients with zero. In this study we will use impose non-triangular restrictions that have been used by Blanchard and Perotti (2002) that are totally based on institutional information. The numbers of restrictions imposed are $\frac{n^2-n}{2}$ where n is number of variables included in VAR. In in this study as the number of variables are five we will impose $\frac{5^2-5}{2} = 10$ restrictions in order to retrieve structural parameters and shocks from reduced form VAR. Pedroni (2013) while discussing structural panel VARs also proposed that for a panel with

M variables a total of $\frac{1}{2}(M^2 - M)$ non-redundant restrictions are required in order to identify model.

The reduced form residuals μ_t^g and μ_t^t of the equations g_t and t_t can be considered as the linear combination of three constituents. First, the automatic response of government expenditure and taxes to expansion in output, prices and interest rates; for example, the unexpected changes in taxes in response to output expansion, for given tax rates. Second, the systematic discretionary response of policymakers to price, output and interest rate innovations; for example, in response to recessions the reduction in tax rates carried out systematically. Finally the third one is the discretionary random shocks to fiscal policy; these are structural fiscal shocks, which are uncorrelated with all other structural shocks unlike the reduced form residuals. This is the first part we are interested in when assessing the impulse responses to fiscal policy shocks (Perotti, 2004).

Formally, the reduced form residuals can be decomposed as

$$\mu_t^g = \alpha_{g,y}\mu_t^y + \alpha_{g,p}\mu_t^p + \alpha_{g,r}\mu_t^r + \beta_{g,t}e_t^t + e_t^g \qquad (8)$$

$$\mu_t^t = \alpha_{t,y}\mu_t^y + \alpha_{t,p}\mu_t^p + \alpha_{t,r}\mu_t^r + \beta_{t,g}e_t^g + e_t^t \qquad (9)$$

Where the coefficients α's represents the automatic and systematic discretionary response of government expenditure and taxes to expansion in output, prices and interest rates while e_t^g and e_t^t are the structural fiscal shocks of the government spending and net tax revenues and also the *cov* (e_t^g, e_t^t) = 0. We cannot estimate (8) and (9) directly with OLS because clearly there exist correlation between reduced form residuals and e_t^g and e_t^t. So we have to look for the other options as we need the values of the coefficients. In order to serve the purpose we will adopt the approach of Blanchard and Perotti (2002) by extending it to take into account the effects of

government spending and taxes on inflation and interest rate. The key to this process of identification is the observation that as, the fiscal decisions are taken annually and implemented during the whole fiscal year therefore it is impossible for the policy makers to quickly respond to the output shock in that particular quarter in which the shock is observed. Therefore, the discretionary fiscal response is absent. Consequently, the coefficients α's represent only the automatic response of macroeconomic variables to economic activity. Thus the external available information on the elasticity of spending and taxes to output, inflation and interest rate can be used in order to compute the appropriate values for coefficients α's. Hence, with these we can than compute the cyclically adjusted fiscal shocks.

Now we have to compute elasticity's based on available information and also to borrow some of the elasticity's from literature. In our definition of the expenditures and net taxes we have not included the interest payments therefore, we can set $\alpha_{g,r}$ and $\alpha_{t,r}$ = 0. Similarly, we could not find an automatic response of government spending of goods and services to output hence we can set $\alpha_{g,y}$ = 0 (Giordano *et al.*, 2007). In his work Perotti (2004) set the price elasticity of government expenditures equal to -0.5 and setting $\alpha_{g,p}$ = 0 does not disturb the results significantly. Tax buoyancy shows the increase in tax revenue due to increase in GDP growth and it includes the discretionary changes made by government in form of increase in tax rate or tax base. If we exclude the tax revenue increase due to discretionary measures we are left with tax elasticity which is just an automatic response of tax revenue to output growth. Here we are just interested in the automatic response part so we will use tax elasticity rather than tax buoyancy. For South-Asia we do not have particular figure in literature but we have tax elasticity's for each country so we can use them by taking average of elasticity's. The tax elasticity for India is 1.2 (Acharya, 2011); for Pakistan is 0.96 (Bilqees, 2004); for Nepal is 0.59

(Timsina, 2007) and for Bangladesh is 1.1 (Yousaf *et al*., 2012). As Pakistan and Bangladesh are the major contributor after India we will take $\alpha_{t,y}$ = 1.

After computing output and price elasticity's the cyclically adjusted fiscal shocks can be constructed like (Perotti, 2004).

$$\mu_t^g = \mu_t^g - \left(\alpha_{g,y}\mu_t^y + \alpha_{g,p}\mu_t^p + \alpha_{g,r}\mu_t^r\right) = \beta_{g,t}e_t^t + e_t^g \quad (8a)$$

$$\mu_t^t = \mu_t^t - \left(\alpha_{t,y}\mu_t^y + \alpha_{t,p}\mu_t^p + \alpha_{t,r}\mu_t^r\right) = \beta_{t,g}e_t^g + e_t^t \quad (9a)$$

The cyclically adjusted fiscal shocks are the linear combination of two structural fiscal policy shocks. In order to identify e_t^g and e_t^t the two structural fiscal policy shocks we will set either $\beta_{g,t}$= 0 first and then estimate $\beta_{t,g}$ or set $\beta_{t,g}$= 0 first and then estimate $\beta_{g,t}$. In public finance, governments set its expenditures first and then decide about their revenues so we will set $\beta_{g,t}$= 0 first and then estimate $\beta_{t,g}$ but the results do not vary much even if we set either of the coefficients equal to zero first. The two structural shocks e_t^g and e_t^t estimated are orthogonal to the other structural shock of the economy therefore they can be used as instrument in the remaining equation we are going to construct.

