IMPACT OF FISCAL POLICY ON OUTPUT GAP
A CASE STUDY OF PAKISTAN

By

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NATIONAL UNIVERSITY OF MODERN LANGUAGES

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Abstract

This preliminary study characterizes the dynamic effects of fiscal policy shocks on output gap (i.e. the difference between actual and potential output) in Pakistan and attempts to measure output gap using the production function approach. The contribution of this study to understand the nature of the fiscal policy variables and their impact on output gap in Pakistan over the short and long run. It employs a five variables Structural Vector Auto Regression model covering the time period 1975-2015. The identification problem of SVAR model is handled using the two approaches that is, the recursive approach also known as Cholesky decomposition and identification approach of Blanchard and Perotti. Interestingly this study suggests that impulse responses through both identification approaches behave in a similar fashion. Since the Blanchard and Perroti approach uses information about the elasticity of fiscal variables to economic activity which enables to identify the automatic response of fiscal policy, this study reveals a significant role of both the government expenditure and taxes in explaining the changes in output gap and in case of inflation study observed that Pakistan economy has been observing varying episodes of excess supply and demand pressures. The study recommended that government spending should be made to increase in the time of recession.

Keyword: Output gap, Fiscal policy and Structural Vector Auto Regressive Model

Contents

CHAPTER 1

INTRODUCTION

Sustainable growth of the economy is the major concern of all countries, especially for the developing countries including Pakistan, which faces many different economic challenges like they operate below their output level as compared to developed countries. The difference in the actual and potential output is closely related with volatility along the business cycle and indicates the macroeconomic management of the country. According to previous studies, Pakistan has always performing below its potential level. Output gap is a key determinant of inflationary or deflationary pressures. Hence most economist and policy makers consider output gap as a dominant indictor that helps policy makers to keep the economy on a sustainable economic growth path with stable inflation. Despite the vast agreement about the role of several policy variables to overcome the output gap, there have been several disagreements about the relative importance and effectiveness of different policies to reduce the output deviation from its potential level.

Output gap is the difference between potential and actual output which may be positive or negative depending upon whether the macroeconomic policies are run efficiently or not. Potential output estimates long run movements' association with the economic growth while output gap measure short run movements in the economy (Hall and Taylor, 1991). Actual output is positive when economy experiences demand pressure this is inflationary pressure and require reducing this pressure through tight monetary policy and to mitigate the negative output gap, there is a need to expand demand through low tax and increase government spending, that is using expansionary fiscal policy. Monetary and fiscal policies play influential role in the pursuit of macroeconomic stabilization; however, two major schools of thoughts Keynesians and the Monetarists have been in a serious debate about relative effectiveness of these policies. According to Monetarists monetary policy have more influence on economic growth whereas the Keynesian believe that fiscal policy rather than the monetary policy can promote economic activities and stability. Economic stability means minimum possible changes in the domestic prices and foreign exchange to maintain the full employment and stable prices. On the other hand, Classical economists were not in favour of fiscal policy. They advocate *Laisseze-fair* economy that is no interference of the government. According to the Keynes fiscal policy can be

used to examine the inflation because when the foreign spending and private spending on investment and consumption exceed the full employment level inflationary pressure accurse in the economy. According to Keynesian school of thought true inflationary pressure in the economy accrue only start after full employment level.

Economic Growth implies a long period expansion of the gross national product in real time. The fiscal measures are adopted to achieve stabilization, particularly when economy suffers from the problem of unemployment. Full employment is a level which varies in different countries. Production capacity can be increased in many ways and, thus, every economy aims at high rates of growth. Long run growth depends on many factors like physical capacity, technically skill, volume of employment and various other production inputs. The role of fiscal policy in advanced countries is to maintain full-employment and economic activities while its role in developing countries is to accelerate growth. According to Donders and Kollau (2002), potential output and output gap affect government fiscal policy directly. In an upturn of the business cycle there will be a budget surplus because of higher government revenues and lower growth of government expenditure. In a downturn, a budget deficit occurs because of lower government revenues and high government expenditures. In this case, output gap and potential output can be used to determine repetitive adjustment to balance the budget. A cyclically adjusted budget balance can be defined as; the actual budget balance corrected for divergences of actual from potential output, and thus provides a measure of the government structural fiscal position

Fiscal policy has a different transmission mechanism and it has great impact on all key macroeconomic variables. In case of budget planning in Pakistan most of the eras face very critical situation. Fiscal planning about development expenditures and non-development expenditures, Government tax and non-tax revenues and debt situation as well is also very poor. Since its independence in 1947 Pakistan's fiscal deficit increase consistently is almost every financial year and unfortunately at the day first Pakistan is in a real debt trap. Economy of Pakistan mostly depends on external debt and foreign aid. Due to very bad economic condition and high public debt World Bank announce Pakistan as a severely indebted country in 2001. Average tax to GDP ratio in last ten years is 10% in Pakistan which is very low against the other developing countries like India has 16.5 % Sri Lanka has 20 % and Bangladesh has 12 % tax to GDP ratio. Almost 70 % of government budget spend on debt servicing and interest payments. All the major government institutions like PIA, Pakistan railway, steel mill earn no revenue and

rely on government bailout packages which also disturb the current expenditures. Skilled labour plays an important role in every field of the economy. Unfortunately, Pakistan face a problem shortage of skilled labour in the economy due to low investment in human capital. However, the quality of labour force can be improved by more investing in health and education. These all factors affected the investment level in the country and the country cannot increase its production up to the capacity. An increase in aggregate demand through adjustment in tax and expenditure can help the economy to produce at least up to its potential.

1.1 Significance Of The Study

This study explores the behaviour of potential output, output gap and analyses the role of fiscal policy variables to reduce the output gap in Pakistan. Many researchers have put the efforts in measuring the potential output and output gap. Many techniques have been used in literature to calculate output gap and among them, the production function approach is the frequently used approach. This study uses production function approach to measure output gap in Pakistan. The contribution of this study to understand the nature of the fiscal policy variables and their impact on output gap in Pakistan over the short and long run. Policy makers can apply the research findings to be able to make sound economic decisions about tax rate and government expenditure while keeping in view the response of output gap and inflation.

1.2 Statement of the Problem

Output gap is very helpful within the economy for indication of potential inflationary pressures especially in developing country like Pakistan which produce its below level due to underutilization of its resources. The estimates of output gap provide key information to judge inflationary or contractionary pressures and the cyclical position of the economy. In developing countries temporary economy shock such as terms of trade shocks, oil price shocks and as natural disaster and social and political uncertainty influenced the short run fluctuation. Potential output and the output gap both are very helpful to examine the scope for sustainable non-inflationary growth and to allow for an analysis of the stance of suitable macroeconomic policies. For aggregate supply side capacity of an economy potential output is considered as best composite indicator. Fluctuation in potential output indicates that changes in the economy's supply side, either in terms of labour supply or productivity. Thus, this study investigates the behaviour of output gap in response to the shocks in fiscal policy variables.

1.3 Delimitations of the Study

Delimitations of our study is as follow

To investigate the impact of fiscal policy on output gap for Pakistan

- A time series data series for variables will be collected.
- Empirical data will be collected for the period 1980-2016.
- Data will be collected from World Bank indicator, Economic survey of Pakistan and Statistical Bureau of Pakistan.
- Our study includes following variables that is, Output Gap, Government Revenue, Government Expenditure and the control variables that are inflation and domestic interest rate.

1.4 Objectives of the Study

- Since there is lot of methods available in the literature on how to measure potential output and output gap, this study tries to use the appropriate method to measure output gap.
- Second objective of the study is to analyse the fiscal practices in the past and trend in output gap
- This study also aims to investigate the impact of Fiscal policy tools, that is, taxes and government expenditure on Output Gap in case of Pakistan using SVAR analysis
- The fourth objective is to recommend appropriate policies to reduce output gap based on the result.

1.5 Similar Studies

For Pakistan no previous study has attempted to investigate the impact of fiscal policy on output gap, while many other studies are attempting to measure the output gap with different methods. Filho (2002), Willman (2002), Kiio (2003), Menashe and Yakhin (2004), Horn *et al*, (2006), Khan (2006), Jareno (2007), Kattai (2010) and many more are use production function approach to estimate the potential output and output gap for different economies. In addition, Sadia *et al* (2009), Shah (2009) and Shaheen *et al*, (2015) also analyzed and estimated output gap for Pakistan economy.

1.6 Organization of the Study

This chapter introduces the problem statement and the objective of the study while chapter 2 review the existing literature regarding output gap and fiscal policy. Chapter 3 is about trend of output gap and fiscal practices in Pakistan. Chapter 4 is about theoretical framework and econometric modelling. Chapter 5 discussed result and discussion and chapter 6 is about conclusion and policy recommendation.

CHAPTER 2

LITERATURE REVIEW

This chapter is about reviews the existing literature regarding the measurement of output gap and the effectiveness of fiscal policy in controlling the output gap.

2.1 Theoretical Literature:

There are two macroeconomic models concerning with the effects of fiscal variables shocks with different point of view. New Keynesian is the first model with concern price rigidity. According to Keynesian positive government spending shock help to increase economic growth, private consumption, labour demand and real wages. Devereux et al. (1996) and Rothenberg and Woodford (1992) establish a model increasing returns to scale and imperfect competition to show the positive government spending shock increase the real wage. Ravn et al. (2006) enlarge the 'deep habits' in imperfectly competitive markets model and indicate that due to positive government expenditure shock real wage and private consumption will be increased. Galí et al. (2007) develop unique model a sticky price model with 'rule-of-thumb consumers' means consumer who consumes their total income in a non-Ricardian fashion. They show that due to the existence of rule-of thumb households and due to countercyclical mark-ups in the model response of consumption can be positive. Simple Keynesian model suppose excess capacity in the economy and price rigidity so that impacts on aggregate demand and total output is positive and significant due to fiscal expansion. In addition, on this model allows the fiscal expansion to increase the borrowing and paid by crowding out effect high interest rate and reduces the investment. Although, Krugman and Obsfeld (1997) argue that a difference among the permanent and temporary policy changes is important. As result of permanent fiscal expansion crowding out accrue in the economy. Private agents also expect will increase the interest rate and this appreciation of interest rate will persist and stay longer. Another assumption of Keynesian approach is consumer's resolution is determined by the current income level of the consumer. If consumer is rational and predict the government inters temporal budget constraints, government will anticipate that through a lower tax policy in government saving is fully offset by aggregate demand and private savings remain unaffected. (Barro, 1974).

Notwithstanding in neoclassical model, such as standard preferences and competitive markets, real Business Cycle model with constant returns to scale, government spending shocks increase

gross domestic product and construct inverse wealth effect due household's prediction of high burden of taxes in future or due to temporary increased interest rate inter temporal substitution effects. For this reason, increase the labour supply and decrease the consumption which is turn to real wages fall. King and Baxter (1993) extend that government increase their expenditures through non-distortionary taxes and this action of the authorities decrease the representative agent's wealth which in turn increase the labour supply and reduce the consumption and real wages both.

In case of supply side fiscal policy have long run entanglement, in other word, policies which are favour and encourage response of supply side can address capacity constraints and their effects are essentially long term. Through increase spending and tax cuts implies a fiscal expansion which lead to enlarge the fiscal multipliers (Hemming et al, 2002). Perotti and Alessina (1997) analysis that expand in the labour income taxes leads to diverse and negative supply side effect. Neo classical models also suggest that aggregate demand is affected by fully anticipated policies, but aggregate supply is not affected by anticipated policies in short run and long run Lucas (1975) and Sargent and Wallace (1975). Supply is effect by only unanticipated policies Lucas and Stokey, 1983, and Chari and Kehoe, 1998).

According to Blinder and Solow, 1974 the effect of fiscal policy on total output also depends on structure of the institutions and these factors comprise the inside and outside lags. Inside lags show the time it takes to identify the fiscal policy should be variants and political process and fiscal management is depending on these lags (Hemming et al, 2002).

2.2 Empirical Literature

Over the last few decades, several researchers tried to measure the potential output and output gap. The concept of potential output is significant for macroeconomic policies, but very rare work done on this topic in Pakistan. Shaheen *et al, (2015)* measures output gap and potential output in case of Pakistan. They estimate potential output thorough production function over the sample period 1973-74 to 2007-08. NAIRU is used to get the potential labor and for capital stock perpetual inventory method is used. In addition, it was observed that total factor production trend for the period 2003-04 to 2007-8 was more than actual output. These results is also compatible with the behaviour of NAIRU in which NAIRU show decreasing trend from 2004-05 to 2007-08 from 8.12 percent to 6.17 percent and in period 2002-2-03 to 2007-08 actual employment was

above potential employment. Tahir (2014) estimates the output gap using structural methods on quarterly basis. This study using Large Scale Manufacturing Index (LSM) use robust proxy and investigate the national Income accounts for Pakistan on quarterly basis. Three techniques are used to estimate output gap which include; Structural VAR model, State–Space model and Wavelet filter and. In addition, since quarter 3 of 2011 negative output gap is due to slowdown in real economy like aggregate supply. Another study Khan (2006) using production function approaches for estimate the output gap in case of Pakistan's economy for the time 1963 to 2005. He can use HP filter approach to estimates potential employment and potential total factor productivity. Findings confirm that TFP shows the increasing trend at the end of sample period. The study concludes that in Pakistan actual output growth fluctuate and output gap increasing significantly because of money supply and increasing trend in imports in Pakistan. The findings also suggest market mechanism of auto corrective is not happening like other developing countries in Pakistan

Kiio (2003), in a study on estimating output gap and time varying NAIRU for developing countries estimate the output gap and found output gap in the year 2003 for Kenyan to be - 4.29, and the potential output growth to be 10.4%. These results conclude there is excess capacity in the Kenya economy. According to study that labor market gaps were determined through output gap. The study also suggests combination of macroeconomic policies achieves the employment level and a sustainable non-inflationary economic growth. Kattai (2010) use production function approach for Estonia economy to measure the Potential Output and the Output Gap. The study found in 1997–2009 average potential growth rate was around 6%. In other study *Roberto et al, (2016)* examine the potential output growth for Central American economies. The findings of the study show that in all central economies potential output growth have been declining in recent years. Potential growth an average of 4 percent expected due to structural constraints to capital and employment growth in most Central American economies is to continue at in the medium-term, and low TFP growth.

Many studies have been examined that relationship between output gap and inflation. Selvin (2001), use Cobb-Douglas production function to estimate the potential output. Output gap measures with two methods one is liner time trend and second is technology vary over the time. The findings of the study show that alone output gap is insufficient in Irish economy to explain

inflation. Linear time trend is the only measure through Cobb Douglas production function which shows the relation between output gap and inflation.

To measure the output gap and potential output growth Filho (2002) also uses Cobb-Douglas production function approach. According to findings of the study the economy has been facing an irregular pattern in output gap and in most of the times the economy shows larger gap in actual output and potential output. For Spanish economy Jareno (2007) use production function approach to estimate the potential output over the time 1990 to 2005. The results of the study show that in Spanish economy the actual output remained above the potential of the economy over the long period.

Horn *et al*, (2006) using production function approach estimates Germany's potential output by using data for the period of 1973 to 2005 annually. The findings of the paper suggest that estimate of output gap vary significantly over time and there are no accurate estimates of potential output. Two of the studies investigate the factor responsible for the existence of output for the New Zealand's economy. Claus *et al.* (2000) and Fox *et al.* (2003) both studies investigate the relationship between output and inflation. Claus *et al.* (2000) conclude that there is relationship between output and general price level which is very important for the prediction of future inflationary pressure. Another study concludes inflation is explanatory variable.

Link between inflation and output is also empirically investigated for China economy by Gerlach and Peng (2006). The results of the study propose that movement in the general price level is at least partially stimulated by the movement in aggregate demand captured by output gap. A study Scacciavillani and Swagel (1999) investigates the relation between output gap and migration in Israel. The study concludes that in the time of heavy migration growth rate of potential output was high. This study highlighted many factors that contribute to wider gap between actual and potential output. Another study examines the link between imports surplus and output gap in Israel and the results of the study shows there is a positive connection among the output gap and imports surplus Menashe and Mealeem (2000). Another study conducted by Willman (2002) use the production function approach to estimate the potential output for European economy. This study uses two approaches Cobb-Douglas Production Function and Constant Elasticity of Substitution (CES) Production Function are used. The results show the same output gap estimate through both approaches. For the estimate of output gap of Cyprus economy PF approach also

been used in another study. The time period of 1985-01 output growth of Cyprus was higher than the 15 European Union (EU) member countries of that time Haroutunian *et al.* (2003).

Cayen and Norden (2004), conduct a study in Canada and estimate the output gap. They use various tools and estimate the large range of output gap. The study concludes that there is measurement error to estimate the output gap for Canadian economy. Choudhry (2009) measures the growth of total factor productivity (TFP) in both agriculture and manufacturing sector over the time period of 1985-2005 using Cobb-Douglas production function. The findings of the study show growth in agriculture sector due to labour and TFP. Benes et al. (2010) estimate the potential output and output gap to develop a small macroeconomic model. Through this model show a relationship between actual output with potential growth general price level unemployment and other utilization capacity of manufacturing sector. The findings show that there in a consistency in output gap in previous decades due to labour and product market. Cheng, Chung and Yu (2011), examine the use various estimation approaches for Hong Kong economy. They use four methods for estimation including production function approach Kalman filter, IMF multivariate and Hodrick-Prescott (HP) filter. The findings of the study show for inflationary pressure information Kalman filter is responsive as compare to IMF that shows no clear advantage.

Menashe and Yakhin (2004), estimate the output gap through production function approach and structural vector autoregressive (SVAR) approach for Israel economy. The results of the paper show that business cycle fluctuations in 1990 and 1996 due to migration and recession. In addition, providing consistent output gap and predication inflation than the HP method. Araujo et al (2004) in Brazil use different measure to examine output gap and potential output. The findings are the study suggests that univariate models are more appropriate than unobserved component models which show inaccurate variance trends in potential output and output gap.

Papell (2012) investigate the real time output gap with revised data from 10 OECD countries. The findings of the study show that researcher more focuses on actual output rather than real time output. In addition, study found real time output gap hardly available in these countries, in other study Gradzewicz and Kolasa (2005) use two factor dynamic production function for Poland economy over the time period 1995-2002. Findings show that due to inflationary pressure output gap accrue in the economy.

Morekwa*et al* (2008) examines the interaction of fiscal and monitory policy in Kenya for the time of 1979-2007 using HP filter approach. The results of analysing the macroeconomic policies revelled on following way. Fiscal policy outcomes are not expected, and monitory policy government pursue usually on their directions that result. Tight monitory policy is more suitable to cover output gap. Cerra and Saxena (2000) estimate the output gap through various approaches HP filter, production function approach and Univariate unobserved components the aggregate findings of all the approaches find output gap and suggest this gap will closer next 2 years if current economic activity continue in Sweden.

Another study in Australia Brouwer (1998), uses unobserved components model, Hodrick-Prescott (HP) filter, linear trend model, multivariate HP filter and production function approach to measure the output gap. The results of the study show similarity in estimating but size of the gap diverges with another like multivariate HP filter produce less output gap as compare to linear trend model which produce larger output gap. He suggests for prediction of inflation production function approach and HP filter are more appropriate.

In other study Bjornland *et al*. (2005) uses different techniques including Kalman filter, Hodrick-Prescott (HP) filter, and production function approach to measure the output gap with same results but different magnitude. Blanchard and Perotti (2002) applying Structural Vector autoregressive (SVAR) show effect of fiscal policy shocks in post war period of the US economic activity by using the time series data for the period of 1974-1997. The findings of the study show that effect of output is positive when more spending and negative when more on revenue. The study also suggests more invest in spending and revenue result to more innovation in the economy.

Giordano *et al.* (2007) investigate the effect of fiscal policy on private investment, GDP, interest rate and inflation in Italy for 1982 to 2004 time period. Quarterly time series data and SVAR econometric techniques are used. The findings revelled government expenditure has positive effect on total output three quarter after shocks and negative after two years. These positive shocks on expenditure are helpful to generate employment also. All other selected variables have negligible effects due to positive shock in government revenue. Kamal (2010) studies the fiscal policy shocks in UK economic activity for the quarterly time period of 1971 to 2009 using the Bayesian Vector Autoregressive (B-VAR) approach. He uses various macroeconomic variables

like short-term interest rate, GDP deflator, government expenditures, trade balance, producer price index, monetary aggregates, private consumption, government revenues, real effective exchange rate, private investment and real wages.

Ravnik and Zillic (2011) explored the dynamic impacts of shocks of fiscal policy in case of Croatia economy. In this study they use proxy of GDP; other variables are short term interest rate and inflation with SVAR approach to investigate. They discover interest rate is the strong fiscal shock as compared to inflation. Inflation increases as government expenditure increases and short-term interest decreases due to expenditure shock.

Kofi Ocran (2011) estimates the effect of fiscal policy on total output in case of South Africa. Budget deficit, Gross fixed capital formation, government current expenditure and tax expenditure are used as fiscal policy variables. In this study quarterly time series data 1990-2004 and VAR model use to investigate the results. The investigation revealed gross fixed capital formation and government expenditure has significant impact on output and positive effect on total growth due to a positive shock on tax receipts.

Bank (2011) also analysis the tight fiscal policy effects on German economy from 1991-2009 with quarterly time series data. Results of the study show a positive shock on government expenditure leads to 2 percent increase in 1st quarter but insignificantly decreases in 2nd quarter to onward. Shock on government revenue is result to small decreasing trend on GDP. This study conformed the point of view of neoclassical economist to fiscal policy ineffective in growth of GDP.

Afonso and Sousa (2012) also analysis the dynamic effects of shocks in government revenue and government spending in case of UK and USA economy with Bayesian SVAR (B-SVAR) econometric approach. Results show same as pervious study, the positive expenditure shock to positive impact on GDP.

Another study conducts by Senhadji (1999) and examines the growth accounting exercise for the panel of88 countries which are including 46 developing countries for the time period of 1960–1994 and results of the study show Africa has annual TFP growth lies between -0.26% to -0.79% which is average of 2.83 of five Africans countries compared with 3.80% for the whole sample. The findings also show low growth in physical and human capital accumulation. Other study in Africa Fedderke (2002) investigates TFP growth and factor accumulation through Cobb-Douglas production function and found low growth in physical and human capital and technology

contribution are also very little. In 1970 economic growth and TFP growth is steadily rising about 1.07 percent in 1990.

Many researchers have used different models to estimate output gap. Benes and N'Diaye (2004) in Czech Republic Exert a similar model with calibrated parameters to estimate output gap series. Kuttner (1994) determine inflation through the Phillips curve with a simpler model relating the output gap. The classical (frequentist)) methodology in the study very similar model was replicate Kichian (1999) for G7 countries, and familiriaze by Gerlach and Smets (1999). in addition, Apel and Jansson (1999) enlarge the model by including unemployment. This model is used to analyse structural unemployment by European Commission. For estimating the Non-Accelerating Inflation Rate of Unemployment (NAIRU) Slanas et al., (2008), for OECD countries this model was used.

Kuttner (1994) also use information about Phillips curve for estimating structural unemployment through backward-looking version. Camba-M´endez (2003) and Apel Jansson (1999) do not include any time-varying component and not consider the investment rate which are contained expected inflation. In contrast Gerlach and Smets (1999) use backward-looking Phillips curve method to aggregate demand equation which relate the output gap own lags and the real interest rate. In contrast Laubach (2001) has suggests different model which consists of only Phillips curve relate the first difference of inflation to cyclical unemployment. The equation of the model is necessary to examine the components which was not observable the NAIRU and the gap. This model is same as the model proposed by Gordon (1997) but in his model in some countries permit the NAIRU to be a non-stationary process. Staigner, Stock and Watson (2001) Using the same methodology and take advantage to compute the time-varying estimate of the NAIRU through already containing information and real wage growth rate. R¨unstler (2002) determines the real-time output gap in a supply curve and examine the different extensions which is include capital stock, productivity, unemployment rate, capital stock, and capacity utilization.

Moreover, the statistical techniques have also been used to estimate the potential output. Simple time trend techniques and HP methods along with other structural methods have been used in different studies. For example, in a study by Gounder and Morling (2000), structural vector auto regressive (SVAR) has been used. Menashe and Yakhin (2004), Dupasquier et al. (1999)

with long-run restrictions use same technique. Gosselin and Lalonde (2002), Rennison (2003), Menashe and Yakhin (2004). Same technique with alternative name Kalman filtering and have been used to estimating the potential output, Kichian (1999), Gradzewicz and Kolasa (2003) and Scacciavillani and Swagel (1999) estimates of potential output through production function approach.

Most of the researchers have concentrated on estimating output gap with real time data for one country. For Canadian economy Cayen and van Norden (2005) estimate output gap with real time data for time period of 1972-2003. Similarly, Kamada (2005) in Japan compares GDP utilization of labour related statistics with non-GDP. He estimates the output gap with real time and found problem in GDP base output gap estimation. Gruen et al. (2002) use the real time data from 1971-2001 for Australian economy and results shows that output gap is reliable with real time data estimation. Correlation among the revised output gap and real time data is over 0.8.

Nelson and Nikolov (2003) examine the revised output gap estimate and real time for UK economy with real time data set for the period of 1962-2000. They also found substantial errors in estimating output gap with real time data. Garratt et al. (2009) investigate and conclude with similar results as Nelson and Nikolov (2003). Orphanides and van Norden (2002) shows the broad range of univariate method for estimating the output gap but lack of exactness estimation are revised over the time.

Clausen and Meier (2005) use various techniques to measure the output gap with the construction of real time data set for German economy. Similarly, Döpke (2004) in Germany conclude the estimate output gap with real time data for the period of 1980 to 2001 and find low correlation among the real time and revised estimates. Marcellino and Musso (2011) found that there is uncertainty in real time estimated output gap in euro area from 2001 to 2010 time period. Same finding of substantial uncertainty is shown in Mitchell (2003) study in same area from the time period of 1992-2003.

Chagny and Lemoine (2004) use various techniques to estimate the output gap but no consensus exists in the study each method are different findings of output gap. Dennis et al (2006) analysed in her study no method shows similar results of output gap every method gives a unique value. Billmeier (2004a) investigate and found that any specific methodology is not appropriate for inflation forecasting because of this conclusion another study by Billmeier (2004b) conclude that in case of Finland economy univariate filter is best for inflation forecasting.

Regardless Cheng et al. (2011) and, Brouwer (1998) examine there is no specific method to estimate inflation rate. Bjornland, Brubakk and Jore (2005) confirm with same findings using multivariate and structural method which are equally good for predicting price trend in case of Norway. Bjornland et al. (2005) also use three types of methods which are multivariate unobserved component method, univariate method and structural method to estimate the output gap. All the findings are different in magnitude with each other.

Bank of New Zealand and Bank of Canada in the era of late 1990_s prior multivariate HP filter over univariate filter to estimate the output gap for two reasons. Firstly is the those same technique is used Coe and McDermott (1996), Dupasquier et al. (1997), Gibbs (1995) and Conway and Hunt (1997) to estimate the output gap with Phillips curve identity. Secondly this method is good to forecast the inflation. Benes et al. (2004) use multivariate HP with unemployment, inflation, real GDP and by incorporating capacity utilization to estimate the output gap and conclude this technique is used in various countries to extract the output gap. Many studies are done at reserve bank of New Zealand Scott (1997) investigate the common cycle model. Claus (2003) use structural model to estimate the output gap. Laxton and Tetlow (1992) use multivariate method for estimating output gap. Conway and Hunt (1997) follow same approach but results are slightly different from previous study. Clark (1987) estimate output gap with adding of Phillips curve equations.

Blanchard and Qua (1989) estimate theory base output gap with imposing long run restrictions with structural vector auto regressive (SVAR) econometric technique. Potential output also estimated by inflation, unemployment and real GDP in the study. Gounder and Morling (2000) and Scott A (2000) analysed that SVAR method is best for measuring the output gap. Other same studies as Cerra and Saxena (2000), Funke (1997), Chantanahom et al. (2002), Billmeier (2004a) and Dupasquier et al. (1997) use unobserved component method which is also name as state space methodology to estimate the output gap. Clark (1987) and Harvey and Jaeger (1993) in its favour also use this methodology to estimate the output gap. Similarly, Aroujo et al. (2004), Bjørnland et al. (2006), and Adnan and Safdar (2008) estimate the output gap through unobserved component methodology.

Most of the studies found variation in estimation within the methodology Coe and McDermott

(1996) examine in the end of estimation that Kalman filter method has better result as compare to univariate method. Recently Bayesian method is very popular to estimate the output gap Berger and Kemp, (2011) use this method to estimate the output gap with theoretical sound foundations. Hu and Khan (1996), Chow and Li (2002), Borensztein and Ostry (1996), Heytens and Zebregs (2003) and Chow (1993) conclude studies to estimate potential output although relationship between inflation and output gap is understudies. Oppers (1997) analysed the Phillips curve model and found the inflationary periods which generally correlate with increasing aggregate demand. He points out those components behind increasing trend in aggregate demand is different. In the first part of 1990 increasing trend due to investment spending increasing raise the production capacity which leads to demand increases.

Imai (1997) uses the small macroeconomic model to study the short run inflation trade off. The findings of the study show that large fluctuation in fixed investment leads to increasing the inflation in reform period. Xie and Lu (2002) investigate the relationship among the inflation and output gap in Taylor rule framework and found that in Mainland (China) monitory policy could be explained for this approach. Stone et al (2003) estimate real time output gap by reserve bank of Australia and findings shows that this method is not appropriate for inflation forecasting.

Choudhry (2009) use the Cobb-Douglas production function to estimate the total factor productivity growth of manufacturing and agriculture sector in case of Pakistan economy from 1985 to 2005 time. Findings of the study show that growth in agriculture sector is labour abundant sector and whole economy driven by other factor of production.

2.3 Literature of Fiscal Policy

In number of studies SVAR has been used to evaluate the impact of fiscal policy on overall economy. Blanchard and Perotti (2002) were the first time use fiscal shocks in their study. In this study they were assume policy makers do not responded in the current quarter shocks. They are used three variables which are total output, Government expenditure and net taxes in the study to formulate the VAR model and investigate fiscal policy effects in case of US economy. The findings of the study show that government expenditure shock has a significant and positive impact on GDP growth but positive shock on tax revenue has a negative effect on GDP. They conclude their study with smaller multiplier increasing trend in output by 1.29 if there is one-dollar shock on government spending after about four years. The findings of the study show

consumption and GDP responds positively but in case of investment component crowding out effect as result of government spending.

Perotti (2002) estimate the fiscal multipliers Canada, UK, Germany and Australia. The findings of this study show that fiscal shocks result for US economy are different of OECD estimates results. In pre-1980 fiscal shock turns out to be small and post 1980 government shock larger than previous shock. Five variables are used which are Inflation, Total output, interest rate, Government expenditure, and net revenue Biau and Girard (2005) to evaluate the effect of fiscal policy shocks in France. They conclude that private consumption has a positive reaction and private investment reaction in the first year is positive and remaining is negative. Frédéric J. (2016) also followed by the Blanchard and Perotti's (2002) approach and assesses the short run effect government spending in Morocco. Falk et al. (2006) in case of German economy quantify that a positive government expenditures shock is leading to enlarge the growth of GDP and private consumption. In Italy Giordano et al. (2007) found that government expenditures have significant and persistent impacts on GDP and private consumption.

Blanchard and Perotti's (2002) study follow many studies. Perotti (2005) developed a vector auto regressive (VAR) model with total GDP, Government spending, taxes, inflation and interest rate for 5 OECD countries. He found fiscal policy has very low effect on GDP and government expenditure shock effect on private consumption is significant over three year's skylines. Biau and Girard (2005) in France use the same model. Raffaela Giordano et al. (2005) adopt Blanchard and Perotti's (2002) approach for Italy and Fernandez (2006) for Spanish economy. Giordano et al. (2007) assess the effect of fiscal policy shock in case of Italy by using one extra variable as follow the Perotti (2005) approach. In case of Spanish economy proposed this approach by De Castro and Hernández De Cos (2008) found government expenditures are causes of increasing GDP and private consumption. Caldara and Kamps (2008) and Fatas and Mihov (2001) investigate positive government expenditure shock increase the consumption and real wage. Alesina *et al*. (2002) and Arin et al. (2015) found a little bit confusing result. They argue that fiscal shock on government wages and salaries is the cause of boosting GDP in short run and long run as well which leads to non-Keynesian effects. Mountford and Uhlig (2008) investigate the fiscal policy shocks for US economy for the period of 1955 to 2000. The findings of the study predict that three different structure, deficit financed expenditure raises, balance budget

spending raises, and deficit finance tax decreases. They conclude their results and found deficit finance tax cut is more appropriate to boost up the total output of the US economy. Burriel et al (2010) estimate the fiscal policy shock with new database for US and Euro area as whole. The findings of the study show that output increase and inflation is due to government expenditure shock notwithstanding the GDP multiplier are very close and steadily raising after 2000 in both US and Euro area. In contrast Ramey (2007), Burnside et al. (2004), and Pappa (2009) investigate as positive expenditure shock increase the rate of unemployment. On the other side some studies consider real wage fluctuation as positive government expenditure shock Pappa (2009) discuss in this study increase in real wage Burnside et al. (2004) found decrease real wage to positive government shock.

There is an important body of literature allocate that a shock of fiscal policy on leading macroeconomic variables through Structural Vector Auto regression (SVAR) model. For example, Ardagna, Alesina, and Perotti and Schiantarelli (2002) estimate the impacts of change in fiscal policy on private investment using a group of OECD countries. The results of the study show that tax increases are cause of low growth of total output which are proposed the Blanchard and Perotti (2002) findings. They conclude their findings that private consumption increases due to tax increases. In addition, Perotti (2004) found that any change in tax structure effect the GDP of the country and its component is frail over time.

Economic theories are recommended different form of taxation. For example, Barro (1990) suggest that negative impact on growth is due to the non-productive expenditure finance by distortionary tax. Baxter and King (1993) found that non-productive government expenditure and lump sum tax have different impacts on the economy. Gordon et al. (2004 and 2004a) examine that income tax and consumption tax have different impact on investment and saving decision. Restrepo and Rincon (2006) analyse the impact of dynamic fiscal shocks on GDP in case of Chile and Colombia. They are respectively used structure vector auto regressive (SVAR) and SVEC econometric techniques in respective to estimate the spending multiplier with quarterly data. Findings of the study show that government spending shocks has significant and positive effect on total output in both countries.

Ramey and Shapiro (1998), introduce the Event-Study approach which analysis the large unexpected increasing trend in defence spending in US. This study has been second by Edelberg

et al. (1999), Fisher and Eichenbaum (2004), Burnside *et al.* (2004) and Perotti (2007). Romer and Romer (2007) concerned with government tax revenue shock uses this approach and found that increasing in tax revenue is highly contractionary in the United State. Fatás and Mihov (2001) use recursive approach and estimate the fiscal policy shock on employment and consumption. Mountford and Uhlig (2009) use sign restriction approach for fiscal policy analysis and for estimating monitory policy shock Faust (1998) use the same approach. However, Canova and Pina (1998), and Canova and De Nicol`o (2002) use same approach to identify the monitory policy shock. Canova and Pappa (2007) also use sign restriction approach to analysis the fiscl policy shock. Another study Dedola and Neri (2007) use sign restriction approach to impulse response for technology shock. In addition, Benati and Mumtaz (2007), Mountford (2005), Fry and Pagan (2007), Fry (2007) and Peersman (2005) use sign restriction for identification of multiple shocks.

Benjamin and Kochin (1984) and Barro (1986) have studies the government expenditure impact on economic activity in UK using the data from eighteen century to World War I. They found that temporary increasing trend in government purchases affect the real interest rates. Specifically, government expenditure shock has not well for interest rate on long term basis. Perotti's (2005) results for UK suggest that government expenditure shock has significant effect on short interest rate. Tax revenue shock has little impact on prices. Positive shock on government expenditure is cause of increasing GDP and negative shock on government tax revenue extract to decreasing trend in total output, private investment and private consumption. According to Monacelli and Perotti (2006) a positive government expenditure shock leads to boost up the private consumption and total output decrease the balance of trade and depreciate the exchange rate. Avn*et al.* (2007) assert similar findings but the in their study they use panel VAR but in previous study use country based estimated VAR has been used. Afonso and Sousa (2009) using recursive identification scheme to examine the fiscal policy shock on total output of the economy through Bayesian Structural Vector Autoregressive (BVAR) model. According to their findings private consumption have no effect on government spending shock negative effect on private investment and very persistent positive with government revenue shock. In addition, wages tend to be positive.

W. Kim (2006) pursue the Blanchard and Perotti (2002) SVAR econometric technique in case of Korean economy with quarterly data from 1970 to 2003 and found that government expenditure shock has positive and Tax shock has negative effect on total output of the economy. These results are reflecting the findings of Blanchard and Perotti (2002) study. S. Kim (2007) examines the short run effects of fiscal policy shock by using the quarterly data of 1994-2006 for Korean economy. Their findings show that spending shock decreases the GDP, interest rate and inflation. A tax cut policy leads to increasing GDP and interest rate and declines the inflation rate.