The reduced form residual for the output is assumed to be the linear combination of the shocks in government expenditure and net taxes.

$$\mu_t^y = \alpha_{y,g}\mu_t^g + \alpha_{y,t}\mu_t^t + e_t^y \quad (10)$$

Similarly, the reduced form residual for price is assumed to be the linear combination of the shocks in government expenditure, net taxes and output.

$$\mu_t^p = \alpha_{p,g}\mu_t^g + \alpha_{p,t}\mu_t^t + \alpha_{p,y}\mu_t^y + e_t^p \quad (11)$$

Finally, the reduced form residual for the interest rate is assumed to be the linear combination of the shocks in government expenditure, net taxes, output and prices.

$$\mu_t^r = \alpha_{r,g}\mu_t^g + \alpha_{r,t}\mu_t^t + \alpha_{r,y}\mu_t^y + \alpha_{r,p}\mu_t^p + e_t^r \quad (12)$$

After cyclically adjusting all the reduced form residuals we will have the structural shocks at one side and the reduced form residuals on the other side along with their coefficients.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & \alpha_{t,p} & 0 \\ \alpha_{y,g} & \alpha_{y,t} & 1 & 0 & 0 \\ \alpha_{p,g} & \alpha_{p,t} & \alpha_{p,y} & 1 & 0 \\ \alpha_{r,g} & \alpha_{r,t} & \alpha_{r,y} & \alpha_{r,p} & 1 \end{bmatrix} \begin{bmatrix} \mu_t^g \\ \mu_t^t \\ \mu_t^y \\ \mu_t^p \\ \mu_t^r \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_{t,g} & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_t^g \\ e_t^t \\ e_t^y \\ e_t^p \\ e_t^r \end{bmatrix} \quad (13)$$

We can rewrite all the equation in matrix (13) in vector form and finally we get the equation

$$\grave{\hat{\mathrm{A}}}\mu_t = B\varepsilon_t \qquad (14)$$

The matrix Â represents the coefficient's showing contemporaneous relation between variables and we get this matrix by imposing identifying restrictions and putting elasticities borrowed from literature discussed above in our initial matrix A. As we decided earlier that we will impose ten restrictions in order to identify our model; we have fulfilled that requirement by putting nine zero's and one elasticity here in matrix Â. Finally we have reduced form residuals

$$\mu_t = \grave{\hat{\mathrm{A}}}^{-1}B\varepsilon_t \qquad (15)$$

Where ε_t represents the vector of orthogonal structural shocks and B represents its respective coefficients and μ_t represents the vector of reduced form residuals. This above discussion on identification is true for each cross-sectional unit, as matrix A and Â are identical for each cross-section and a panel hence equation (15) can be represented for a panel like

$$\mu_{it} = \grave{\hat{\mathrm{A}}}^{-1}B\varepsilon_{it} \qquad (16)$$

Once we have identified the structural shocks we can construct the impulse responses using average elasticities over the considered period of time.

4.3 Data Sources

In order to investigate the dynamic effects of fiscal spending, the study has used standard set of macroeconomic variables. These variables include; final government consumption expenditure, total tax revenue, consumer price index (CPI) is used as a measure of inflation, output measured by GDP and lending interest rate. The data for these included variables has been taken from World Development Indicators (WDI) except interest rate. As the data for lending interest rate is not available in WDI for Pakistan and Sri Lanka therefore the data for lending interest rate for these two countries has been taken from International Financial Statistics (IFS). The data has been converted into log form and 2010 is taken as base year. Finally, for some descriptive analysis and to make some comparisons the data has been taken from Asian Development Outlook by Asian Development Bank (ADB) as it includes data for South-Asian region as a whole. The data has been taken for the time period of 1990 to 2015 for India, Pakistan, Bangladesh and Sri Lanka. The remaining South-Asian countries[15] have not been included in the analysis as there share in total South-Asian GDP is hardly 2 percent,[16] which is so minimal that they can be excluded from analysis.

[15] Afghanistan, Nepal, Bhutan and Maldives

[16] Calculated through International monetary Fund (IMF) official GDP figures for South-Asian countries

CHAPTER V

RESULTS AND DISCUSSION

5.1 Panel Unit Root Properties of Data

It is imperative to check that whether the variables are stationary or not because in order to estimate the structural vector autoregressive model the data of the variables should be stationary. The econometric theory for time series data allowed the number of time series observations (T) to move from $T \rightarrow \infty$ for fixed cross-section (N) in contrast to panel data in which we can have $N \rightarrow \infty$ for fixed T. The Augmented Dickey Fuller test has been widely used in order to check the existence of unit root or stationarity of data with single fixed cross-section for a given period of time or simply we can say time series data. However, the unit root test for panel data are different than ADF. The two generations of panel unit root tests have been developed over the time: the first generation test by Levin, Lin and Chu test (2002), Im, Pesaran and Shin test (2003) in which they assumed the cross-section independence over units; the second generation test in which two main approaches can be identified: the covariance restriction approach adopted especially by Chang (2002) and the billing structure approach by Bai and Ng (2004), Phillips and Sul (2003) and Pesaran (2003).

In order to find the presence of unit root in the data we will use the first generation test of Levin, Lin and Chu test (2002), Im, Pesaran, Shin test (2003). The Levin, Lin and Chu (LLC) test assume homogeneity of all single time series which means that either all the series are stationary or all the series non-stationary. Hence the null and alternate hypothesis based on the assumption can be constructed like

The Null Hypothesis is:

$$H_o : \rho_i = \rho = 0 \qquad \text{(Unit root exists in all cross-sections)}$$

Where represents the i[th] cross-section and $\rho = 0$ means that unit root exists and the data for the variable is non-stationary and when $\rho_i = \rho$ it is true for all of the cross-sections. Similarly the alternative hypothesis can be written like

The Alternative Hypothesis is:

$$H_a : \rho_i = \rho < 0 \qquad \text{(Unit root does not exists in all cross-sections)}$$

Where $\rho < 0$ means that unit root does not exist and the data for the variable is stationary and it is true for all of the cross-sections.

The Levin, Lin and Chu (LLC) test has limitation and was criticized due to its assumption of cross-section independence because it cannot be applied when cross sectional correlation is present. This limitation has been overcome by Im, Pesaran, Shin (IPS) test (2003); they suggested a panel unit root test without the identical first order correlation assumption in the alternative hypothesis. It allowed the existence of stationary and non-stationary series simultaneously which implies that ρ_i can differ between the individual cross-section. Hence the null and alternate hypothesis based on their assumption can be constructed like

The Null Hypothesis is:

$$H_o : \rho_i = 0 \quad \forall\ i \qquad \text{(Unit root exists in all cross-sections)}$$

Where $\rho_i = 0$ means that unit root exists and the data for the variable is non-stationary in all of the cross-section. Similarly the alternative hypothesis can be constructed in following way

The Alternative Hypothesis is:

$$H_a : \begin{cases} \rho_{i<0} & for\ i=1,\ldots\ldots,N_1 \\ \rho_{i=0} & for\ i=N_1+1,\ldots\ldots\ldots,N \end{cases} \qquad \text{with } 0 < N_1 \leq N$$

The alternative hypothesis depicts that unit root does not exist for some of the cross-section varying from i =1… N_1 and the data are stationary in these cross sectional units; the unit root does exist for number of cross-sections varying from N_1+1…N and data is non-stationary for these cross sectional units which means stationary and non-stationary series exist simultaneously. We will apply these two tests in order to check the stationarity of the data of included five variables; government spending, tax revenue, output, inflation and interest rate for four cross sectional units India, Pakistan, Bangladesh and Sri Lanka. The results of these two panel unit root test (LLC and IPS) are shown in table 5.1.

Table 5. 1: Results of Panel Unit Root Tests

Variables	Test Applied	Significance		Conclusion
		I (0)	I (1)	
Government Expenditure	Levin, Lin and Chu Test	0.6064	0.0012	I (1)
	Im, Pesaran, Shin Test	0.9988	0.0000	I (1)
Total Tax Revenue	Levin, Lin and Chu Test	0.2986	0.0027	I (1)
	Im, Pesaran, Shin Test	0.9790	0.0002	I (1)
Output	Levin, Lin and Chu Test	0.9992	0.0012	I (1)
	Im, Pesaran, Shin Test	1.0000	0.0033	I (1)
Inflation	Levin, Lin and Chu Test	0.5736	0.0540	I (1)
	Im, Pesaran, Shin Test	0.9984	0.0185	I (1)
Interest Rate	Levin, Lin and Chu Test	0.0411	0.0000	I (0)
	Im, Pesaran, Shin Test	0.0653	0.0000	I (1)

*At 5% level of Significance

Where, I (0) and I (1) characterize the order of integration; I(0) at level and I(1) at first difference respectively, at 5 percent level of significance. In order to check the stationarity of the data of all five variables; the government consumption expenditure, total tax revenue, inflation, output and interest rate, two tests Levin, Lin, Chu test and Im, Pesaran, Shin test have been applied to the data of all included variables. After applying these two tests the results we get are that the data for four variables; the government consumption expenditure, total tax revenue, output and inflation is non-stationary at level according to results of both tests. We accept the null hypothesis of non-stationarity at 5 percent level of significance which means that probability value or p-value is greater than 0.05. However, for interest rate according to Levin, Lin, Chu test we reject the null hypothesis of existence of unit root and conclude that data of interest rate is stationary at level at 5 percent level of significance. But according to Pesaran, Shin test if we consider 5 percent level of significance the data for interest rate is non-stationary and we accept the null hypothesis of the existence of unit root. By repeating the same exercise for all five variables at first difference it is found that the data becomes stationary for all five variables and we reject the null hypothesis of non-stationarity and conclude that data is stationary at first difference at 5 percent level of significance.

The conclusion column in table shows that we have found all five variables stationary at first difference I (1) and accept alternate hypothesis of stationarity at 5 percent significance level except for interest rate for which according to Levin, Lin, Chu test the data is stationary at level I (0). We will make this data stationary for four variables; the government consumption expenditure, total tax revenue, output and inflation and take interest data in its original form as it is stationary at level according to Levin, Lin, Chu test. It is necessary to convert the non-stationary data into stationary because if we run the VAR model with the data which is stationary

at first difference I (1) the impulse response will not tend to decay and it might diverge from the real impulse response and hence we can lose the consistency of the parameters. Hence we have taken first difference of the data in order to avoid this problem of inconsistency.

5.2 Lag Length of the Model

Given one time structural shock and to know its impacts the SVAR model has been widely used in monetary policy and recently revived for fiscal policy within the framework of Blanchard and Perotti (2002). An important component in the specification of VAR model is the determination of lag length of the model. The estimates of VAR models whose lag length differs from the actual lag length of the model are inconsistent; also the impulse response function and variance decomposition derived from those estimates becomes inconsistent (Braun and Mittnik, 1993). If the model is over fitted means that the selected lag length of the model is higher than the actual lag length induces an increase in mean square forecast errors of VAR and if it is under fitted it generates the errors which are auto correlated and residuals do not fulfill the properties of pure white noise (Lutkepohl, 1993). Also adding too many lags will consume many degrees of freedom as an extra lag adds n^2 more coefficients to be estimated. Hence it is very important to specify the number lags to be included in the model and in order to serve the purpose we use Akaike information criterion (AIC), Schwarz information criterion (SIC), Hannan-Quinn information criterion (HQ) and by the Likelihood ratio (LR) and the results have been displayed in table 5.2.