While Darrat (1984) using St. Louis equation model in his study found that in developing countries fiscal policy is more effective to increase the overall economy. Blanchard and Perotti (1999) and Taylor (1993) find same results. In another study with St. Louis equation model Chowdhury (1988) argues in the study the effectiveness of fiscal policy is different across the developed countries. He suggests that increase in government expenditures are fully balance and negative wealth and substitution effects is crowding out due to expansionary fiscal policy. Upadhyaya (1991) also use St. Louis equation model for all developing countries and results show lack of constant analysis across the countries. Chaudhary *et al.* (1986) use VAR model instead of St. Louis equation model and find the same results of pervious study.

Gemmell et al., (2006) analysed the effectiveness of fiscal policy with uses of panel data of OECD countries and found that productive expenditure are positive and distortionary taxes are adverse effect on economic growth in long run. The long run impact in all OECD countries is the same but in short run results are quite different. In another study Knellera, (1999) found the same results. Martin and Fardmanesh (1990) also examined the effectiveness of fiscal policy on economic growth in developing and developed countries of sample of 76 countries with taxes and non-tax revenue, Spending, share of gross fixed capital formation in GDP and deficits are considered. They conclude their findings tax, deficits have negative and government productive spending has positive effect on economic growth.

Many researchers have explored the importance of fiscal policy variables on unemployment in the past years. The economic researcher given an unclear result about the relationship among fiscal policy and unemployment. Battaglini and Coate (2011) checked the relationship between fiscal policy and unemployment and suggest that government should increase the development expenditure and tax cut policies. Government expenditure is the main instrument and should

increase in development sector for better economic growth. The study conducts by Leigh and Neill (2008) together for examine the impact of government spending and unemployment. The results of the study show that government expenditures have a significant impact on unemployment because of development expenditures are automatically generating employment opportunities in the country. Another study Castro and Fernandez (2013) analyse the impact of fiscal policy shock on effective exchange rate for Spanish economy over the 1981 to 2008 time period. The study uses standard structural VAR framework and found that response of government spending on output is positive and response of government spending and private consumption jointly disturb the trade balance. This study also found the twin deficit in Spanish economy. Another study for Spanish economy Pablo (2006) estimates the exogenous fiscal policy shock through VAR framework. The results of the study show that in short run government expenditure shock have positive effect on GDP and lower output in medium run and long run. The study also found that in short run higher output at the cost of higher inflation and public deficit.

Before the policy implication we cannot judge the effectiveness of fiscal policy the findings of the fiscal policy tell us the how much policy is effective it was for this purpose Farmer (2009) analysis of effectiveness of fiscal policy and found that private expenditure is more appropriate as compare to government expenditure to restore the full employment level. Fiscal policy has a microeconomic and macroeconomic level effect on the economy to check the macroeconomic effect Afonso and Sousa (2009) conduct a study and revealed the results that government spending has positive impact on GDP growth and negative impact on private investment. Another study Fatas et.al (1998) checks the macroeconomic impact of fiscal policy. The results of the study show that due to increase in government expenditures investment was not affected significantly and also found that expansionary fiscal policy with development spending show positive effect on unemployment. Furthermore, it was found that as a result of government spending consumption also decrease because of negative wealth effect.

Fiscal performance and GDP growth has positive and long run relation with each other. For examine this relation Gale and Orszag (2003) conduct a study and found that due to budget deficit negative impact on total output growth because of national saving decrease. Government expenditure decreases when government faces budget deficit and increase the long run cost of

economic growth. It is also found that due to expenditure decrease unemployment also increases in the country. Another study Plotnikov and Farmer (2011) investigate the impact of expansionary fiscal policy on overall economy. The results of the study show that in short run more government spending leads to boost up the economic growth and reduce the unemployment. According to Keynesian expansion in fiscal expenditure does not reduce the unemployment if the economy is not itself confident.

Government should take serious policy initiatives to reduce the unemployment from the country were investigated by Amjad (2005). He observes that government policies are to reduce the unemployment and the main objective of the government policies is to reduce the poverty in the country. The study suggests that government should increase the skill level and more spend in education sector. Furthermore, he suggests that government should pay a lot of attention in public development programmed because of these types of program are helped the employment creation in the country. Another study conducts by Mehmood and Khalid (2013) and analyses the connection between fiscal policy and unemployment for Pakistan economy over the 1980 to 2010 time period. Through co integration econometric technique indicate that there is long run relationship between fiscal policy variables and unemployment. The study also found that Inflation and government expenditures have positive relation with unemployment and tax revenue, growth rate and foreign direct investment has negative relation with unemployment. The findings of the study indicate that foreign direct investment has effective tool to eliminate the unemployment in Pakistan.

Gul et.al (2012) conducts a study to check the Phillips curve working in Pakistan. The results of the study show that Phillips curve is still working in Pakistan because of due to high inflation decreasing the unemployment in the country. They also found that there is a positive relation between unemployment and tax rate. They conclude their findings that there are many problems in the country which are causing unemployment one of the main are no regulation of different development program. Similar study Zaman et al (2011) examines Phillips curve approach through 35 years data 1975-2009 for Pakistan economy. The findings of the study show that in Pakistan there is non-proportional and negative connection between inflation and unemployment. Furthermore, results show that in short run relation between inflation and unemployment is transitory but in long run there is a permanent relationship between inflation and unemployment.

Another study Christie (2011) analyses the various aspects of connection between the government spending and output growth in long run. To find the relation of describe variables for 136 countries of developed and developing countries study use the GMM technique. The results of the study show that government spending is negatively affect the economic growth and suggest that government should manage the public spending because in developing countries public expenditures are more than 30% in 2001to 2005 the expansion in public spending have negative impact in GDP growth in long run.

Babalola and Aminu (2011) try to examine the relationship among the fiscal policy total output of the Nigeria for the period of 1977-2009. The findings of the study get by using the Error Correction Model and Engle-Granger approach and observe that development and non-development both have insignificant impact on economic growth. Furthermore, they found that with contrary to economic theory direct income tax has significant impact and capital spending have insignificant impact on growth of total output. The study concludes with their recommended that government should improve the expenditures on education and health to boost the economic growth in long run. Another study Kakar (2011) investigates the effect of fiscal variables on GDP growth of the economy in Pakistan. To determine the connection among the variables Granger causality, Johansen Co integration and error correction techniques are applied. The study observes that in long run fiscal policy effect the economic growth and in short run output can be stimulation by controlling the interest rate.

Government subsidies and transfer payments are found to be enough and more countercyclical over time. A study conducted by Arreaza, Sorensen, and Yosha (1999) by generating a panel-based estimation of the volatility of the subsidies, government consumption, and transfer payment. The study found and suggests that in recessions due to transfer payment current government expenditure are increases. Similar study Lane (2003) analysis the OECD countries and find that current government expenditures are tending to be countercyclical and behaviour of government investment spending is procyclical. Furthermore, it is found that due to transfer payments or debt government expenditures are countercyclical and due to government consumption component current spending are procyclical.

For budget deficit and interest rate Regan (1984) explained multi regression equation analysis for American economy using Vector auto regressive econometric technique. The study concludes

that current anticipated deficit and budget deficit have long run impact on bond yield. Qauyes (2007) confirmed that crowding out theory is existing in American economy. The interest rate and budget deficit are interring relate and budget deficit increase due to interest rate increasing. Hubbard (2005) examined relationship between fiscal deficit and interest rate by using vector auto regressive technique. The result of the study shows that increase in 1% of government debt will result increase in interest rate these findings are agreeing with findings of Regan (1984).

Josine and Gupta (2007) found the relationship between interest rate and budget deficit by using Johnson co integration technique. The study observed that interest rate and these Treasury bills are not correlated and further argue that in South Africa changing in budget deficit due to interest rate, but this deficit does not cause Treasury bill. Kameda (2008) find under the neoclassical frame work relationship among the budget deficit and nominal interest rate by using (OLS) ordinary least square econometric technique. Furthermore, it is also observed that fiscal deficit has greater impact on interest rate in case of Japan as compared to government internal debt. Another study Husing Y (2001) examined that fiscal deficit increasing due to increase in interest rate and suggests that it need to control. Another study which is uses same econometric technique ordinary least square method by Yasmeen and Nadeem (1989). They found that in Pakistan interest rate effect the budget deficit. Aqeel and Nishat (2000), found the twin deficit in Pakistan and suggest that to overcome the fiscal deficit and budget deficit more money supply should be used. In is examined by Noor and Mehran (2010), budget deficit is the main reason of the crowding out effect by using co integration technique. They also found that private investment has a long run and direct relationship with interest rate while inflation and GDP affect interest rate and positively correlated.

According to Waqas (2012) Recrardian equivalence hypothesis does not hold in Pakistan. He found long run relationship between public debt, budget deficit and interest rate by using ARDL econometric technique. Furthermore, it is examined that fiscal policy is more dominant policy for the balance budget. A study conducted by Rangrajan and Shrivastava (2005) described that budget deficit affect the interest rate. Lekha (2012) examined that in India link the interest rate and budget deficit which are causing crowding out effect. Another study Joseph and Uma (2013) In case of Nigeria since 1970 interest rate and budget deficit are co integrate in short run and long run as well. These results are shows Keynesian theory on government spending is exist in Nigeria. Another study by Lumengo (2012) second the results of Noula (2012) that in South

Africa increase in non-productive expenditure on interest rate are correlated with each other. This study also adopts Johnson co integration and VAR technique like other researcher and suggest that fiscal and monitory mix policies are friendly for investors.

In case of Pakistan economy Yasmeen (1998), Ahmed (1994) and Nadeem (1998) are failed to find the relation among the budget deficit and interest rate. To check this traditional view researcher, use various variables and regress these variables on interest rate. Keeping this traditional view Mukhtar and Zakria (2008) conduct a study. The findings of the study budget deficit having no impact on interest rate and Ricardian equivalence exist in Pakistan. Furthermore, they also found that Keynesian theory of crowding out is hold in Pakistan and suggest that overcome the non-productive expenditure and deficit. In case of Canada in past fiscal deficit had neutral towards the interest rate hence Silkos (1988) attempt a study to examine the current situation and found that Ricardian equivalence was hold in the era of 1960's to till 1980's. Kormandi and Aris (2004) using the multi regression model and counter the finding of Regan (1984). The findings of the study seconded the neutrality hypothesis and found that impact of current and expected deficit. Whenever there is a large grow in demand for loan by the government Sweden also face the crowding out problem and in Turky current account deficit and fiscal deficit are endogenous in nature. Yankin (2016) try to find the twin deficit hypothesis using VAR (Vectot auto regressive) econometric technique. The findings of the study show that there is no the twin deficit in Turkey but Recardian equivalence exists in Turkey. On the other hand, different findings of fiscal deficit and interest rate in other study Chen (2011) show that results of loan able funds are completely adverse the Yankin (2016) in Japan. The Results shows that when increase in budget deficit decrease the interest rate.

According to Keynesian point of view interest rate have adverse effect on total output. Because when monitory authorities increase the interest rate investors are discourage and investment in the country is low level which are ultimately affect the growth of the economy. Aron and Muellbauer (2001) found that interest rate affects the total output at least three years. The results of the study suggest that a change in monitory policy toward the interest rate also capturing volatility of output growth. Rangrajan and shrivastava (2005) also second the findings of Aron and Muellbauer (2001) by using the vector error correction technique. They found their study nominal interest rate affect the overall output of the economy. In case of Germany and Japan

economy Charles.T and Thomas (2003) found that due to interest rate volatility economy experience downward trend or lower output growth.

According to Keynesian when government expands its spending positive impact on the output but while later government face deficit problem and economy show the negative sign. Many researchers attempt to do this economic connection and to see the theory in their own economies. The excess current account has significant effect on total output of the economy observes by using the multi-step forecasting technique. On the other hand, Aron and Mullebaur (20001) using structural VAR technique Liana (2001) examined the relationship between GDP, deficit and aggregate debt in Europe and America. The findings of the study show that debt has no impact on GDP but in case of internal debt effects the output of Americans economy. In European countries this policy should be changed for better growth.

Budget deficit has negative impact on total output but according to William and orszag (2003) in case of Srilanka and Singapore in short run budget deficit increase the economic growth but in long run economy face hurdle in the way of GDP growth. Furthermore, it is also found that fiscal factors cause money growth. In the next year Antika (2004) try to examine the effects of budget deficit on growth of GDP by using the granger causality. The findings show that GDP affecting the budget deficit and this relation is unilateral. Another study Arisen and Hauner (2008) observe through GMM technique that deficit is more effect on emerging countries as compare to advance countries. This study agrees the findings of Kormandians Aris (2004) for USA. Same study done by Dejtbanmrong (1993) for Asian countries and suggest that when deficit is low fiscal policy is more effective and more financial option is available. They also found that total output helps to reduce the budget deficit but in very small fraction. Same study conducts by Bob (2008) and conclude that effects of long run co integration between interest rate and budget deficit in USA also effects in European countries.

According to Keynesian school of thought money supply is considering to be a policy variable because of negative effect of nominal interest rate when money supply increases and this is favourable condition for borrowers. Many researchers try to test this theory in their respective countries.

A study conducts by Hunner (2008) that observe long run connection between the interest rate and money supply in developed countries as well developing countries. The findings of the study agreeing the findings of Monnet (2011). Ezaebasli and joseph (2011) use vector error correction

and Johnson co integration technique to examine the relationship between interest rate and money supply. The study does not use Taylor rule due to changing the interest rate in period of high inflation. Another study Lozano.I (2008) correlation is existing among the money supply and interest rate in short run and long run in case of Colombian economy. It is found that when money supply changes interest rate effected. Furthermore Noula (2012) find the same findings and suggest that government should finance through domestic borrowing and control the non-development expenditure. According to Sberwoski and Weber (2013) money gap and interest rate relation was positive and this gap was increases due to fiscal policy shock not for the monitory. Lekha (2012) use granger causality for findings and figures shows that interest rate is determined by the money reserve. These findings are different from Rangrajan and Shrivastava (2005) findings.

According to Keynesian relationship exist between money supply, government spending and budget deficit. According to Lozano (2008) in Colombia relationship between these variables are exist since 1957. The findings of the study show that relation between money supply and fiscal deficit not the dangerous for the economy of Colombia as compare to other developing economies. The study suggests that government control the money supply for decreasing inflation. Another study Bakare (2014) observe that in Nigeria budget deficit and money supply is co integrated since 1975 and affecting the commodities prices. It is suggesting that in short run inflation does not control but in long run this problem can be solved. Sajad and Samimi (2011) using (VAR) vector auto regressive econometric technique and found that in Iran budget deficit has positively affected by money supply. Furthermore, they also observe that money supply is the cause of inflation in Iran. In Asian countries Dejtbanmrong (1993) conduct a study and examine the relation between the budget deficit, money supply and output in SEACEN group of countrie which include Singapore, Sri Lanka, Thialand, Philippines and Malaysia. This study using the granger causality technique and results shows that Thailand and republic of Korea fail to explain monitory growth. In case of Malaysia and Philippine no clear relationship exists among the money supply and budget deficit.

Ridu (2004) empirically proved that in the late 1990's loans and money supply are unable to explain the volatility in output growth in Japan. In case of America Liean and Hung (2011) observe that previous value of GDP is affect the current value of money supply since year 2000. A Herwartz and Reimers (2006) analysis by usin P-star model that if the money supply and GDP

are positively correlated then spends more immediately on development and public spending projects. Francis (2010) examined that money supply cause GDP growth in Nigeria but in past tio still 2010 unchanged the GDP growth due to change in money supply. These findings are done by error correction model and suggest that expansionary and contractionary monitory policy have no effect on growth of GDP. Another study Nori and Suleiman (2011) observe that there is long run co integration and causality among the GDP growth and money supply in Sudan and Iran. They find their results with ordinary least square method and suggest that control the excessive money supply to decrease the inflation in the economy.

Same findings are observing the Sayed (2014) in case of Bahrain economy by using the vector error correction model. The findings of the study confirmed that relationship exist between GDP growth and money supply. It is suggesting that through coordination between central bank and government money supply should be directly controlled. Andreas and Antonio (2011) observe correlation among the GDP and money supply since 1980's and in Cyprus public spending has major share on development projects. They found that liquidity trap and inflationary pressure in the economy are accruing due to these public expenditures. It is suggesting that government should more focus on development expenditure rather than current expenditure.

According to Keynesian school of thought there is direct or indirect relation among the money supply, interest rate, budget deficit, government expenditure and output. Researcher tries to prove this theory and check the availability of other variable to fit this collaboration in their respective regions. In Nigeria Ezaebasli and joseph (2011) examined the fiscal deficit have impact on interest rate and due to interest rate money supply has adverse effect. These findings are done by using johnson co integration and vector error correction technique. Nigeria Sule and Bagaji (2012) conducted with findings that in long run budget deficit cause money supply and GDP growth. This study done without including the interest rate effect on output and budget deficit impact on interest rate. It is suggesting that policy should be balance and well planned and execute properly to run the economy efficiently. Same suggestion is given to the study by Papa and Vella (2013) and indicates that effective changing in monitory policy and reform in interest rate.

For explaining the small economy "Muddle Fleming model" is consider the best model. Noula (2012) observed that interest rate affected by real income, money supply, and budget deficit. Furthermore, it is examined that nominal interest rate also effects the budget deficit. The study

suggests that government finance through domestic borrowing and control the current expenditure. Another study Rojer and Charles (2012) observe that existing the long run co integration between budget deficit, interest rate and output. Qauyes (2007) also agreeing the findings of Rojar and Charles (2012) study that fiscal deficit effected by nominal interest rate. Another research Ankita (2004) examined the impact of fiscal deficit on money supply, Inflation, and total output growth. Through granger causality it is observe that there is unilateral causality between GDP and budget deficit. Furthermore, it is also found that money supply and CPI is correlated but budget deficit does not affect money supply and CPI in India. Lekha (2012) also conduct a study but the findings of this study are different from Rangrajan and shrivastava (2005). The results of the study establish by granger causality result and show that interest rate in determined by money supply, expected inflation and volatility of capital flow but it is remained un effected to change in budget deficit.

Jilani and Asim (2010) observe the findings through ordinary least square method that government of Pakistan should impose contractionary monitory policy to decrease the inflation rate, so it is negative impact on total output. It is suggested that for better growth government should lower the interest rate limit to increase the investment. Qayum (2006) also agree and support the effective monitory policy in Pakistan. The study found that money supply effects the GDP growth and suggest that government should adopt the tight monitory policy. Because according to his findings inflation is determined by the money supply since 1960's and also totals output growth. Another study Iftikhar and Wakeel (2013) conduct a study and observe that by using the 3 stage least square method money supply affected by the foreign reserve, government borrowing, and credit provide by the private sector positively. Furthermore, they found that interest rate effect money demand negatively and positively effects by real output.

Demand for money is the negatively correlate with interest rate because of both are dependent on marginal utility of consumption. Saberwoski and Weber (2013) generate a impulse response function and the findings show that money gap was not rely on monitory functions while existence of effective fiscal policy shock increase the gap between money gap and interest rate.