Table 5. 2: Vector Auto Regressive Lag Order Selection Criteria

Lags	Akaike information criterion (AIC)	Schwarz information criterion (SIC)	Likelihood ratio (LR)	Hannan-Quinn criterion (HQ)
0	3.813916	3.972018	NA	3.876857
1	-14.42143	-13.47282*	1249.366	-14.04379
2	-14.89413*	-13.15501	71.19579*	14.20178*
3	-14.83877	-12.30914	35.78847	13.83171
4	-14.37683	11.05669	11.85791	-13.05507
5	-14.11914	10.00849	20.09052	-12.48268

* Indicates the optimal lag order selected by the criterion

The optimal lag length for the model according to Akaike information criterion, Hannan-Quinn information criterion and Likelihood ratio is two and according to Schwarz information criterion it is one as indicated in above table. Akaike information criterion and Schwarz information criterion use minimum value to decide maximum lag. Akaike information criterion (AIC) has been widely used in literature in order to specify the optimal number of lags for VAR; therefore we use two lags in our model as specified by Akaike information criterion, Hannan-Quinn information criterion and also by the Likelihood ratio.

After specifying our structural vector autoregressive model; checking stationarity of the data and making it stationary by taking first difference; deciding the optimal lag length of the model and imposing additional identifying restrictions we are all set to finally estimate our model and get the estimated results, impulse response function's and variance decomposition. As we are interested in knowing the dynamic effects of fiscal spending shock; the fiscal policy shock can occur, either due to change in net taxes or due to change in central government expenditures. Therefore after running SVAR model the results displayed in table 4.3 contain only those coefficients of matrix À which shows the effects of government spending 'g' and taxes 't' on output 'y', inflation 'p' and interest rate 'r'. Another coefficient of matrix B is also

displayed in the table which shows the effect of government expenditures on the tax revenue. So the final estimated coefficients along with their p-values are shown in table 5.3.

Table 5. 3: The Required Estimated Coefficients (In Matrix À and B)

Coefficient	$\alpha_{y,g}$	$\alpha_{p,g}$	$\alpha_{r,g}$	$\alpha_{y,t}$	$\alpha_{p,t}$	$\alpha_{r,t}$	$\beta_{t,g}$
Estimated Value	0.863770	1.30231	0.293581	−1.63871	0.38676	−0.06167	2.07658
Z Statistic	7.13597	7.80794	1.032763	−13.8730	0.81926	−0.12094	12.3678
P-Value	0.0000	0.0000	0.3016	0.0000	0.4147	0.8990	0.0000

*At 5% level of Significance

The estimated coefficient of government spending and output ($\alpha_{y,g}$) is positive and highly significant at 5 percent level of significance which implies that the government expenditure have positive and significant effects on output i.e. government expenditure's multiplier is 0.86 indicating that an increase in government spending by one unit induces a rise in output by o.86. Likewise, the estimated coefficient of government spending and inflation ($\alpha_{p,g}$) is positive and highly significant at 5 percent level of significance which shows that the increase in government expenditures induces a rise in inflation and the increase in inflation is much higher than the increase in government spending. However, the estimated coefficient of government spending and interest rate ($\alpha_{r,g}$) is positive and insignificant as the probability value is higher than the level of significance hence the increase in government expenditures does not effects interest rate contemporaneously. Similarly for the effects of taxes we see that; the estimated coefficient of taxes and output ($\alpha_{y,t}$) is negative and highly significant as the probability value is much less than the level of significance which implies that the taxes have negative effects on output and the intensity of this negative effect is much higher. The estimated coefficient of taxes and inflation ($\alpha_{p,t}$) is positive and insignificant therefore we cannot surely

say that taxes have positive impact on inflation. Also the estimated coefficient of taxes and interest rate ($\alpha_{r,t}$) is negative and insignificant at 5 percent level of significance hence we cannot actually say that increase in taxes have negative impact on interest rate. Finally the estimated coefficient of government expenditures and total tax revenue ($\beta_{t,g}$) is positive and significant as the probability value is much less than the level of significance hence from this we can infer that the increase in government spending leads towards higher tax revenue and this might happens to balance the budget as the increase in government spending require total tax revenue to be higher in order to avoid budget deficit. The remaining estimated coefficients of matrix Â which are price elasticity of output ($\alpha_{p,y}$), interest elasticity of output and prices ($\alpha_{r,y}, \alpha_{r,p}$) and tax elasticity of prices ($\alpha_{t,p}$) can be seen in appendix A. In next section dynamic effects of fiscal spending are being discussed.

5.3 Dynamic Effects of Fiscal Policy

The VAR model allows us to identify how the government spending shock affects macroeconomic variables over the time by estimating impulse response function and variance decomposition.

5.3.1 Impulse Response Functions

An impulse response function traces out the effects of a one standard deviation shock to one of the structural innovations on the current and future values of the endogenous variables. The blue dark line of impulse response functions represents the actual movements of the endogenous variable in response to one standard deviation shock to one of the structural innovations while the dotted line represent errors brands. The black zero line separates the positive and negative effects on the endogenous variables over the specific number of times

(numbers of years in this study); if the blue line is above zero line the effect on endogenous variable is positive while if blue line is below zero line the effect is negative but the effect being positive might be increasing or decreasing above zero line. Two set of impulse response functions are being used in our model; one considers the dynamic effects of government expenditure shock and the other traces out dynamic effects of tax revenue shock.

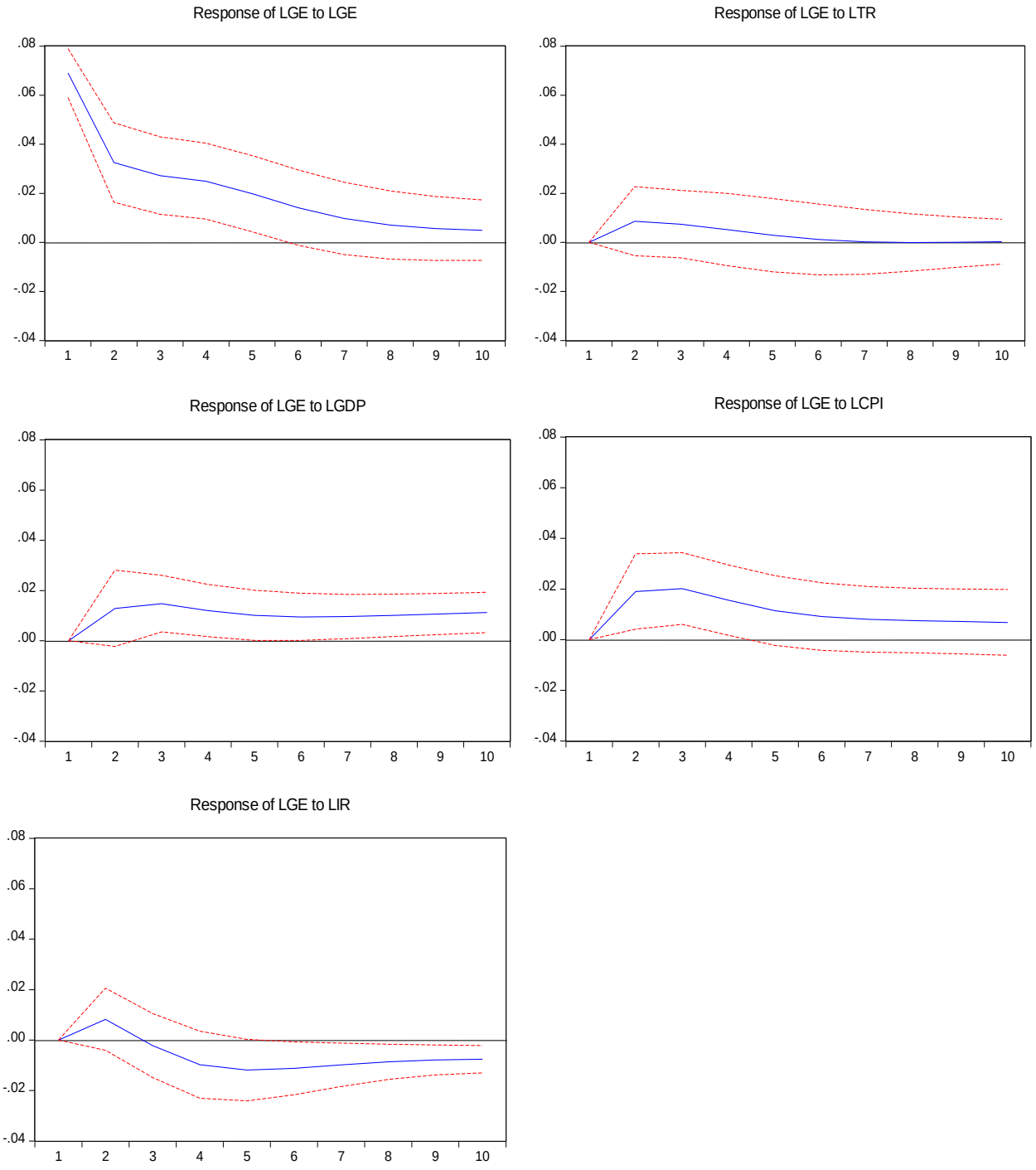
5.3.2 Government Expenditure Shock

The results of standard deviation shock to government spending on itself and other included macroeconomic variables are shown in figure (5.1) below. The response of government expenditure shock on itself is positive but declining very fast and finally becomes stable over the time. The results are consistent with Linnenmann and Andreas (2003) that the increase in government expenditure leads towards higher interest rate which ultimately causes reduction in investment spending. In response to a positive government spending shock output increases for first year, minor decline near fourth time period but remains positive and shock persist in all subsequent periods. The results are in line with RBC and New-Keynesian model also with several SVAR studies which report an increase in out in response to a positive government expenditure shock; for example Blanchard and Perotti (2002) Castro and Cos (2007), Fatas and Mihov (2001), Pappa (2009). However the magnitude of response varies across the studies also with in studies the value of the multipliers change with different specifications and sample periods. Other than SVAR studies some of the other studies also suggest that the increase in government expenditures induces an increase in output (Rotemberg and Woodford, 1992; Linnenmann and Schabert, 2003). While examining the nexus between government spending shock and output growth in SAARC countries Pradhan (2011) found that there exist long run relationship between government spending and economic growth which also validates our results

of positive impact of government spending on output. Similarly from figure (5.1) we can see that a government expenditure shock induces rise in inflation in first year and then it starts decreasing in third year and becomes stable after sixth year but remains positive. In order to finance its spending government can print new money; the injection of this money into the economy can lead toward higher inflation (Barro, 1987). The results of this study are also consistent with the prediction of New-Keynesian model also with some of the studies like Javid and Arif (2009), Rehman et al. (2015) who found that the government spending shocks have positive impact on inflation. The aggregate expenditure made by the government lead toward higher demand for goods and services in the economy which in turn can cause an increase in inflation and this inflation is commonly known as the "demand pull inflation" which is a fiscal driven monetary phenomenon (Sheheen and Turner, 2010). Finally we can discuss the dynamic response of interest rate to one standard deviation shock in government expenditure. We can infer from figure (5.1) that in response to a positive government spending shock the interest rate increases for one period and then decreases and finally becomes negative after third year. The governments in South-Asia are running huge budget deficits than in order to finance their expenditure they need to borrow money which increases domestic demand for loans hence causing interest rate to rise. The results are in line with RBC and New-Keynesian model also with the studies like Javid and Arif (2009), Shaheen and Turner (2010) and Rehman et al. (2015). The results of all these studies conclude that the government spending shock have positive impact on inflation and interest rate. As interest rate rises in face of expansionary fiscal policy it causes the private investment to crowd out (Ghani Din, 2007). The impulse response functions for the effects of government spending shock are shown below in figure 5.1.

Figure 5. 1: Dynamic Impact of Government Expenditure Shock on Macro-Variables

Response to Cholesky One S.D. Innovation ± 2 S.E.



*Where LGE → government expenditure; LTR →Tax revenue; LGDP →output; LCPI→ inflation and LIR → interest rate.