Another debate starts in the world wide after the rescission of 2008 and 2009 consequences of fiscal deficit. To examine these prevailing phenomena Martattin, Paesani and Salotii (2011) investigate a study on Italy, United states of America and Germany. The results of the study show that exist the relationship between fiscal deficit and economic growth.

Hameed and Amen (2011) investigate the effect of monitory policy on output growth. The findings of the study show that impact of interest rate on GDP growth is insignificant and money supply impact on total output is positive and significant. Jilani and Asim (2010) confirmed the findings of Hameed and Amen (2011) and there is consensus developed by them a contractionary monitory policy is good for better growth and low inflation. The study of Ihsan and Anjum (2013) not agree with the Jilani and Asim (2010) findings and found that CPI and interest rate have positive and significant impact on economic growth. According to their results when State bank grow the money supply the performance of all the sectors are observing well and overall economic performance of the country is better. Furthermore, it is found that to money supply as tool to control the inflation was questionable and new interest rate is effective tool to control the overall economy. Nwankwoeze (2011) find the very interesting result in case of Nigerian economy. The results of the study show that exchange rate and interest rate does not affect the output growth but the connection between GDP growth and money supply still strong hence Oweye (2007) also validate the Nwankwoeze (2011) findings.

A large number of studies are done to estimate the fiscal policy variables on GDP growth inflation, consumption, exchange rate, investment, external deficit and other key macroeconomic variables by Castro, *et al*. (2006), Amanja and Morrissey (2005), Fatas and Mihov (1998), Landau (1986), Sinha (1998), Rezk (2006) and Kukk (2006). Budget deficits, tax revenues, and government expenditures use as fiscal policy variables and researchers found different results of fiscal policy variables to macroeconomic activities. According to Claus, *et al*. (2006), Höoppner (2003), Castro, *et al*. (2006) and Heppke-Falk, *et al.* (2006) government expenditures shock has positive effect on economic growth and tax revenue shock are negatively affected to GDP. In addition, Jafri, *et al*. (2006), Balassa (1988) and Iqbal and Zahid (1998) estimate the budget deficit in negative effect to economic growth in long run. Many authors are Odedokun (2001), Tanzi and Zee (1997), Barro and Sala-i-Martin (1995), Amanja and Morrissey (2005), and Mendoza, *et al*. (1997) use fiscal variables in the growth equation and found that positive contribution. According to Easterly and Rebelo (1992), Balassa (1988), Iqbal and Zahid (1998), Mwebaze (2002), Barro (1991), Fischer (1993) and Levine and Zervos (1993) the rising trend in budget deficit is the main cause of low growth.

In case of Pakistan only few studies Shabbir and Mahmood (1992), Ahmad and Qayyum (2008), Khalid, *et al*. (2008), Haque and Montiel (1991) examined the impact of fiscal policy variables on economic growth In addition few studies Iqbal (1994, 1995, 1998), Iqbal (1994, 1995, 1998) are about budget deficit and found that deficit is the more influent variable to effect the total output of the economy.

2.4 Literature of Fiscal and Monitory Policy

In the era of 1960 discussion started related to effectiveness monitory and fiscal policies. Friedman and Meiselman (1963), and Andersen and Jordan (1968) two seminal papers are important examples in this regard. Andersen and Jordan (1968) paper is important and firstly analysed the effectiveness of monetary and fiscal policy on GDP. They find in the study that monitory policy is faster and effective as compare to fiscal policy to influence the overall economy. In case of developed countries effectiveness of monitory and fiscal policy specially focus on US in 1974. Waud (1974) examines the effectiveness of both in case of US economy and found that both monitory and fiscal policy are equally important to the economy and have significant impact on GNP. These results are adverse the Andersen and Jordan (1968) study which arguing that monitory policy has more influence on the US economy.

Another study by Batten and Hafer (1983) analysed the effectiveness monitory and fiscal policies in six developed countries which are France, Italy, Canada, Germany, UK and USA in late 1960. They found that in all countries monitory policy is more influence on GNP growth and fiscal policy has no significant influence on the economy. Recently Senbet (2011) examine the relative effectiveness of two polices and conclude that monitory policy is more appropriate for the US economy as compare to fiscal policy. Another study Bruce and Snyder (2004) analysed the relative effectiveness of fiscal and monitory policy using the US data. They found that fiscal policy is very influent to total output of the US economy.

In case of developing countries more studies are done to examine this effectiveness about policies. For this stance Adefeso and Mobolaji (2010), Ajisafe and Folorunso (2002), Looney (1989), Olaloye and Ikhide (1995) examine the effectiveness. Among some other studies Ali and Ahmad (2010), Chowdhury (1986a, 1986b), Havi and Enu (2014) and Fatima and Iqbal (2003) focused on the Kenya, Saudi Arabia, Bangladesh, Pakistan, Ghana and Serbia. Ajisafe and Folorunso (2002) analysed the relative effectiveness of monitory and fiscal policies using error correction and co integration estimation techniques in Nigeria. They quantify their results and

show that monitory has more influence as compare to fiscal policy to boost up the output. Another study in same country by Adefeso and Mobolaji (2010) but different time period and find same results of Ajisafe and Folorunso (2002) study. In contrast, Olaloye and Ikhide (1995) find that fiscal policy is much stronger than monitory policy. In additions, Sanni et al. (2012) find different results in same country. They argue that none of the policy, it superior than other policy depends on numbers and type of the variables. They conclude their study with remarks that monitory and fiscal policies both are appropriate for the economy. Jordan, Roland and Carter (1999) examine the effectiveness of macroeconomic policies in Caribbean countries. Government spending as fiscal policy and net domestic asset as monitory policy use in the study. Vector auto regressive (VAR) base results show that both fiscal and monitory policies are equally effective on economic growth but in long run coefficients of monitory policy are not good for economic stabilization. Another VAR base study Senbet (2011) examines the effectiveness of fiscal verses monitory policy in US. Government spending and real money stock as a use of fiscal and monitory policies respectively. They conclude their results monitory policy is more effective as compare to fiscal policy for output growth of the country. Bernanke and Blinder (1992) firstly use VAR methodology to analyse the effectiveness of fiscal and monitory policy which are pursue other researcher in their studies like Blanchard and Perotti (2002) and Bernanke and Mihov (1998) in case of US economy. Bernanke and Blinder (1992) check the policy shock through imposing the set of restrictions about contemporaneous impact. Bernanke and Mihov (1998) also use same methodology of imposing restriction and built a semi structure VAR model.

Havi and Enu (2014) in the other country specific study investigate the relative effectiveness of fiscal and monitory policy with OLS estimation. They found that both policies are employing economic growth in Ghana, but monitory policy is more effective than fiscal policy. Another country-specific study by Jawaid et al. (2010) analyses the relative effectiveness of fiscal and monitory policy in Pakistan from 1981 to 2009 time period. They estimate that there is long run relation among the monitory and fiscal policy and GDP as well. In case of effectiveness monitory policy has more influenced on the economy of Pakistan as compare to fiscal policy. In contrast Mahmood and Sial (2011) find that both monitory and fiscal policy is significant for the growth of Pakistan.

In recent years many researchers tried to find relative effectiveness of both polices in many countries regardless of their development rather than a country wise study. These sort of study such as Jayaraman (2002), Petrevski et al. (2015), Batten and Hafer (1983), Atchariyachanvanich (2007), Owoye and Onafowora (1994), Ali et al. (2008) and Hussain (2014) are the main studies. For this stance in 10 Africans countries Owoye and Onafowora (1994) investigate the relative effectiveness monitory policy and fiscal policy by using VAR model. They quantify their results with indicating 5 out of 10 supports the Monetarist view that is monitory policy is much stronger than fiscal policy and other five countries results showed Keynesian view that is fiscal policy is more dominant policy as compare to monitory policy. They conclude that in case of Africans countries it is not possible to pursue a single policy for growth relative importance of Keynesian and Monetarist for the African economy. Fatima and Iqbal (2003) expand the multivariate model and investigate the effectiveness of monitory and fiscal policy for output of five South Asian countries which are Malaysia, Thailand, Indonesia, Pakistan and India. The study finds unidirectional causality in case of Pakistan, Indian, Malaysia and Indonesia but in case of Thailand find bi-directional causality. Ali et al. (2008) analysed the effectiveness of fiscal and monitory on total output of South Asian countries with ARDL technique and time series data from the 1990 to 2007time period is used. The findings of the study also show monitory policy is more dominant to economic growth than fiscal policy in South Asian countries.

Most interesting study done by Atchariyachanvanich (2007), investigates the relative effectiveness of fiscal and monitory policy in 12 countries, including developed and developing countries. He uses the quarterly data from the period of 1990 to 2004 with OLS econometric technique. Divide the 12 countries in three sets which are fiscal policy dominated, monetary policy dominated, and mixed policies dominated. The findings about the effect of mixed policies on output are ambiguous. In other multiple-country study Petrevski et al. (2015) analysed the effectiveness of macroeconomic policies in three South Eastern Europe countries with quarterly data and VAR model. The findings of the study show that positive government shocks are the cause of raising GDP in all countries and suggest expansionary fiscal policy is good for Bulgaria, Croatia, and Macedonia. In another study regarding South Asian countries Irum and Ali (2008) examined whether fiscal or monitory policy effective for GDP growth with ARDL and ECM econometric techniques. The findings of the study show that monitory policy is much better than fiscal policy for the growth of South Asian countries. Abbas (1991) investigate the connection

among the monitory aggregates and GDP of Asian countries and establish the Bidirectional causality between two variables.

Friedman and Meiselman (1963) investigate the validity of Keynesian and monetarist approach in study of Kenyan economy through single equation models. The results of the study show that monetary policy is more effective approach as compare to Keynesian model. In another similar study, Jordan and Anderson (1968) use a dynamic econometric approach and conclude that monitory policy is much stronger and has stronger influence on overall economy. In contrast Chowdhury (1986) examine the relative effectiveness of fiscal and monitory policy in St. Louis. He concludes his results which are contrary to Jordan and Anderson (1968), that fiscal policy is more effective than monitory policy.

Hassan (2006) use structural VAR model to investigate the relative effectiveness of fiscal policy in case of Egypt by using of annual data from 1981-2005. The findings of the study show that fiscal policy is inappropriate to stabilize the Egypt economy. In contrast Adefeso and Mobolaji (2010) re analyse the effectiveness of macroeconomic policies on output growth of Nigeria. They employed their results with cointegration technique and found that in case of macroeconomic stabilization monitory policy is more effective to stabilize the economy as compare to fiscal policy. In case of Thailand Koimain (2007) examine the causal relation among the real GDP and government expenditure. Government expenditure is used as proxy of fiscal policy and finds no cointegration between economic growth and government expenditure but causality between M2 and economic growth are developed in the study. Patterson and Sjoberj (2003) supporting these results with using the Sweden data from 1961 to 2003. Dungey and Fry (2007) estimate the identification monitory and fiscal policy shocks by using the sign restriction approach. Pesaran (2007) use same identifications with permanent and temporary shock methodology. Caldara and Kamps (2008) use a recursive approach in US economy for fiscal policy shocks analysis.

Rukelj (2009) examine the relationship between macroeconomic policies and output growth in Croatia. The findings of the study show that fiscal and monitory policy has no relation and move in the opposite direction. Fiscal policy is mostly insignificant about narrow money and monitory policy shock produce negative impacts on government spending. Another study in Croatia, Ravnik and Žilić (2011) estimate tax revenue and government shock have negative impact on total output and found that interest rate is the strong responder of fiscal policy shock. In addition, they found that fiscal policy has a little impact on inflation. Hinić and Miletić (2013) examine

the relative effectiveness of macroeconomic policies by using the Serbian economic data. The findings show that tax revenue and government spending shock are effective for output but fiscal multiplier in short run are smaller. Monitory and fiscal policies shocks are accommodated with each other.

Jawaid et al. (2010) estimate the effectiveness of fiscal verses monitory policy in case of Pakistan economy. They conclude their results that monitory policy is more prominent for the growth of the country and found long run relation among macroeconomic policies and economic growth. Another study in Pakistan Alam and Waheed (2006) examine the sectoral impacts of monitory policy. Results of monitory shocks variation in real output with declining trend in second quartet and boos up after second quarter with respond to expansionary monitory policy.

The insurance sector, manufacturing wholesale and retail trade are decline due to interest rate shock. Long run relation results are following the Alam and Waheed (2006) findings. Hussain and Siddiqi (2012) also examine the relationship among the fiscal and monitory policies and institutions in Pakistan. The outcomes of the study show that monitory policy and economic institutions have more influence on the increase of the GDP and per capita but there is no significant role of political and social institutions to grow up the per capita and output. They suggest government should take a healthy fiscal step to boost up the efficiency of government institutions. Khan and Qayyum (2007) investigate the monitory policy shock for Pakistan economy with applied the Monetary Condition Index (MCI) to estimate the changes in exchange rate and interest rate. The findings show that in case of Pakistan supply shock is more dominant exchange rate is more appropriate than interest rate.

Mohammad et al. (2009) investigate the long run relationship between macroeconomic policies and economic growth on Pakistan. They quantify the results with long run relation between monitory policy and total output is accrued but in case of fiscal policy results are negative and insignificant.

To summarize the literature has identified different methods to calculate potential output. Each of the method has its pros and cons, while the production approach is relatively better because it considers the potential inputs to produce the output. In case of Pakistan, literature doesn't find any study that calculates output gap using production function approach. There are studies that calculate impact of fiscal variables on output gap, but literature lacks the examination of fiscal policy shocks on output gap in the long run and short run for Pakistan. Thus, this study

considering the output gap tries to build a SVAR model that involves interest rate and inflation in addition to fiscal policy variables that is tax revenue and expenditures to capture gap in Pakistan economy.

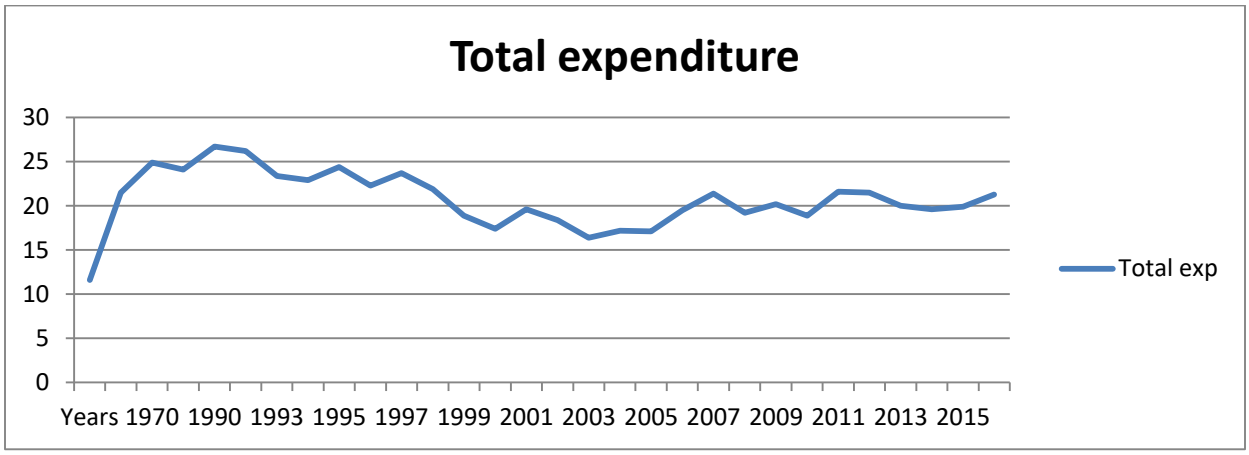
CHAPTER 3

TREND OF OUTPUT GAP AND FISCAL PRACTICES IN PAKISTAN

Pakistan has per capita income of US 1641 dollars per annum and 6th most populist country with 193.2 million populations in the world. In Pakistan 24.3% people of the total population live below the poverty line. Fiscal policy tools are used for allocation of resources efficiently that helps the economy to produce up to its potential level. Macroeconomic policies are very helpful and play a vital role to improve the living standard of the common man. For macroeconomic stability a sound fiscal position is pre-requisite for promoting economic growth and reducing the poverty. For better savings and mobilizing the resources in efficient way fiscal management helps to achieve the goals. Role of fiscal policy in developing country like Pakistan is very important to boost up the growth of the economy and breaking the vicious cycle of poverty. Fiscal policy deals with the government revenue, government expenditure which is composition of development and non-development expenditure, Public debt and deficit. This chapter discusses the changes made in fiscal policy tools by different regimes and its trend over the period. Before going into detailed empirical analysis of the fiscal policy tools and output gap it is necessary to discuss the trend of fiscal policy measures later in the part, so this chapter presents detail wise trend of fiscal policy tools from 1960 to 2017.

3.1 Government Expenditure

Figure 3.1 **Trend of Government Expenditure**



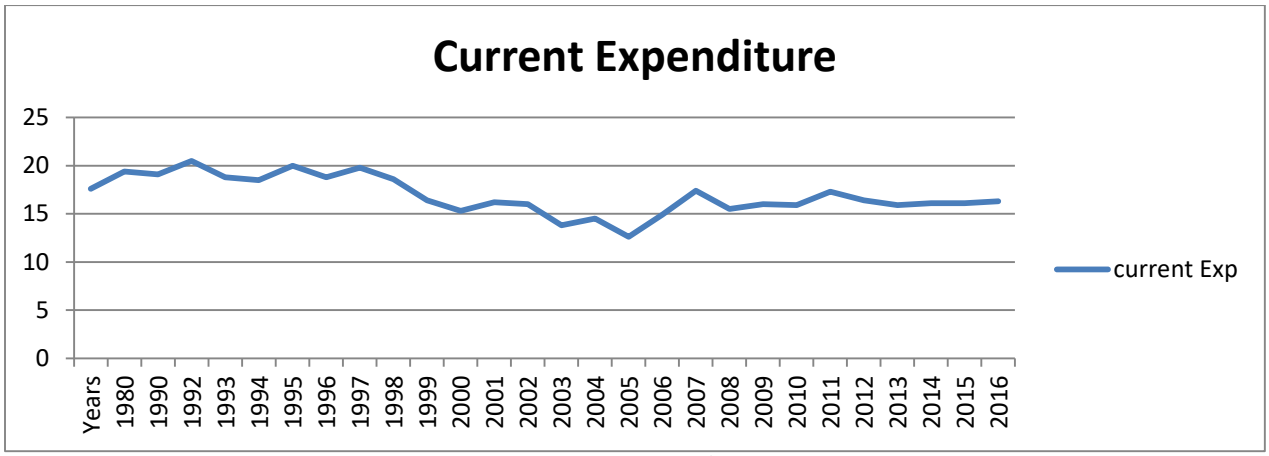
Source: Economic Survey of Pakistan

In case of Pakistan saving and investment by the private sector is very low. While on the other side every government prefers to spend more in public sector and create constructive demand in the market but the effect of public spending on total output growth is not much clear both theoretically and empirically. In 1960 public spending has grown consistently in Pakistan. During the 1960's public spending is 11.6 % of GDP as average which are grown to 21.5 % 1n 1970's. In 1970's the major reason of accelerating the public expenditure is government nationalization policy. Due to nationalization policy government owned the private sector and lost the control over fiscal expenditure. Public spending permanently grew and in 1980's it become 24.9 percent of the GDP. In case of revenue collecting it's remained stagnant and budget deficit expand, on this situation of the economy government more rely external debt to fill this revenue gap. Debt problem were very severe in 1990's and Pakistan adopted structural adjustment program. Pakistan face financial crunch due to commitment made with the international financial institution (IFI's). Public spending was shrinking, and they were on average 15 % of the GDP in 1990's. The economic growth was slow due to this reduction in public expenditure in 1990's. However, Government total expenditures remained stable and are an average 8 to 11 percent of the GDP. The changes in public expenditures in last thirty years are summarized in above picture government spending as a percentage of GDP was permanently grow in 1980 to 1990 but after 1990 it was declining up to 2005. After the earthquake in 2005 government expenditures are increases with an average of 20 percent of GDP till 2017.

3.1.1 Current Expenditure

Current expenditures are spent to finance the current government spending like rent, salaries, interest payments and maintenance etc. which are spent in a short period of time mostly in a financial year. Government current expenditures are increasing at a consistent rate in Pakistan since 1980's

Figure 3.2 **Trend of Current Expenditure**



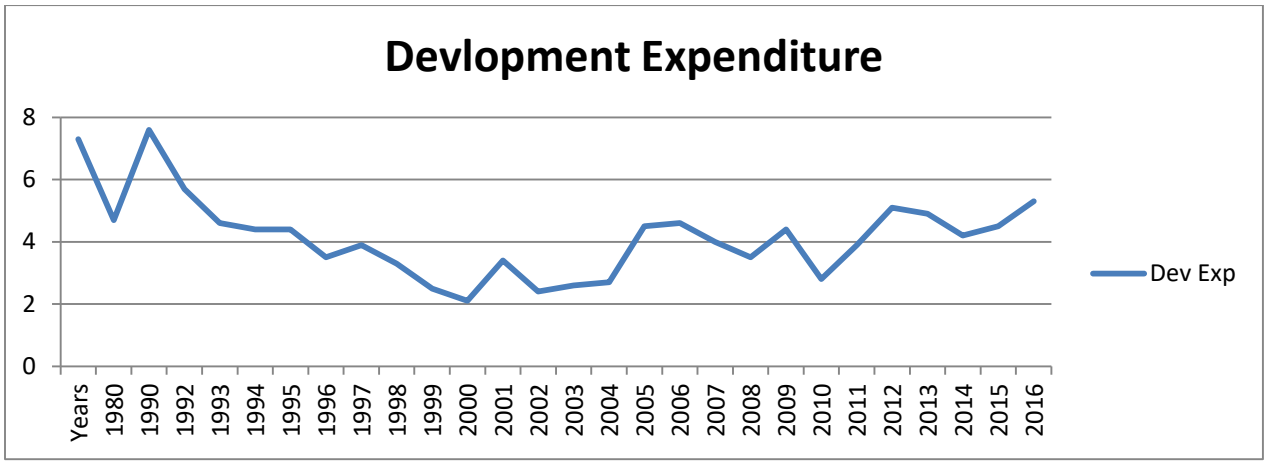
Source: Economic Survey of Pakistan

One of the main reasons of this growing current expenditures is the rapidly increase in inflation rate. An average current expenditure during the period of 1980 was 17.6% and after that it become 18.9% of total GDP during the period of 1990-2000. During this time due to severe political instability total government expenditures are decrease but government current expenditures and development expenditures are increases. It can be concluded that when the government faces fiscal pressure in the economy it cut down the development expenditures rather than the spending of government itself. The current government spending increases so rapidly during 1980 to 1999 that result huge reduction in development expenditures and fiscal deficit did not decline significantly. During the period 2001 to 2006 current expenditures were controlled by the new government and it was on average 14.7% of GDP during that period. After the controlled by new government the current expenditures are as an average during 2008 to 2013 was 16.4 percent. During the fiscal year of 2017-18 government current expenditure are 16.3 % of the GDP.

3.1.2 Development Expenditure

Development expenditures play an important role in the growth of the economy overall development as well as poverty reduction in the country. As mentioned earlier mostly successive governments are unable to cut down the non-development expenditures due to political reason and they are reducing the productive expenditures. Through this strategy political governments were trying to make the expenditures on sustainable level and fulfil the IFI's commitments.

Figure: 3.3 **Trend of Development Expenditure**



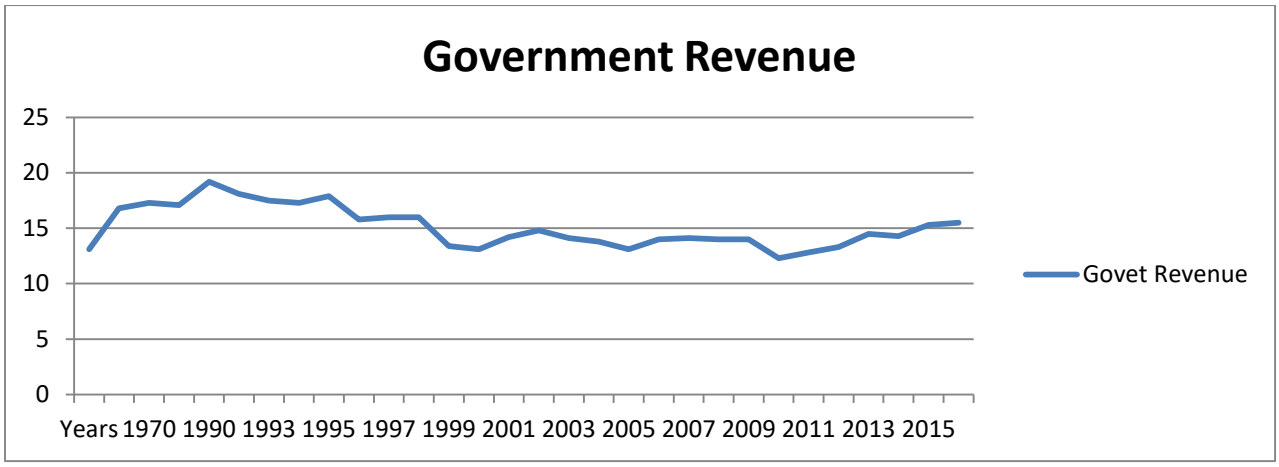
Source: Economic Survey of Pakistan

Development expenditures was on average 7.4 % of GDP in Pakistan during the period of 1973-77 it was consistently decline and in FY 2001 it was mere 2.1 % of GDP. Government development was on average 7.3 % of GDP in 1980's it was shrunk to 4.7 % of GDP in 1990's due to fiscal problems. Development expenditures are consistently decline and it was on average 2.6 % of GDP in 2000-03, but after that situation start improving and development expenditures was 4.5 % of GDP in fiscal year 2006-07. Development expenditures were in fiscal year 2015-16 4.4 % which are increase 5.5 % of GDP in 2016-17. The diminishing trend in development expenditures has negative effect the economic growth in three ways. Firstly, cutback the social expenditures likes' health and education has confined the human development which is perquisite for sustainable economic growth of the country. Secondly cut back in development spending which leads to public spending, especially in social infrastructure such as water supply roads, water and irrigation are very important for boost up the economy. Thirdly cut down in development expenditures put adverse effect on private investment, which in mandatory to public investment in infrastructure.

3.2 Government Revenue

Government collects resources from various channels to finance its expenditures such an equitable way without disturbance the economy.

Figure 3.4 **Trend of Government Revenue**



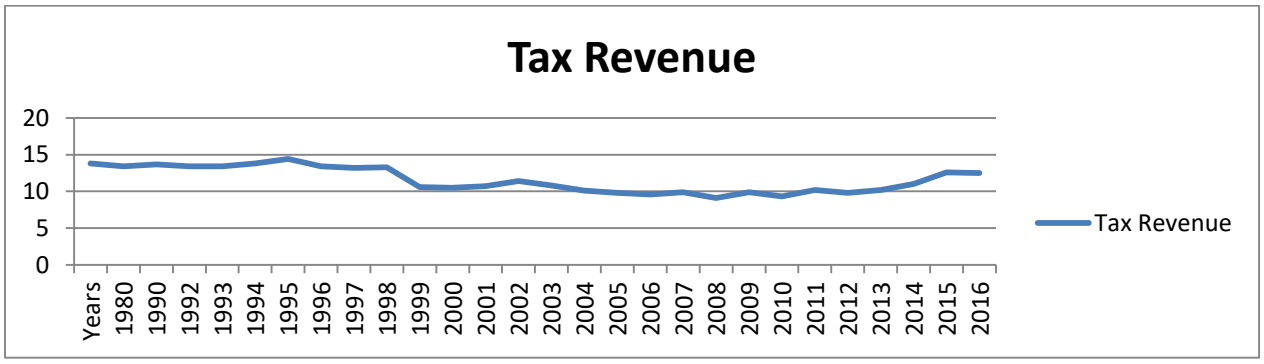
Source: Economic Survey of Pakistan

In Pakistan during the 1960's total revenue collection was an average 13.6 % of total output and this ratio increase 16.8 % of total growth in 1970's and revenue further increase 17.3 % GDP in 1980's. After that government revenue start declining ad it was on average 17.1 % in 1990's. Public revenue was 13.2 % of GDP in fiscal year 2006-7 and total revenue grew 15.3 percent in 2016-17.

3.3 Tax Revenue

If the government increases the services of the people, it should increase the development expenditures. Increasing trend in tax to GDP ratio and revenue of tax elasticity is essential to finance current expenditures without indebtedness in the economy.

Figure 3.5 **Trend of Tax Revenue**



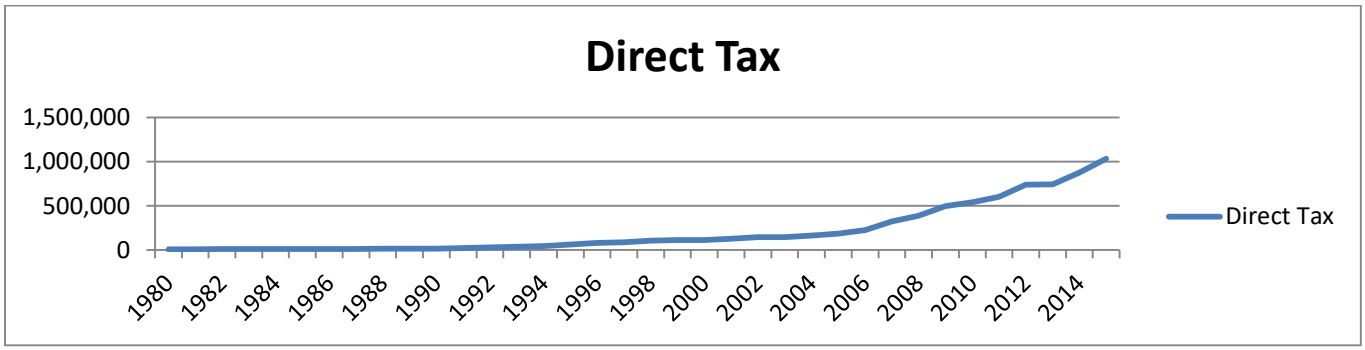
Source: Economic Survey of Pakistan

Pakistan recognized as a country of having inadequate elasticity of tax revenue with respect to total output growth rate and low tax to GDP ratio. In Pakistan tax to GDP ratio during 1980's was 13.7 % which is reduced to 13.1 % in 1990's. This declining trend in tax to GDP ratio was consistent and in 2006-7 it was 9.8.6 of GDP. Tax to GDP ratio continuously increases after the 2012 because of new government takes productive step to increase the tax revenue in Pakistan. This low collection of tax government takes heavy loans to run their expenditures and face deficit. Central Bank takes a various step to increase the tax revenue in 2001. State Bank of Pakistan introduces the three type of scheme which is large Tax-Payer units, Medium Tax-Payer units and Universal Self-Assessment. The result of these schemes is increased tax revenue but this increase in absolute term. These tax reforms are failed to increase the tax to GDP ratio in Pakistan.

3.3.1 Direct Taxes

In the era of 90's many changes accrue in the Pakistani tax system and introduce withholding and presumptive taxes but number of income tax filer in Pakistan about one million which are less than one percent of the population. Direct tax includes income tax and along with supplementary role of wealth tax. Direct taxes are mostly levied on higher income or wealth groups. Direct taxes collect in the form of wealth tax, capital value tax, income tax etc. Direct taxes were only 18 % of the total tax collection in financial year 1990-91. In fiscal year 2000-01 this ratio has been increased to 32 % and in 2006-07 it is 36.9 % of total tax collection. Direct tax collection was 40 % of total taxes in 2015-16. In Pakistan direct tax collection only, 4 percent of total GDP which is low as compare to other developing countries where 7 % of the GDP is.

Figure 3.6 **Trend of Direct Tax**

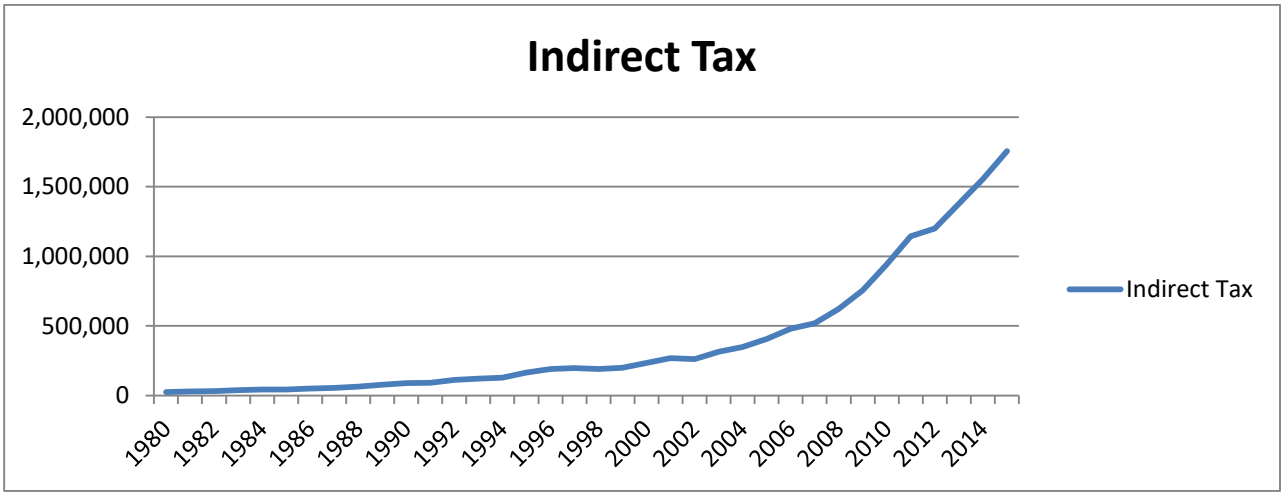


Source: Economic Survey of Pakistan

3.3.2 Indirect Taxes

Indirect tax levied in the form of sale tax, custom duty and excise duty etc. low-income groups are affected more seriously as compared to who which have high income. Despite the fast growth in direct tax collection, share of indirect taxes are very large in tax collection. Because of the government always under pressure by powerful wealthy groups, to collect its revenue with indirect form of taxes rather than direct taxing the upper class directly. Indirect taxes were 82 % in the fiscal year 1990-91 over the period the share of indirect taxes is decrease as in 2006-07 it was 60 % of total tax collection. The share of indirect taxes in Pakistan in fiscal year 2015-16 was 62 % of total tax collection. Pakistan heavily relies on indirect taxes as compare to other developing countries where share of direct taxes is far better in overall tax collection.

Figure 3.7 **Trend of Indirect Tax**

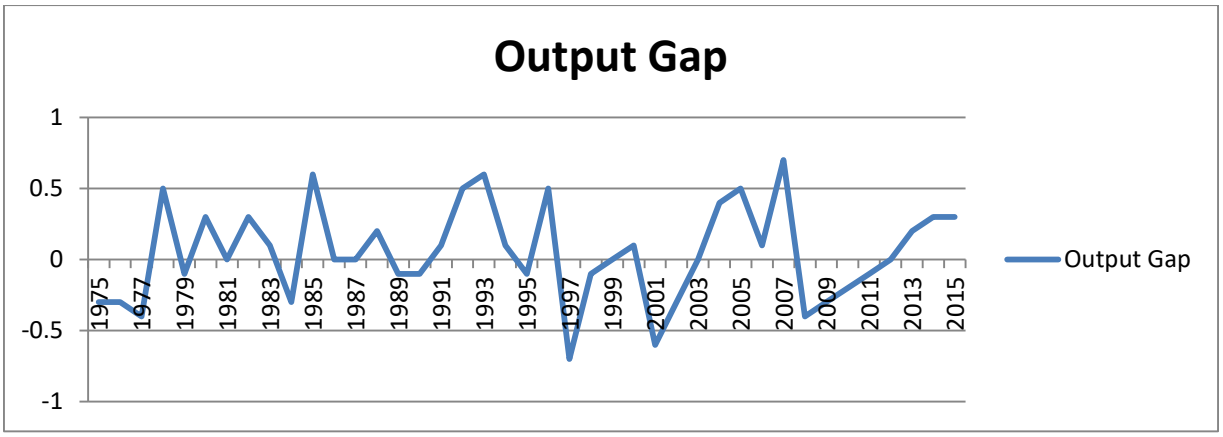


Source: Economic Survey of Pakistan

3.4 Output Gap

Output gap is vital component linking the real economy with trends in inflation and its expected path in the near term. The output gap provides key information to judge inflationary or contractionary pressures and the cyclical position of the economy. If the actual output is greater than the potential output, it reflects that an economy is experiencing demand pressures. This situation is often considered as a source of inflationary pressures and requires a reduction in aggregate demand linked with reduced government spending or tightening of monetary policy.

Figure 3.8 **Trend of Output Gap**



Source: Economic Survey of Pakistan

The output gap has shown a cyclical pattern of excess and deficient scenarios over time. The period of fiscal years 1975 study observed that supply pressure in the economy and this pressure going ahead, in the decade of 1980s.The output gap reflect supply pressures throughout the decade except for fiscal year 1984. In the decade of 90s study observe that the supply pressures were dominating in its later half as compared to demand pressures observed at the start of this decade. The supply pressures continued even in the 2000 to till fiscal year 2004. Unlike the historical pattern the output gap started rising, which points to building of demand pressures in the economy since fiscal year 2004 to till fiscal year 20007. After that economy face serious problem with low demand and high inflation due to worldwide recession and law and order situation in the country till 2013.