5.3.3 Government Tax Revenue Shock

The results of standard deviation shock to government total tax revenue on itself and other included macroeconomic variables are shown in figure (5.2) below. The response of government total tax revenue shock on itself is positive in all years but declining very fast and it becomes stable in last years. In response to public revenue shock the government expenditure are positive but with very small and stable overtime. It shows prudent behavior of policy makers and also the fiscal consolidation measures as the increase in total tax revenue does not enhances government expenditures much which implies that government is collecting more revenue but in order to avoid unsustainable budget deficits it is spending less.

The one standard deviation shock to total tax revenue induces a small rise in output and the one time transmitted effect remains stable over the time. Though the results are consistent with some of the studies like Dungey and Fry (2009), Giordano *et al.* (2007) in which they found that the increase in tax revenue shock have positive small effects on output; also Favero and Giavazzi (2007) for USA for the period of 1980-2006 found positive impact on output due to positive tax revenue shock. But the results in this study for the effect of positive tax revenue shock on output are contradictory to most of the studies in literature like Blanchard and Perroti (2002), Castro and Cos (2007), Mountford and Uhlig (2009) and Caldara and Kamps (2008) endorsed the view that positive tax revenue shock have negative impact on output. The rationale for dynamic increase in output in response to tax revenue shock can be provided in a way that tax revenue is allocated on productive current development expenditure rather than unproductive capital expenditure which increased output ultimately.

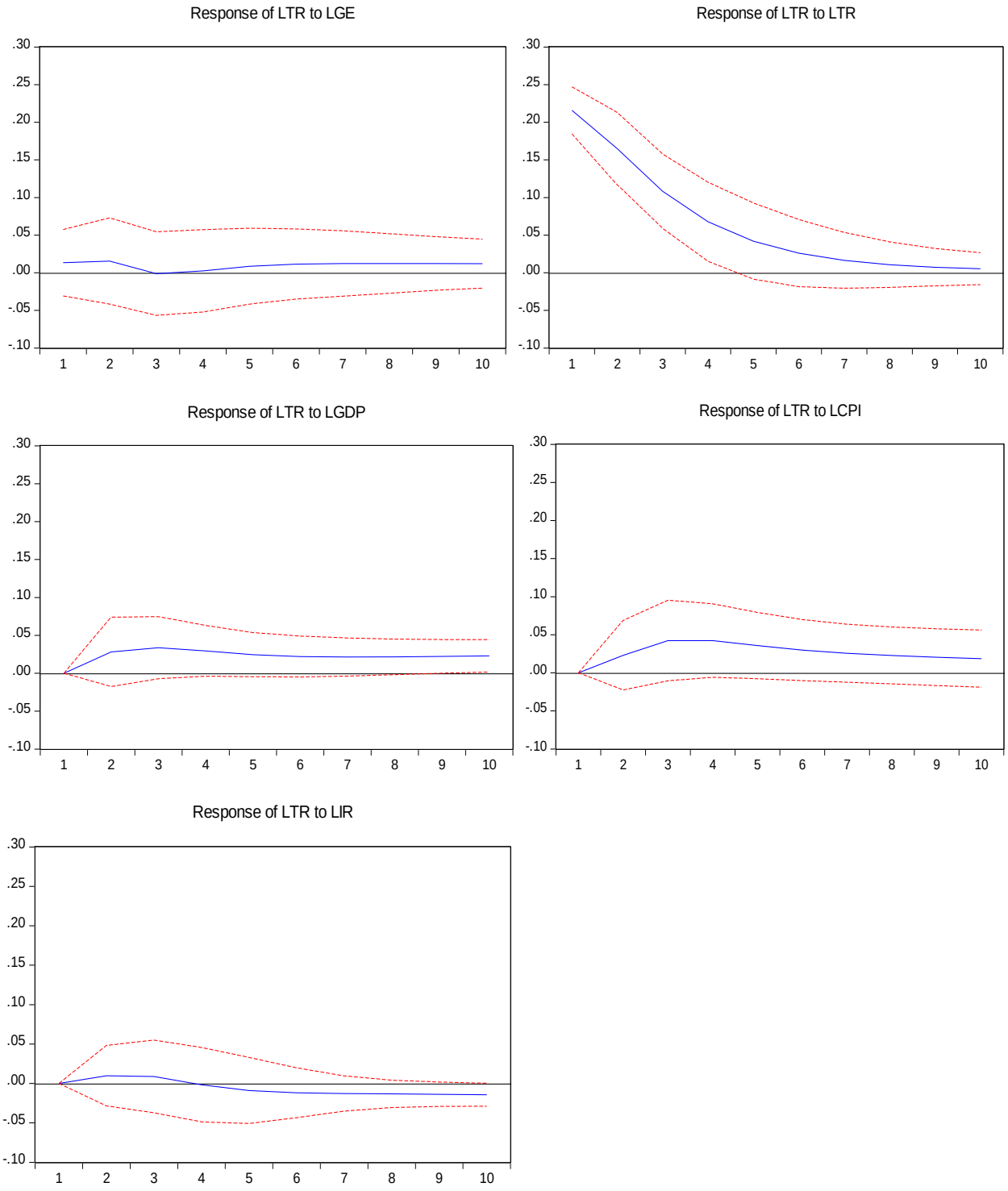
The positive one standard deviation shock in public tax revenue induces a rise in inflation as depicted in figure (5.2). In response to tax revenue shock inflation rise in first year than

declines and finally becomes stable after sixth year but remains positive. The results are consistent with conventional wisdom that when taxes are imposed the prices for goods and services in the economy rise hence inducing a rise in inflation. As the countries in South-Asia running budget deficit therefore in order to finance its spending government mobilizes its revenues by imposing more taxes which lead to rise in inflation in the country (Rehman et al., 2015). Utgoff and Frank (1979) working in classical framework in which aggregate demand determined by money supply found that the increase in taxes causes aggregate supply to fall and hence inducing a rise in the inflation.