The over-all graph of government expenditure, government revenue and output gap suggest that in the period of increasing government expenditure the revenue has also been increasing and correspondingly the output gap observe varying episodes of excess supply and demand pressures from 1975 to 2015.

3.5 Data and Variable Description

3.5.1 Government Expenditure

In economic activity healthy contribution of the government has brought public expenditures to the leading variable among the fiscal tools. The suitable in variation in government public spending can have more direct impact upon the level of economic growth. The consistently grow the public expenditure will have a greater impact upon income of the country, total output and

employment level exactly in same way as expand investment has its impact on them. Similarly, a low level of public expenditures can decrease the level of economic activity through the reverse operation of the government spending multiplier.

During the period of inflation, the basic reason of inflationary pressures in the economy is the surplus aggregate expenditures. Private consumption and investment spending both are extraordinarily high. In this situation, public expenditures, policy must aim at reducing the government non-developing expenditures. In other word, some scheme should be forsaken and other be delayed. In depression public expenditures appear of more appropriate. It is helpful to lift the economy out of the swamp of stagnation. In this period due to lower demand is the result of stagnant private consumption and investment spending. Therefore, it can be met through the extra doses of public spending equivalent to the deflationary gap. The multiplier and acceleration impact of public expenditure will offset the depression impact of lower private expenditure and encourage the path of recovery.

3.5.2 Government Revenue

Taxation is the powerful tool of fiscal policy in the hands of government authorities which have more effect the changes in disposable income, investment and consumption. Government increases the disposable income through anti depression tax policy and promotes consumption and investment. Obviously, a tax reduction policy leads to people have more funds for consumption and investment. Government tax cut policy will ultimately result in the increases of spending activity in the economy, increase effective demand and reduce the deflationary gap. In this regard, something, it is proposing that a reduction in the rate of indirect taxes like sale tax, excise duties and import duty consumption level is promoted in the economy. Many economists argue that to increasing private investment in the country should decrease corporate and personal income taxation. Government adopts these types of policies to overcome contractionary tendencies in the economy.

3.5.3 Output Gap

The output gap is an economic gauge of the difference among the actual output and potential output of the economy. An output gap proposes that an economy is performing at an efficient rate either over utilization or underutilization of its resources. Such a relationship, mention to as a Phillips curve, is often seen as an obliging guide for policymakers focus to preserve low

inflation and stable output growth. The Various instrument of fiscal policy such as Government revenue, Government spending and public debt can go a long way for preserving full employment without any inflationary and deflationary hurdle in developing countries.

The unemployment gap is an idea closely associated with output gap. Unemployment and output gap both are central to the conduct of macroeconomic policies. The non-accelerating inflation rate of unemployment (NAIRU) is the unemployment rate compatible with a sustained rate of inflation. Divergence of unemployment rate from the NAIRU is related with variation of total output from its potential level. Theoretically, if policymakers get the actual unemployment rate to equal the NAIRU, the economy will produce at its maximum level of output without straining resources in other words there will be no output gap and no inflation pressure. Governments can also use fiscal policy to overcome the output gap.

3.5.4 Inflation

According to Keynesian school of thought role of fiscal policy is more important to check inflation. Inflationary situation occurs in the economy when aggregate demand is extra ordinary high and private expenditures on consumption and investment of goods and foreign expenditures exceed the full employment level. Keynes says that actual inflation accrues in the economy after full employment level, but two market forces demand pull inflation and cost push inflation influence greatly in this condition.

3.5.5 Interest Rate

Role of Interest rate is also a significant and crucial to indicate the economy. Central bank controls the interest rate with condition of the economy when federal bank change the interest rate its effect the consumer as well as producer in term of interest payment. Second a change in interest rate also great impact on overall economy. Higher the interest rate lowers the investment because of high interest payment. To avoid the risk usually short-term maturity bond is favourable for the investors. Low-interest rates have the negative impact on the overall economy. Low mortgage rates have the same effect as lower housing prices, stimulating demand for real estate and savings rates fall. When savers find they get less interest on their deposits, they might decide to spend more. They might also put their money into slightly riskier, but more profitable, investments.

CHAPTER 4

THEORATICAL FRAMEWORK AND ECONOMETRIC MODELING

4.1 Introduction

This chapter explains the theoretical framework and econometric methodology for econometric analysis of the study. It also explains the estimation technique. Structure auto regressive (SVAR) econometric technique is used in this study to identify the relationship and responsiveness of correlation among the government expenditure, government revenue, interest rate, output gap and inflation. This chapter is comprised of two sections; first is theoretical framework and different view point regarding role fiscal policy and second part is the complete detail of estimation techniques.

4.2 Theoretical Framework

The most basic achievement of Keynesian school of thought was influence of fiscal policy on macroeconomic policies. Before the Keynesian revaluation role of government revenue and expenditures are ineffective to aggregate level of public spending and employment level in the economy. According to theoretical literature impact of fiscal policy classified in two ways demand side impact and supply side impact. The traditional Keynesian model supposes excess capacity and price rigidity. According to Keynesian school of thought due to excess capacity fiscal expansion has great impact on aggregate demand and GDP growth. This model extension leads to crowding out effect in the economy and due to higher level of borrowing interest rate increasing which leads to decrease the investment in the economy. Although Krugman and Obsfeld (1997) comment that difference among the short term and permanent policy changes is valuable. A short run fiscal expansion is leads to not long run impact will not dominate assumption, a permanent expansion in fiscal policy cause of crowding out effect in the economy. A private investor will assume the initial enlarge in interest rate and appreciation of exchange rate will instant and greater. Furthermore, Keynesian approach supposes that current income level is the main detrimental of consumption decision. According to (Barro,1974) If the consumers has rational approach and consumer is well informed about government inter temporal budget constrain, consumer know about reduction government saving by lower tax rate is fully know about excess saving and aggregate demand is not affected.

The supply side impacts of fiscal policy have long term indication. A pro supply side policies response address the capacity constrain and their effect on the total output is long term. According to Hemming et al, (2002) a government fiscal expansion policy through increasing demand and lower tax rate leads to increase the fiscal multipliers. Furthermore, Alessina and Perotti (1997) examine that if the labour income tax increased it is negative and insignificant impact on supply side; higher taxes reflect the increase the labour cost in the market. According to neo classical school of thought fully anticipated policies have greater impact on aggregate demand but not affecting the aggregate supply. According to Lucas (1975) anticipated policies have no long run and short impact on output growth. In contrast Chari and Kehoe (1998) argue that only anticipated policies have impact on output growth through supply side.

Keeping in view the above discussion regarding the effectiveness of taxes and government expenditure to explaining economic output level. This study analyses the impact of fiscal policy variables on output gap.

4.3 Model Specification

In this study first, we use production function to examine the potential output for Pakistan. The basic model of this research to measure the effect of fiscal policy on output gap takes the following form,

Output Gap$_t$= $\alpha_o + \alpha_1 FP_t + X_t + \varepsilon_t$ 4.1

FP= Fiscal Policy (Government Revenue, Government Expenditure)

Xt= Control variables (Interest rate, Inflation)

ε_t = Error term

An economy covers its output gap when its output is at the level of full employment, that is, the balance implies that the difference among actual output and economy potential output is zero.

$$\mathbf{OutputGap = Y^a - Y^f = 0} \quad 4.2$$

Where

Y^a = Actual output

Y^f = Potential output

The potential output is defined as the amount of GDP produced when the economy is performing or operating at its full capacity. For estimating potential output using production function approach.

$$Y_t = A_t L_t^{\alpha} K_t^{\beta} \quad 4.3$$

Where Yt is GDP, which represent to actual output, at define as total factor productivity (TFP), Lt is define as labour input and Kt define as capital stock. The output elasticity of labour and capital are shown by α and β respectively and the sum of this elasticity is unity.

4.4 Output Gap Estimation

Output gap is contrast among actual output of the country and potential output of the country. For measuring potential output using production function approach.

$$Y_t = A_t L_t^{\alpha} K_t^{\beta} \quad 4.4$$

In the above equation Y_t is define as total output, A_t is define as total factor productivity, Lt is labour input and K_t is define as capital stock. The α and β are define as elasticity of labour and capital respectively.

4.5 Estimating Potential Inputs

We need to measure potential inputs labour, capital and total factor productivity (TFP) for estimating potential output.

4.5.1 Potential Total Factor Productivity

In the start we estimate total factor productivity as Solow residual using above equation

$$A_t = \frac{Y_t}{L_t^{\alpha} K_t^{\beta}}$$

Which can be rewrite as:

$$\ln A_t = \ln Y_t - \alpha \ln L_t + \beta \ln K_t \qquad 4.5$$

In the next we can use Hodrick Prescott (HP) filter method to estimate potential factor productivity.

4.5.2 Capital Stock

The data series of capital stock is not obtained in Pakistan. Therefore, this study uses perpetual inventory method to construct this data series

$$K_t = l_t + (1-\delta)K_{t-1} \qquad 4.6$$

Above equation represented that capital stock estimated by new plus previous investment. For Investment Gross fixed capital formation (GFCF) is used as proxy. Depreciation rate used five percent for Pakistan according to previous studies.

4.5.3 Potential Labour Input

Now we can estimate potential labour input using HP trend and potential employment measured by HP trend and labour force multiplied (1-NAIRU). Where NAIRU was estimated by Ball-Mankiw (2002) approach.

$$L_t = WAP * PARTS * (1 - NAIRU) * HOURS \qquad 4.7$$

In the above equation WAP is define as working age population, PARTS present in the equation is define participation rate and HOURS is the labor force average worked per year. The participation rate is measured by HP filter method.

4.6 Econometric Techniques

To analyse the model discussed in section 4.5.3, SVAR technique used in this study. It is a general practice to check unit root when time series data is used. This section describes the details of required tests and estimation technique to assess the impact of fiscal policy tools on output gap.

4.6.1 Augmented Dickey Fuller (ADF)

After taking the time series data, the common practice is to check the stationary and non-stationary of the data. Time series data must be stationary, that is mean, and variance are constant, and covariance should be equal to zero. For the analysis of time series data, data should be invariant, that is the characteristics of the data should not change over the time. Mathematically, the characteristics of a stationary variable can be written as under.

Mean: $E(Y_t) = \mu$ 4.8

Variance: $var(Y_t) = E(Y_t - \mu)^2 = \delta^2$ 4.9

Covariance: $\gamma_k = \mathrm{E}[(Y_t - \mu)(Y_{t+k} - \mu)]$ 4.10

The time series is non-stationary when variance is not constant, and they can change over the time. Random walk model with drift, without drift and with drift parameter are the three types of non-stationary time series data which are written random walk model without drift can be written as $Y_t = Y_{t-1} + \mu_t$ and random walk model with drift can be written as $Y_t = \delta + Y_{t-1} + \mu_t$ where δ is a drift parameter. However, the data generating process can also be random walk with drift and trend. Data can be transformed to stationary data with differences and drift. Keeping in view the above-mentioned data generating process, the ADF test equations ara as follow.

$\mathbf{\Delta y_t = \delta\, y_{t-1} + v_t}$ 4.11

$\mathbf{\Delta y_t = \alpha + \delta\, y_{t-1} + v_t}$ 4.12

$\mathbf{\Delta y_t = \alpha + \beta t + \delta\, y_{t-1} + v_t}$ 4.13

The equation 4.13 assume random walk model, equation 4.14 assume random walk with drift and equation 4.15 assume random walk with drift and trend. The null and alternative hypothesis ADF test is as follow

$$H_0 : \delta \geq 0$$
$$H_1 : \delta \leq 0$$

The null hypothesis is stated as the data has unit root, that is, non-stationary. The ADF test statistics is $\tau = \frac{\delta^{\wedge} - \delta}{se(\delta^{\wedge})}$ where δ the hypothetical value and in this case, it is zero. The calculated value of τ is then compared with the critical value obtained from the table designed by Ackinnon. If the calculated of τ is less than the critical value than we reject null hypothesis and conclude that there is no unit root in the data.

4.6.2 Granger Causality Test

To check the causal relationship among the one variable on other variables this test is to be used. In other word if the variable X_t granger causes on Y_t then we can say that Y_t predictable through the lagged values of X_t. Granger causality test introduce by the Granger (1969) and in Econometrics literature this test is a suitable test for diagnose the existence of a causal connection among the two different variables.

4.7 Structural Vector Auto Regressive Model (SVAR)

In the era of 80, and early 90, researchers were facing a non-linearity problem in basic macro-economic variables like money supply, growth of GDP and treasury etc. Econometricians and researchers were required to have more appropriate approach to analyses these types of macroeconomic models. The idea about structural model firstly introduces the Hurwicz in 1962. According to Hurwicz if the model permits to forecast the effects of the innovation would be structural but an appropriate technique was not available.

Sims (1980) introduced VAR in the paper "Macroeconomics and Reality" it is very large and philosophical paper at that time large macroeconomic modelling solve through many restrictions and many equations. According to Sims these restrictions are unrealistic and gave idea of VAR as alternative solution for these types of models. Researcher is considering SVAR as an appropriate tool for business cycle modelling and policy modelling. SVAR is a good technique to forecast future and results of SVAR show an appropriate picture as compare to other econometric technique. CGE modelling is also a modern technique but results are sensitive to elasticities used which are fixed for a situation. CGE Modelling is based on assumption of perfect competition, absence of market failures and non-convexities in production.

Error term is generally correlated in SVAR model and usually cannot be interpreted. In SVAR model the variables are treated as endogenous variables and assume that everything causes everything. SVAR is important development in VAR framework and traditional theory of contemporaneous movement in the variables. This development allows structural shocks, identification and structural innovation.

Ordering of our variables are adjusted into estimated SVAR are as follow;

Government expenditure, Government revenue, Output gap, Inflation and Interest rate. By assumption, first variable is treated as the most exogenous variable and other cannot have contemporaneous effect on this variable. In our case, Government Expenditure is considering as the most exogenous variable and interest rate is assumed to be most endogenous variable.

$$\left.\begin{aligned}
GE_t &= b_{10} - \alpha_{11}GR_t - \alpha_{12}OGAP_t - \alpha_{13}INF_t - \alpha_{14}DIR_t + \gamma_{11}GE_{t-k} + \gamma_{12}GR_{t-k} + \gamma_{13}OGAP_{t-k} + \gamma_{14}INF_{t-k} + \gamma DIR_{15t-k} + \varepsilon_{ge_t} \\
GR_t &= b_{20} - \alpha_{21}GE_t - \alpha_{22}OGAP_t - \alpha_{23}INF_t - \alpha_{24}DIR_t + \gamma_{21}GE_{t-k} + \gamma_{22}GR_{t-k} + \gamma_{23}OGAP_{t-k} + \gamma_{24}INF_{t-k} + \gamma DIR_{25t-k} + \varepsilon_{gr_t} \\
OGAP_t &= b_{30} - \alpha_{31}GE_t - \alpha_{32}GR_t - \alpha_{23}INF_t - \alpha_{34}DIR_t + \gamma_{31}GE_{t-k} + \gamma_{32}GR_{t-k} + \gamma_{33}OGAP_{t-k} + \gamma_{34}INF_{t-k} + \gamma DIR_{35t-k} + \varepsilon_{ogap_t} \\
INF_t &= b_{40} - \alpha_{41}GE_t - \alpha_{42}GR_t - \alpha_{43}OGAP_t - \alpha_{44}DIR_t + \gamma_{41}GE_{t-k} + \gamma_{42}GR_{t-k} + \gamma_{43}OGAP_{t-k} + \gamma_{44}INF_{t-k} + \gamma DIR_{45t-k} + \varepsilon_{\inf_t} \\
DIR_t &= b_{50} - \alpha_{51}GE_t - \alpha_{52}GR_t - \alpha_{53}OGAP_t - \alpha_{54}INF_t + \gamma_{51}GE_{t-k} + \gamma_{52}GR_{t-k} + \gamma_{53}OGAP_{t-k} + \gamma_{54}INF_{t-k} + \gamma DIR_{55t-k} + \varepsilon_{dir_t}
\end{aligned}\right] \quad 4.14$$

The exogenous error term $\varepsilon_{ge_t}, \varepsilon_{gr_t}, \varepsilon_{ogap_t}, \varepsilon_{\inf_t}, \varepsilon_{dir_t}$ are independent as structural innovation. The model may call structural vector auto regressive (SVAR) because of it has been similar by some economic theory and fundamental. The intuition of ε_{ge_t} has interpreted as catch unforeseen effects of government expenditure that has not correlate with ε_{gr_t}, the unpredicted shocks to government revenue

$$\left.\begin{aligned}
GE_t + b_{10} - \alpha_{11}GR_t - \alpha_{12}OGAP_t - \alpha_{13}INF_t - \alpha_{14}DIR_t + \gamma_{11}GE_{t-k} + \gamma_{12}GR_{t-k} + \gamma_{13}OGAP_{t-k} + \gamma_{14}INF_{t-k} + \gamma DIR_{15t-k} + \varepsilon_{ge_t} \\
GR_t + b_{20} - \alpha_{21}GE_t - \alpha_{22}OGAP_t - \alpha_{23}INF_t - \alpha_{24}DIR_t + \gamma_{21}GE_{t-k} + \gamma_{22}GR_{t-k} + \gamma_{23}OGAP_{t-k} + \gamma_{24}INF_{t-k} + \gamma DIR_{25t-k} + \varepsilon_{gr_t} \\
OGAP_t + b_{30} - \alpha_{31}GE_t - \alpha_{32}GR_t - \alpha_{23}INF_t - \alpha_{34}DIR_t + \gamma_{31}GE_{t-k} + \gamma_{32}GR_{t-k} + \gamma_{33}OGAP_{t-k} + \gamma_{34}INF_{t-k} + \gamma DIR_{35t-k} + \varepsilon_{ogap_t} \\
INF_t + b_{40} - \alpha_{41}GE_t - \alpha_{42}GR_t - \alpha_{43}OGAP_t - \alpha_{44}DIR_t + \gamma_{41}GE_{t-k} + \gamma_{42}GR_{t-k} + \gamma_{43}OGAP_{t-k} + \gamma_{44}INF_{t-k} + \gamma DIR_{45t-k} + \varepsilon_{\inf_t} \\
DIR_t + b_{50} - \alpha_{51}GE_t - \alpha_{52}GR_t - \alpha_{53}OGAP_t - \alpha_{54}INF_t + \gamma_{51}GE_{t-k} + \gamma_{52}GR_{t-k} + \gamma_{53}OGAP_{t-k} + \gamma_{54}INF_{t-k} + \gamma DIR_{55t-k} + \varepsilon_{dir_t}
\end{aligned}\right] \quad 4.15$$

$$\begin{bmatrix} 1 & \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} \\ \alpha_{21} & 1 & \alpha_{22} & \alpha_{23} & \alpha_{24} \\ \alpha_{31} & \alpha_{32} & 1 & \alpha_{33} & \alpha_{34} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & 1 & \alpha_{45} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 \end{bmatrix} \begin{bmatrix} GE_t \\ GR_t \\ OGAP_t \\ INF_t \\ DIR_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \\ b_{40} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14} & \gamma_{15} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24} & \gamma_{25} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34} & \gamma_{35} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44} & \gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & \gamma_{54} \end{bmatrix} \begin{bmatrix} GE_t \\ GR_t \\ OGAP_t \\ INF_t \\ DIR_t \end{bmatrix}$$

And the above equation can be written as

$$BX_t = \Gamma_0 + \Gamma_1 X_{t-1} + \varepsilon_t \qquad 4.16$$

In above equitation B is the coefficients matrix having one in the diagonal captures contemporaneous impacts of variables on one another. The X is the matrix of variables which has estimate the lagged impacts of variables on each other.

Where

$$X_t = [GE_t, GR_t, OGAP_t, INF_t, DIR_t] \qquad 4.17$$

Whereas:

GE = Government Expenditure

GR = Government Revenue

OGAP = Output Gap

INF= Inflation

DIR = Domestic interest rate

ε_t Literally is a term and Γ_0 show a vector of constant.

Reduced form of SVAR is obtained by multiplying equation () by B^{-1} on both sides and we have $B^{-1}BX_t = B^{-1}\Gamma_0 + B^{-1}\Gamma_1 X_{t-1} + B^{-1}\varepsilon_t$ as we know that $B^{-1}B = 1$ thus the above equation takes the following form $X_t = B^{-1}\Gamma_0 + B^{-1}\Gamma_1 X_{t-1} + B^{-1}\varepsilon_t$ for simplify we can rewrite as

$$Z_t + Z_0 + Z_1 X_{t-1} + u_t \qquad 4.18$$

Where

$$Z_0 = B^{-1}\Gamma_0$$

$$Z_1 = B^{-1}\Gamma_1$$

And

$$u_t = B^{-1}\varepsilon_1$$

$$Z_t = B^{-1}r_0 + B^{-1}r_1 X_{t-1} + B^{-1}\varepsilon_t \qquad 4.19$$

$$X_t = Z_0 + Z_1 X_{t-1} + \mu_t \quad \text{As} \quad \begin{matrix} Z_0 = B^{-1}r_0 \\ Z_1 = B^{-1}r_1 X_{t-1} \\ \mu_t = B^{-1}e_t \end{matrix} \qquad 4.20$$

The error term comprises following property:

$$\begin{matrix} E(u_t) = 0 \\ VAR(u_t) = \delta^2 \\ COV(u_t, v_t) = 0 \end{matrix} \qquad 4.21$$

And

$$\begin{bmatrix} \varepsilon_{GE_t} \\ \varepsilon_{GR_t} \\ \varepsilon_{OGAP_t} \\ \varepsilon_{INF_t} \\ \varepsilon_{DIR_t} \end{bmatrix} \approx idd \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} \chi_1 & 0 & 0 & 0 & 0 \\ 0 & \chi_2 & 0 & 0 & 0 \\ 0 & 0 & \chi_3 & 0 & 0 \\ 0 & 0 & 0 & \chi_4 & 0 \\ 0 & 0 & 0 & 0 & \chi_5 \end{bmatrix} = idd(0, D)$$

$$\begin{bmatrix} e_{GE_t} \\ e_{GR_t} \\ e_{OGAP_t} \\ e_{INF_t} \\ e_{DIR_t} \end{bmatrix} \approx idd \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} \varphi_{11} & \varphi_{12} & \varphi_{13} & \varphi_{14} & \varphi_{15} \\ \varphi_{21} & \varphi_{22} & \varphi_{23} & \varphi_{24} & \varphi_{25} \\ \varphi_{31} & \varphi_{32} & \varphi_{33} & \varphi_{34} & \varphi_{35} \\ \varphi_{41} & \varphi_{42} & \varphi_{43} & \varphi_{44} & \varphi_{45} \\ \varphi_{51} & \varphi_{52} & \varphi_{53} & \varphi_{54} & \varphi_{55} \end{bmatrix} = idd(0, \varpi)$$

This may be equal to= 0

$$COV(e_{At}, e_{At-1}) = 0$$

Thus

$$X_t = Z_0 + Z_1 X_{t-1} + ... + Z_j X_{t-j} + \mu_t$$

It is important to know that linear combination errors are composite with error term $\varepsilon_{ge_t}, \varepsilon_{gr_t}, \varepsilon_{dir_t}, \varepsilon_{ogap_t}, \varepsilon_{\inf_t}$ that have variance and covariance matrix of $\varepsilon_t, \varepsilon_{1_t}, \varepsilon_{2_t}, \varepsilon_{3_t}, \varepsilon_{4_t}, \varepsilon_{5_t}$ are under

$$\begin{bmatrix} Var(\varepsilon_{1t}) & \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{2t}) & \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{3t}) & \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{4t}) & \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{5t}) \\ \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{2t}) & Var(\varepsilon_{2t}) & \text{cov}\, ar(\varepsilon_{2t}, \varepsilon_{3t}) & \text{cov}\, ar(\varepsilon_{2t}, \varepsilon_{4t}) & \text{cov}\, ar(\varepsilon_{2t}, \varepsilon_{5t}) \\ \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{3t}) & \text{cov}\, ar(\varepsilon_{3t}, \varepsilon_{2t}) & Var(\varepsilon_{3t}) & \text{cov}\, ar(\varepsilon_{3t}, \varepsilon_{4t}) & \text{cov}\, ar(\varepsilon_{3t}, \varepsilon_{5t}) \\ \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{4t}) & \text{cov}\, ar(\varepsilon_{4t}, \varepsilon_{2t}) & \text{cov}\, ar(\varepsilon_{4t}, \varepsilon_{3t}) & Var(\varepsilon_{4t}) & \text{cov}\, ar(\varepsilon_{4t}, \varepsilon_{5t}) \\ \text{cov}\, ar(\varepsilon_{1t}, \varepsilon_{5t}) & \text{cov}\, ar(\varepsilon_{5t}, \varepsilon_{2t}) & \text{cov}\, ar(\varepsilon_{5t}, \varepsilon_{3t}) & \text{cov}\, ar(\varepsilon_{5t}, \varepsilon_{4t}) & Var(\varepsilon_{5t}) \end{bmatrix} \quad 4.22$$

$$\begin{bmatrix} \Omega_{11} & \Omega_{12} & \Omega_{13} & \Omega_{14} & \Omega_{15} \\ \Omega_{21} & \Omega_{22} & \Omega_{23} & \Omega_{24} & \Omega_{25} \\ \Omega_{31} & \Omega_{32} & \Omega_{33} & \Omega_{34} & \Omega_{35} \\ \Omega_{41} & \Omega_{42} & \Omega_{43} & \Omega_{44} & \Omega_{45} \\ \Omega_{51} & \Omega_{52} & \Omega_{53} & \Omega_{54} & \Omega_{54} \end{bmatrix}$$

After "n"Iteration the backwardness reiteration of immensely arrangement produced the next form

In besides of € (Error term) has contemporaneous associated mostly that has a covariance matrix

$$X_t = \sum_{P=0}^{\infty} A^s U_{t-s} = U_t + A_1 U_{t-1} + A^2_1 U_{t-2} + ...$$

Where

$$\mu = (I - A)^{-1} B$$

The structural moving average (SMA) method has illustrated X_t that based on it. This tool is very helpful to diagnose the impulse response function.

4.8 Impulse Response Function

In SVAR model after imposing a restriction study utilize the impulse response function to interpret the result of SVAR model. Some external changes are shown in impulse response shocks as reaction of any dynamic system. In the Sims (1980) Methodology VMP representation has an essential feature. Through VMP we can find out the pathway of various shocks on dependent variable forecast that has employ in Vector auto Regressive (VAR) analysis. For this first we can transfer VAR into VMA presentation. By rewrite unrestricted VAR:

$$X_t = Z_0 + Z_1 X_{t-1} + \varepsilon_t \Rightarrow X_t = \frac{Z_0}{1 - Z_1 L} + \frac{e_t}{1 - Z_1 L} \qquad 4.23$$

First component on RHS

$$\frac{Z_0}{1 - Z_1} = (1 - A)^{-1} A_0 = \frac{(1 - A)^{-1} A_0}{|1 - A_1|} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\inf} \end{bmatrix}$$

Roots of $1 - Z_1 L$ lie outside the unit for stability requirement. Second Component can be written as

With the standard VAR Error term can writing as VMA as

$$\begin{bmatrix} ge \\ gr \\ dir \\ ogap \\ \inf \end{bmatrix} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\inf} \end{bmatrix} + \sum_{t=0}^{\infty} A_1 e_{t-1}$$

These errors replace with e's with € 's from $e_t = B^{-1}\varepsilon_t$ because of these errors be made up of the fundamental I innovation.

$$\begin{bmatrix} ge \\ gr \\ dir \\ ogap \\ \inf \end{bmatrix} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\inf} \end{bmatrix} \sum_{t=0}^{\infty} \frac{A^1}{|B|} B^{-1}\varepsilon_{t-1} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\inf} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \Omega_{11} & \Omega_{12} & \Omega_{13} & \Omega_{14} & \Omega^{(i)}_{15} \\ \Omega_{21} & \Omega_{22} & \Omega_{23} & \Omega_{24} & \Omega^{(i)}_{25} \\ \Omega_{31} & \Omega_{32} & \Omega_{33} & \Omega_{34} & \Omega^{(i)}_{35} \\ \Omega_{41} & \Omega_{42} & \Omega_{43} & \Omega_{44} & \Omega^{(i)}_{45} \\ \Omega_{51} & \Omega_{52} & \Omega_{53} & \Omega_{54} & \Omega^{(i)}_{55} \end{bmatrix} \varepsilon_{t-1} = \overline{X} + \sum_{i=0}^{\infty} \Omega\varepsilon_{t-1}$$

The structural impulse response function presents a unit shock at the time of X for disparate values. Suppose it is determining to analyse the interaction among Government expenditure, Government revenue, Domestic interest rate, Output gap and inflation in different time periods. This inscription is called effect multiplier that recognize the strong consequences of a one unit change within a structural requisite innovation on Government expenditure, Government revenue, Domestic interest rate, Output gap and inflation

$$\begin{bmatrix} \Omega_{11}(0) = \frac{dge_t}{d\varepsilon_{gr,t}} \Omega_{12}(0) = \frac{dge_t}{d\varepsilon_{ge,t}} \Omega_{13}(0) = \frac{dge_t}{d\varepsilon_{dir,t}} \Omega_{14}(0) = \frac{dge_t}{d\varepsilon_{ogap,t}} \Omega_{15}(0) = \frac{dge_t}{d\varepsilon_{\inf,t}} \\ \Omega_{21}(0) = \frac{dgr_t}{d\varepsilon_{gr,t}} \Omega_{22}(0) = \frac{dgr_t}{d\varepsilon_{ge,t}} \Omega_{23}(0) = \frac{dgr_t}{d\varepsilon_{dir,t}} \Omega_{24}(0) = \frac{dgr_t}{d\varepsilon_{ogap,t}} \Omega_{25}(0) = \frac{dgr_t}{d\varepsilon_{\inf,t}} \\ \Omega_{31}(0) = \frac{ddir_t}{d\varepsilon_{gr,t}} \Omega_{32}(0) = \frac{ddir_t}{d\varepsilon_{ge,t}} \Omega_{33}(0) = \frac{ddir_t}{d\varepsilon_{dir,t}} \Omega_{34}(0) = \frac{ddir_t}{d\varepsilon_{ogap,t}} \Omega_{35}(0) = \frac{ddir_t}{d\varepsilon_{\inf,t}} \\ \Omega_{41}(0) = \frac{dogap_t}{d\varepsilon_{gr,t}} \Omega_{42}(0) = \frac{ogap_t}{d\varepsilon_{ge,t}} \Omega_{43}(0) = \frac{ogap_t}{d\varepsilon_{dir,t}} \Omega_{44}(0) = \frac{ogap_t}{d\varepsilon_{ogap,t}} \Omega_{45}(0) = \frac{ogap_t}{d\varepsilon_{\inf,t}} \\ \Omega_{51}(0) = \frac{d\inf_t}{d\varepsilon_{gr,t}} \Omega_{52}(0) = \frac{d\inf_t}{d\varepsilon_{ge,t}} \Omega_{53}(0) = \frac{d\inf_t}{d\varepsilon_{dir,t}} \Omega_{54}(0) = \frac{d\inf_t}{d\varepsilon_{ogap,t}} \Omega_{55}(0) = \frac{d\inf_t}{d\varepsilon_{\inf,t}} \end{bmatrix} \quad 4.24$$

In the same way effect of one period can be find out the leading variables for example $\Omega_{11}(1)$ and $\mathbf{\Omega_{22}}$ (1) are one time period impact of unit changes in $\varepsilon_{gr,t}, \varepsilon_{ge,t}$ on ge_{t-1} respectively

$$\frac{dge_{t+1}}{d\varepsilon_{gr,t}} = \Omega_{11}(1) \frac{dgr_{t+1}}{d\varepsilon_{ge,t}} = \Omega_{22}(1) \frac{dir_{t+1}}{d\varepsilon_{dir,t}} = \Omega_{33}(1) \frac{dogap_{t+1}}{d\varepsilon_{ogap,t}} = \Omega_{44}(1) = \frac{d\inf_{t+1}}{d\varepsilon_{\inf,t}} = \Omega_{55}(1)$$

Similarly, impact cannot on GE, GR, DIR, OGAP, and INF for one period ago:

$$\frac{dge_{t-1}}{d\varepsilon_{gr,t}} = \Omega_{11}(1) \frac{dgr_{t-1}}{d\varepsilon_{ge,t}} = \Omega_{22}(1) \frac{dir_{t-1}}{d\varepsilon_{dir,t}} = \Omega_{33}(1) \frac{dogap_{t-1}}{d\varepsilon_{ogap,t}} = \Omega_{44}(1) = \frac{d\inf_{t-1}}{d\varepsilon_{\inf,t}} = \Omega_{55}(1)$$

IRF despites the how the current and future values of GR, DIR, OGAP, and INF react to different impact GE_t to one unit change in OGAP

$$ge_t = \Omega_{12}(0), \Omega_{12}(1), \Omega_{13}(2), ...$$

The combined impact on one-unit impulse is the addition of the coefficients of impulse response function. The effect of long run multiplier can be relent infinite approach:

$$\sum_{i=1}^{n} = \varphi_{12}(i)$$

And

$$\sum_{i=1}^{\infty} \varphi_{ij}{}^{2}(i) \text{ is infinite}$$

In case SVAR in unidentified we are unable to compute these possessions in this case through compulsion reaction function. So, it is important to execute approximate restrictions on VAR to recognize this response. So, in addition we need to imply Cholesky decomposition and should assume GR have not affected contemporaneously on GE, GR, DIR, OGAP and INF Then

$$b_{12} = 0 b_{13} = 0 b_{14} = 0 b_{15} = 0$$

And

$$b_{12} = 0 b_{13} = 0 b_{14} = 0 b_{15} = 0$$

4.8.1 Variance Decomposition

Variance decomposition gets information about how much change accrue in variable due to own personal shock with cause shocks of extra variables. In this order first, we check and consider VMA presentation of VAR analysis.

$$\begin{bmatrix} ge \\ gr \\ dir \\ ogap \\ \text{inf} \end{bmatrix} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\text{inf}} \end{bmatrix} + \sum_{t=0}^{\infty} \frac{A^1}{|B|} B^{-1} \varepsilon_{t-1} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\text{inf}} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \Omega_{11} & \Omega_{12} & \Omega_{13} & \Omega_{14} & \Omega_{15} \\ \Omega_{21} & \Omega_{22} & \Omega_{23} & \Omega_{24} & \Omega_{25} \\ \Omega_{31} & \Omega_{32} & \Omega_{33} & \Omega_{34} & \Omega_{35} \\ \Omega_{41} & \Omega_{42} & \Omega_{43} & \Omega_{44} & \Omega_{45} \\ \Omega_{51} & \Omega_{52} & \Omega_{53} & \Omega_{54} & \Omega_{55} \end{bmatrix} \varepsilon_{t-1}$$

$$\Omega_{1,0}\varepsilon_{ge,t+n} + \Omega_{1,1}\varepsilon_{ge,t+n-1}$$

$$\begin{bmatrix} ge \\ gr \\ dir \\ ogap \\ \text{inf} \end{bmatrix} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\text{inf}} \end{bmatrix} 1\sum_{t=0}^{\infty} \frac{A^1}{|B|} B^{-1} \varepsilon_{t-1} = \begin{bmatrix} \overline{ge} \\ \overline{gr} \\ \overline{dir} \\ \overline{ogap} \\ \overline{\text{inf}} \end{bmatrix} 1\sum_{i=0}^{\infty} \begin{bmatrix} \Omega_{11} & \Omega_{12} & \Omega_{13} & \Omega_{14} & \Omega_{15} \\ \Omega_{21} & \Omega_{22} & \Omega_{23} & \Omega_{24} & \Omega_{25} \\ \Omega_{31} & \Omega_{32} & \Omega_{33} & \Omega_{34} & \Omega_{35} \\ \Omega_{41} & \Omega_{42} & \Omega_{43} & \Omega_{44} & \Omega_{45} \\ \Omega_{51} & \Omega_{52} & \Omega_{53} & \Omega_{54} & \Omega_{55} \end{bmatrix} \varepsilon_{t-1}$$

Starting from 1 period

$$x_{t+1} = \overline{X} + \Phi_0 \varepsilon_{t+1} + \Phi_1 \varepsilon_t + \Phi_2 \varepsilon_{t-1} \qquad 4.25$$

$$Ex_{t+1} = \overline{X} + \Phi_1 \varepsilon_t + \Phi_2 \varepsilon_{t-1} \qquad 4.26$$

$$x_{t+1} = Ex_{t+1} = \Phi_0 \varepsilon_{t+1} \qquad 4.27$$

We manage and get last period forecast error in same way:

$$x_{t+2} - Ex_{t+2} = \Phi_0 \varepsilon_{t+2} + \Phi_1 \varepsilon_{t+1}$$

Forecast error for 3rd period of time

$$x_{t+3} - Ex_{t+3} = \Phi_0 \varepsilon_{t+3} + \Phi_1 \varepsilon_{t+2} + \Phi_2 \varepsilon_{t+1}$$