Finally, the dynamic response of interest rate to one standard deviation shock to public tax revenue is represented in figure (5.2). The response of interest rate to rise in public tax revenue is near neutral in first four years. Using Blanchard and Perotti (2002) identification strategy in their model Caldara and Kamps (2008) found the same results that interest rate does not reacts to a positive tax revenue shock. The impulse response shows that interest rate becomes negative due to positive public tax revenue shock after fourth year. These findings are consistent with Mountford and Uhlig (2009) who found that the interest rate reacts negatively to a positive tax revenue shock; also Favero and Giavazzi (2007) for USA for the period of 1960-1979 found negative impact on interest rate due to positive tax revenue shock. While investigating the effects a tax policy in Canada Arin and Koray (2006) also found the same results that in response one standard deviation shock to income tax revenue the interest rate reacts negatively in all subsequent periods. The impulse response functions for the effects of one standard deviation shock in public total tax revenue on the other included macroeconomic variables are shown in figure (5.2) below.

Figure 5. 2: Dynamic Impact of Government Tax Revenue Shock on Macro-Variables

Response to Cholesky One S.D. Innovation ± 2 S.E.



*Where LGE → government expenditure; LTR →Tax revenue; LGDP →output; LCPI→ inflation and LIR → interest rate.

5.4 Variance Decomposition Analysis

The forecast error variance decomposition analysis gives us the proportion of the movements in a sequence or variable due to its own shock and also to the shock in other variables. Variance decomposition explains the overall rise and fall in the variables due to different shocks at different time. As we have five endogenous variables in our model the variance decomposition analysis will let us know that which variable is affected more due to fluctuation in different shocks. Hence the method of forecast error variance decomposition is used to decide variability proportion in variables at current time as well as in the long run due to variability in structural shock because the variability proportion in the variables or sequences changes when structural shocks occur.

To explain the cumulative behavior of the variables in response to variability in structural shocks the variance decomposition is taken in percentage. In our analysis we will have five tables of forecast error variance decomposition analysis; as we have five variables and the variability in each sequence due to one structural shock is constructed in one table hence having five structural shocks we will end up by having five tables of forecast error variance decompositions. As we are interested in knowing the dynamic effects of fiscal spending shock on other macroeconomic variables; the fiscal spending shock can either take place due to government spending or through tax revenue shock hence we will analyze the variability in variables due to just these two shocks. The forecast error variance decomposition of government tax revenue, output, inflation and interest rate due to shock in government expenditure is shown below in table (5.4).

Table 5. 4: Variance Decomposition of Government Spending

Period	S.E.	DLGE	DLTR	DLGDP	DLCPI	DLIR
1	0.075544	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.083130	92.25014	1.173319	3.974640	1.029324	1.572577
3	0.083301	92.04196	1.191405	4.019864	1.132731	1.614043
4	0.084206	90.65049	1.217492	4.588362	1.213848	2.329810
5	0.084288	90.49850	1.215258	4.579605	1.255003	2.451630
6	0.084320	90.47052	1.215235	4.576126	1.278263	2.459856
7	0.084324	90.46448	1.217680	4.576494	1.278286	2.463063
8	0.084326	90.46155	1.217825	4.576643	1.278743	2.465243
9	0.084327	90.45953	1.217808	4.576595	1.279597	2.466466
10	0.084327	90.45935	1.217809	4.576653	1.279678	2.466509

*Cholesky Ordering DLGE DLTR DLGDP DLCPI DLIR

The variance decomposition shows that in response to shock in government expenditure none of the variables responded in first year. The variation in tax revenue in second year is 1.17% and over the time it increases to 1.21 % in tenth year. The variance decomposition of output shows that in response to government expenditure shocks 3.97% variations are explained by output in second year and it increases to 4.57% in tenth year. If we look into the table this is highest variation among the other variables which implies that output reacts more to government spending shock. Similarly we can see that inflation does not react much as it increases from 1.02% in second year to just 1.27 in last years. Interest rate reacts to shock in government expenditure shock and the variability increases from 1.57% in second year to 2.46% in last tenth year. Hence we can say that output reacts more to spending shock followed by interest rate.

Similarly, we can construct the forecast error variance decomposition for government tax revenue shock to analyze the variations it induces in itself and in other variables. The forecast error variance decomposition of government expenditure, output, inflation and interest rate due to shock in government total tax revenue is shown below in table (5.5).

Table 5. 5: Variance Decomposition of Government Tax Revenue

Period	S.E.	DLGE	DLTR	DLGDP	DLCPI	DLIR
1	0.244391	0.273266	99.72673	0.000000	0.000000	0.000000
2	0.247324	0.286471	97.90613	1.509652	0.254841	0.042903
3	0.250641	0.773442	95.53355	1.540632	1.862183	0.290192
4	0.251509	1.249425	94.93646	1.547814	1.874517	0.391779
5	0.251677	1.285080	94.82783	1.565378	1.914458	0.407257
6	0.251827	1.306177	94.72242	1.577201	1.952119	0.442086
7	0.251871	1.323034	94.69011	1.590148	1.953600	0.443106
8	0.251901	1.331450	94.66764	1.595704	1.953133	0.452071
9	0.251902	1.331568	94.66654	1.596252	1.953201	0.452439
10	0.251903	1.331769	94.66596	1.596492	1.953201	0.452577

*Cholesky Ordering DLGE DLTR DLGDP DLCPI DLIR

The variance decomposition shows that in response to shock in government tax revenue none of the variables responded except government expenditure in first year. The variation in spending in first year is 0.27% and over the time it increases to 1.33 % in tenth year. The variance decomposition of output shows that in response to government tax revenue shock 1.50% variations are explained by output in second year and it increases to 1.59% in tenth year; which shows that tax revenue shock does not cause much variation in output over the time. From table we can see that inflation increases from 0.25% in second year to 1.95% in last five years. An interesting outcome we can see that after second year there is a sudden jump in inflation; the variation rises from 0.25% in second year to 1.86% in third year which shows that when taxes are imposed soon after that there is a rise and upward jump in inflation. If we look into the table this is highest variation among the other variables which implies that output reacts more to government spending shock. Interest rate reacts to shock in government tax revenue shock and the variability increases from 0.04% in second year to 0.45% in last tenth year. Hence, we can conclude finally that the government tax revenue shock does not induce much variation in output and interest rate but in inflation it induces much variation in initial time periods.

CHAPTER VI

CONCLUSION

The effects of innovation in government spending on aggregate economic activity and on macroeconomic variables and the transmission mechanism of these effects have been the central most debated issue in macroeconomics on which no widespread agreement exists among the scholars. The present study investigates the dynamic effects of fiscal spending shock which can take place either due to positive government expenditure shock or total tax revenue shock on output or we can say economic activity, interest rate and inflation. The study presents the dynamic analysis based on the hypothesis that government expenditure shock have positive and long lasting effects on output, interest rate and inflation in selected South-Asian countries by taking into consideration the time period from 1990-2015. In order to serve the purpose identification scheme by Blanchard and Perotti (2002) has been employed in structural vector autoregressive (SVAR) model. The impulse response functions are being constructed for the following five variables: government spending, government tax revenue, output, inflation and interest rate in order to analyze the transmission mechanism or the dynamic response to government spending innovation.

The empirical results reveal that government expenditure and taxes have significant role in explaining the variation in output, inflation and interest rate in South-Asian region. These results can be summarized as following; i) government expenditure shock have positive impact on output with multiplier less than one i.e. output increases less than increase in expenditure and the effect lasts for subsequent periods as well. The results are consistent with standard Keynesian wisdom that an expansionary fiscal policy can stimulate the aggregate economic activity; ii) in response to a fiscal spending expansion the interest rate raises which can ultimately cause private

investment to crowd out; iii) a positive fiscal spending stimulus induces a rise in inflation which persists and remains positive over the time, this inflation can be seen as a demand-pull inflation; iv) a tax revenue shock has a significant negative impact on output contemporaneously which in line with Keynesian theory of tax multiplier and the dynamic effect of this tax revenue shock is positive and is in line with the balanced budget multiplier theory that an rise in government expenditure and taxation of equal magnitudes will have a net expansionary effect on aggregate demand; hence on output; v) in response to a tax revenue shock the inflation raises and it persists for subsequent periods as well; vi) Finally the response of interest rate to rise in public tax revenue is near neutral initially then becomes negative in long-term.

6.1 Policy Recommendations

We can draw two main policy conclusions from these empirical results: firstly, fiscal policy is able to stimulate the economic activity through expansion in government expenditure but at the cost of higher inflation and crowding out of private investment due to increase in interest rate. Secondly, though increase in tax revenue increases output in short-term but fiscal consolidation achieved by increasing the tax burden might slow down the economic activity in long-term. Hence, governments in South-Asia should look for the avenues where they can mobilize their revenues in order to finance their spending as they contribute towards the higher growth in output, rather than imposing more and more taxes in long-term because they have their respective costs.

6.2 Limitation of the Study

Though South-Asian regions GDP has grown at an average growth rate of 7.5 percent per year since 2003 and region remained economically the world's fastest growing region since

April, 2015 and still it is expected to grow at a rate of 7.3 percent in 2018. [17] But presently, South-Asia is one of the least integrated regions of the world because of limited transport connectivity, heavy logistics and regulatory barriers, and deficiency of trust, costs more to trade within South Asia than between the South Asia and other regions of world. Also the recent shifts, trust deficits, historical political tensions, cross-border encounters and security concerns results in a low level equilibrium.[18] This study however, does include the fact that how much regional disintegration have contributed to the loss in output growth of the region.

Although vector autoregressive models are useful forecasting tools in the short-term but their use is limited because two reservations. Firstly, their accuracy deteriorates at longer horizons. Hence, the inferences drawn about the long-term responses to shocks in fiscal policy, in general, need careful interpretations. Secondly, the econometric model used in this study makes sure the symmetry of the responses to shocks of equal absolute magnitude with opposite signs. On the other hand, the real economy might not be symmetric and, as a result, reactions to fiscal expansions might be of very different magnitude than fiscal contraction.[19]

[17] Asian development outlook by Asian Development Bank 2007-17

[18] "One South Asia" World Bank August 3, 2017

[19] There are some papers that have highlighted limitations of VAR models; for further details see, Rozina and Paul (2010), Attiya and Umaima (2009) and Jan (2001).

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Appendix A

Table 5. 6: The Remaining Estimated Coefficients (In Matrix À)

Coefficient	$\alpha_{p,y}$	$\alpha_{r,y}$	$\alpha_{t,p}$	$\alpha_{r,p}$
Estimated Value	-64.19270	1.505107	2.07045	−2.074091
Z Statistic	-13.55642	0.168808	13.75889	−0.57160
P-Value	0.0000	0.8159	0.0000	0.5676

*At 5% level of Significance

ROBUSTNESS

In structural vector autoregressive model we impose identifying restrictions and for that we borrow some of the elasticities from the literature. In order to know that whether our results are consistent with the actual results we will check the robustness. There are two approaches to check the robustness of results; one way is to add and subtract 5% of the borrowed values and estimate the results and then analyze the change in results and the other way is to change the sample period. In this study we will use the first method which is to add and subtract 5% to the values which we have borrowed from literature.

Perotti (2004) set the price elasticity of government expenditures equal to -0.5 and we found that setting $\alpha_{g,p}$ = 0 does not affect the results significantly also we set value of tax elasticity $\alpha_{t,y}$ = 1. After adding and subtracting 5% to these values SVAR model is again estimated. After estimation, the results we get are consistent with the previous ones. From all other coefficients just the effect of government expenditure on output ($\alpha_{y,g}$) declines from 0.86 to 0.79. The impulse response functions and variance decomposition produced from these results are almost of same pattern.