For n- period forecast error

$$x_{t+n} - Ex_{t+n} = \Phi_0 \varepsilon_{t+n} + \Phi_1 \varepsilon_{t+n-1} + \Phi_2 \varepsilon_{t+n-2} + \ldots\ldots\ldots\ldots \Phi_{n-1} \varepsilon_{t+1} = \sum_{i=0}^{n-1} \varepsilon_{t+n-i}$$

$$\left.\begin{aligned} ge_{t+n} - Ege_{t+n} = &(\Phi_{11,0}\varepsilon_{ge,t+n} + \Phi_{1,1}\varepsilon_{ge,t+n-1} + \ldots\ldots\ldots + \Phi_{1,1n-1}\varepsilon_{t+1}) + (\varphi_{21,0}\varepsilon_{gr,t+n} + \Phi_{21,1}\varepsilon_{gr,t+n-1} + \ldots\ldots\ldots + \Phi_{21,n-1}\varepsilon_{t+1}) \\ &+(\Phi_{31,0}\varepsilon_{dir,t+n} + \Phi_{31,1}\varepsilon_{dir,t+n-1} + \ldots\ldots\ldots + \Phi_{31,n-1}\varepsilon_{t+1}) + (\Phi_{41,0}\varepsilon_{ogap,t+n} + \Phi_{41,1}\varepsilon_{ogap,t+n-1} + \ldots\ldots\ldots + \Phi_{41,n-1}\varepsilon_{t+1}) \\ &+(\Phi_{51,0}\varepsilon_{\inf,t+n} + \Phi_{51,1}\varepsilon_{\inf,t+n-1} + \ldots\ldots\ldots + \Phi_{51,n-1}\varepsilon_{t+1}) \end{aligned}\right] \quad 4.28$$

The variance of nth step is below for forecast error is:

$$\left.\begin{aligned} \sigma_{ge,n}{}^2 = &\sigma_{ge}{}^2(\Phi_{11,0}\varepsilon_{ge,t+n} + \Phi_{1,1}\varepsilon_{ge,t+n-1} + \ldots\ldots\ldots + \Phi_{11,n-1}\varepsilon_{t+1}) + \sigma^2{}_{gr}(\Phi_{21,0}\varepsilon_{gr,t+n} + \Phi_{21,1}\varepsilon_{gr,t+n-1} + \ldots\ldots\ldots + \Phi_{21,n-1}\varepsilon_{t+1}) \\ &+\sigma^2{}_{dir}(\Phi_{31,0}\varepsilon_{dir,t+n} + \Phi_{31,1}\varepsilon_{dir,t+n-1} + \ldots\ldots\ldots + \Phi_{31,n-1}\varepsilon_{t+1}) + \sigma^2{}_{ogap}(\Phi_{41,0}\varepsilon_{ogap,t+n} + \Phi_{41,1}\varepsilon_{ogap,t+n-1} + \ldots\ldots\ldots + \Phi_{41,n-1}\varepsilon_{t+1}) \\ &+\sigma^2{}_{\inf}(\Phi_{51,0}\varepsilon_{\inf,t+n} + \Phi_{51,1}\varepsilon_{\inf,t+n-1} + \ldots\ldots\ldots + \Phi_{51,n-1}\varepsilon_{t+1}) \end{aligned}\right] \quad 4.29$$

$\varphi_{1,0}\varepsilon_{ge,t+n} + \varphi_{1,1}\varepsilon_{ge,t+n-1}$ Are the properties of variant because of its own shock of government expenditure grew over the time?

Impulse response function and variance decomposition are called innovation variables that is meaningful to identify $\varepsilon_{i,t}$. Sequence is to be compulsory to restrict B Matrix for this problem Cholesky decomposition is mostly used.

4.8.2 Identification Problems

Without certain restriction the parameters in the structural vector auto regressive (SVAR) cannot be identify and it is not possible to solve Ω^0, B and Γ. Sims (1986) had very clearly advocated in her paper that these restrictions are necessary on SVAR model for classification of all the parameters. The number of restrictions may calculate through remove the least number equal to variance among the parameters of vector auto regressive (VAR) and structural auto regressive (SVAR) so it had to accomplish n^2 restrictions implicit on parameters to adjust all of them. If not knowing parameters and known parameters are equivalent in numbers than structural vector

auto regressive (SVAR) is exactly identified. We can apply typical identifying restriction to estimate the reduce form vector auto regressive (VAR) include:

4.9 Recursive Ordering and Cholesky Factorization for Identification:

The popular method for this type of identification is triangular identification. It is generally believed that this Cholesky restriction is applies short run restrictions. It is shown the objective reasoning to determine which restriction should be inflict for gives the exact identification of n^2 restriction. Sims (1986) and Bernanke (1986) using the n^2 restrictions for economic analysis and to derive restriction proposed the innovation modelling.

Model with first order variable as follow:

$$\begin{bmatrix} 1 & \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} \\ \alpha_{21} & 1 & \alpha_{22} & \alpha_{23} & \alpha_{24} \\ \alpha_{31} & \alpha_{32} & 1 & \alpha_{33} & \alpha_{34} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & 1 & \alpha_{45} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 \end{bmatrix} \begin{bmatrix} GE_t \\ GR_t \\ DIR_t \\ OGAP_t \\ INF_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \\ b_{40} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14} & \gamma_{15} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24} & \gamma_{25} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34} & \gamma_{35} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44} & \gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & \gamma_{54} \end{bmatrix} \begin{bmatrix} GE_t \\ GR_t \\ DIR_t \\ OGAP_t \\ INF_t \end{bmatrix}$$

Consider the first order model with variable compact form:

$$X_t = B^{-1}\Gamma_0 + B^{-1}\Gamma X_{t-1} + B^{-1}\varepsilon_t \qquad 4.30$$

In addition it yields $A_0 = B^{-1}\Gamma_0, \in = Be_t$ to recover $\in_t = B_t$ as $\in_t$ we take the value of ε_t and restricted the system. We can count the equation and unknown parameters for solving the identification

Variance and covariance matrix $\sum$ by using the OLS is obtained as:

$$Eee^t = \sum = \begin{bmatrix} \alpha^2{}_1 & \alpha_{12} & \alpha_{1n} \\ \alpha_{21} & \alpha_2{}^2 ..... & \alpha_{2n} \\ ..... & & \\ \alpha_{n1} & \alpha_{n2} & \alpha_n{}^n \end{bmatrix}$$

$\sum$ Is equal it consists of elements defined $\frac{n^2+n}{2}(n-1)$

Elements through first of diagonal and (***n-2***) next of diagonal completely are clear elements. There are numerous unknown parameters are traced in B and covariance matrix in the system. It is assumed that structural shock equal to zero thus

$$Eee^t = \sum = \begin{bmatrix} \alpha^2_1 & 0 & 0 \\ 0 & \alpha_2{}^2 ..... & 0 \\ ..... & & \\ 0 & 0 & \alpha_n{}^2 \end{bmatrix}$$

The total no of unknown is greater than the known $n^2 \rangle \frac{n^2+n}{2}$. in this we can identify the unknown n^2 from $\frac{n^2+n}{2}$ known independent elements of $\sum$ we impose extra restrictions on the system. $\frac{n^2+n}{2}$ Restrictions are necessary to enforce for solving identification problem. All the elements in diagonal matrix are equal to zero for using the Cholesky decomposition.

$$\sum \varepsilon = \begin{bmatrix} \chi^2_1 & 0 & 0 & 0 & 0 \\ 0 & \chi^2_2 & 0 & 0 & 0 \\ 0 & 0 & \chi^2_3 & 0 & 0 \\ 0 & 0 & 0 & \chi^2_4 & 0 \\ 0 & 0 & 0 & 0 & \chi^2_5 \end{bmatrix}$$

In the structural model the contemporaneous co-efficient restriction can be considered. Now suppose

$$\frac{\partial ge_t}{\partial gr} = \frac{1}{b_{12}} = 1 \text{ thus } b_{12} = 1$$

As same $b_{12} = 1 b_{13} = 1 b_{13} = 1 b_{23} = 1 b_{24} = 1 b_{34} = 1$

In diagonal $b_{12} = b_{21}$ regularity restriction while coefficient have same values. To meet the identification condition different identification scheme have been. For identification and

estimation identification of Cholesky decomposition has been used the impacts of the structural shocks and effect

$$e_t = \Psi^{-1}\varepsilon_t \Rightarrow \Psi e_t = \varepsilon_t \qquad 4.31$$

Thus

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 \end{bmatrix} \begin{bmatrix} e_{GE_t} \\ e_{GR_t} \\ e_{DIR_t} \\ e_{OGAP_t} \\ e_{INF_t} \end{bmatrix} = \begin{bmatrix} \varepsilon_{GE_t} \\ \varepsilon_{GR_t} \\ \varepsilon_{DIR_t} \\ \varepsilon_{OGAP_t} \\ \varepsilon_{INF_t} \end{bmatrix}$$

And

$$\left.\begin{aligned} \varepsilon GE_t &= {}^{e}GE_t \\ \varepsilon GR_t &= {}^{e}GR_t - b_{45}{}^{e}GE_t \\ \varepsilon DIR_t &= {}^{e}DIR_t - b_{31}{}^{e}GE_t - b_{32}{}^{e}GR_t \\ \varepsilon OGAP_t &= {}^{e}OGAP_t - b_{41}{}^{e}GE_t - b_{42}{}^{e}GR_t - b_{43}{}^{e}DIR_t \\ \varepsilon INF_t &= {}^{e}INF_t - b_{51}{}^{e}GE_t - b_{52}{}^{e}GR_t - b_{53}{}^{e}DIR_t - b_{54}{}^{e}OGAP_t \end{aligned}\right] \qquad 4.32$$

It demonstrates that ${}^{\varepsilon}GE,\ {}^{\varepsilon}GR_t,\ {}^{\varepsilon}DIR_t,\ {}^{\varepsilon}OGAP_t,\ {}^{\varepsilon}INF$ can be identifying from estimates of ${}^{e}GE_t, {}^{e}GR_t, {}^{e}DIR_t, {}^{e}OGAP_t, {}^{e}INF_t$ variance and covariance matrix.

The recursive identification method has portrayed the ε_{get} is known ε_{grt} which identify and build a set of not related shock and impact in linear line from shocks. In this scheme we can assume some variables are affected with each other only a specific time that would be problematic for this scheme. In overall B matrix with the organizing and assembling it as lower

triangle for putting identification in the system. Identification scheme for long run has implied more possible restrictions that must be imposed through approaches of classical and Keynesian.

To recover B matrix

$$B=\begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix}$$

$$\begin{bmatrix} Var(\varepsilon\phi_1) & \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_2) & \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_3) & \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_4) & \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_5) \\ \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_2) & Var(\varepsilon\phi_2) & \operatorname{cov}ar(\varepsilon\phi_2,\varepsilon\phi_3) & \operatorname{cov}ar(\varepsilon\phi_2,\varepsilon\phi_4) & \operatorname{cov}ar(\varepsilon\phi_2,\varepsilon\phi_5) \\ \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_3) & \operatorname{cov}ar(\varepsilon\phi_3,\varepsilon\phi_2) & Var(\varepsilon\phi_3) & \operatorname{cov}ar(\varepsilon\phi_3,\varepsilon\phi_4) & \operatorname{cov}ar(\varepsilon\phi_3,\varepsilon\phi_5) \\ \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_4) & \operatorname{cov}ar(\varepsilon\phi_4,\varepsilon\phi_2) & \operatorname{cov}ar(\varepsilon\phi_4,\varepsilon\phi_3) & Var(\varepsilon\phi_4) & \operatorname{cov}ar(\varepsilon\phi_4,\varepsilon\phi_5) \\ \operatorname{cov}ar(\varepsilon\phi_1,\varepsilon\phi_5) & \operatorname{cov}ar(\varepsilon\phi_5,\varepsilon\phi_2) & \operatorname{cov}ar(\varepsilon\phi_5,\varepsilon\phi_3) & \operatorname{cov}ar(\varepsilon\phi_5,\varepsilon\phi_4) & Var(\varepsilon\phi_5) \end{bmatrix}$$

And

$$\sum\varepsilon=\begin{bmatrix} \operatorname{var}(\varepsilon\phi_1) & 0 & 0 & 0 & 0 \\ 0 & \operatorname{var}(\varepsilon\phi_2) & 0 & 0 & 0 \\ 0 & 0 & \operatorname{var}(\varepsilon\phi_3) & 0 & 0 \\ 0 & 0 & 0 & \operatorname{var}(\varepsilon\phi_4) & 0 \\ 0 & 0 & 0 & 0 & \operatorname{var}(\varepsilon\phi_5) \end{bmatrix}$$

Or

$$\begin{bmatrix} Var(e\phi_1) & \operatorname{cov}ar(e\phi_1,\varepsilon\phi_2) & \operatorname{cov}ar(e\phi_1,e\phi_3) & \operatorname{cov}ar(e\phi_1,e\phi_4) & \operatorname{cov}ar(e\phi_1,e\phi_5) \\ \operatorname{cov}ar(e\phi_1,e\phi_2) & Var(e\phi_2) & \operatorname{cov}ar(e\phi_2,e\phi_3) & \operatorname{cov}ar(e\phi_2,e\phi_4) & \operatorname{cov}ar(e\phi_2,e\phi_5) \\ \operatorname{cov}ar(e\phi_1,e\phi_3) & \operatorname{cov}ar(e\phi_3,e\phi_2) & Var(e\phi_3) & \operatorname{cov}ar(e\phi_3,e\phi_4) & \operatorname{cov}ar(e\phi_3,e\phi_5) \\ \operatorname{cov}ar(e\phi_1,e\phi_4) & \operatorname{cov}ar(e\phi_4,e\phi_2) & \operatorname{cov}ar(e\phi_4,e\phi_3) & Var(e\phi_4) & \operatorname{cov}ar(e\phi_4,e\phi_5) \\ \operatorname{cov}ar(e\phi_1,e\phi_5) & \operatorname{cov}ar(e\phi_5,e\phi_2) & \operatorname{cov}ar(e\phi_5,e\phi_3) & \operatorname{cov}ar(e\phi_5,e\phi_4) & Var(e\phi_5) \end{bmatrix}$$

4.10 Blanchard and Perotti Approach for Identification

Blanchard and Perotti (2002) describe that the identification approach depends on conventional information about government taxes timing of tax collection and transfer system to estimate the instinctive reaction of government expenditure and taxes to economic activity. So, following this approach, we have applied long run restrictions.

For identification, 15 restrictions have been applied to parameters of Matrix A that would help to examine the impacts of the structural shock. To required exogenous elasticities, Rozina Shaheen (2008) suggests that some share of government purchases of goods and services are likely to respond to the price level therefore setting this price elasticity to zero does not make any sense. Following Perotti (2005), an assorted approach is adopted, and the price elasticity of government expenditure is set to -0.5. While, Perotti (2004) is of the view that setting this price elasticity to zero does not seem to affect the results significantly. However, this paper follows Perroti (2004) approach of using price elasticity. This paper also uses external information on the output and price elasticities of net taxes. Bilquess (2004) calculated tax elasticizes for Pakistan's economy and found that tax to output elasticity is 0.96 which is closer to 1 but not greater than 1 therefore tax in Pakistan is not buoyant, keeping this in view it is believed that by affecting actual output, it will affect the output gap also by the same proportion because tax is not supposed to effect the potential output and tax to price elasticity is 0.7, thus, this study employs the elasticity values 0.71 and 0.96 of net taxes.

Keeping in view the Cholesky restriction and the long run restriction imposed using Blanchard and Perroti approach this model explains the effect of shocks in fiscal policy variables on output gap through impulse response function. The variance decomposition helps to explain how shocks repds in the economy.

Thus

$$\begin{bmatrix} 1 & 0 & 0.5 & 0 & 0 \\ b_{21} & 1 & 0 & b_{24} & 0 \\ b_{31} & 0.96 & 1 & b_{34} & 0 \\ b_{41} & 0.71 & b_{43} & 1 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 \end{bmatrix} \begin{bmatrix} e_{GE_t} \\ e_{GR_t} \\ e_{OGAP_t} \\ e_{INF_t} \\ e_{DIR_t} \end{bmatrix} = \begin{bmatrix} \varepsilon_{GE_t} \\ \varepsilon_{GR_t} \\ \varepsilon_{OGAP_t} \\ \varepsilon_{INF_t} \\ \varepsilon_{DIR_t} \end{bmatrix}$$

And

$$\left.\begin{aligned} \varepsilon GE_t &= {}^{e}GE_t \\ \varepsilon GR_t &= {}^{e}GR_t - b_{21}{}^{e}GE_t - b_{24}{}^{e}OGAP_t \\ \varepsilon OGAP_t &= {}^{e}OGAP_t - b_{31}{}^{e}GE_t - b_{34}{}^{e}DIR_t \\ \varepsilon INF_t &= {}^{e}INF_t - b_{41}{}^{e}GE_t - b_{43}{}^{e}OGAP_t \\ \varepsilon DIR_t &= {}^{e}DIR_t - b_{51}{}^{e}GE_t - b_{52}{}^{e}GR_t - b_{53}{}^{e}OGAP_t - b_{54}{}^{e}INF_t \end{aligned}\right] \quad 4.33$$

It demonstrates that ${}^{\varepsilon}GE,\ {}^{\varepsilon}GR_t,\ {}^{\varepsilon}OGAP_t\ {}^{\varepsilon}DIR_t,,\ {}^{\varepsilon}INF$ can be identifying from estimates of ${}^{\varepsilon}GE,\ {}^{\varepsilon}GR_t,\ {}^{\varepsilon}OGAP_t\ {}^{\varepsilon}DIR_t,,\ {}^{\varepsilon}INF$ variance and covariance matrix.

To recover B matrix

$$B = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix}$$

$$\begin{bmatrix} Var(\varepsilon\phi_1) & \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_2) & \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_3) & \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_4) & \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_5) \\ \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_2) & Var(\varepsilon\phi_2) & \operatorname{cov} ar(\varepsilon\phi_2, \varepsilon\phi_3) & \operatorname{cov} ar(\varepsilon\phi_2, \varepsilon\phi_4) & \operatorname{cov} ar(\varepsilon\phi_2, \varepsilon\phi_5) \\ \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_3) & \operatorname{cov} ar(\varepsilon\phi_3, \varepsilon\phi_2) & Var(\varepsilon\phi_3) & \operatorname{cov} ar(\varepsilon\phi_3, \varepsilon\phi_4) & \operatorname{cov} ar(\varepsilon\phi_3, \varepsilon\phi_5) \\ \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_4) & \operatorname{cov} ar(\varepsilon\phi_4, \varepsilon\phi_2) & \operatorname{cov} ar(\varepsilon\phi_4, \varepsilon\phi_3) & Var(\varepsilon\phi_4) & \operatorname{cov} ar(\varepsilon\phi_4, \varepsilon\phi_5) \\ \operatorname{cov} ar(\varepsilon\phi_1, \varepsilon\phi_5) & \operatorname{cov} ar(\varepsilon\phi_5, \varepsilon\phi_2) & \operatorname{cov} ar(\varepsilon\phi_5, \varepsilon\phi_3) & \operatorname{cov} ar(\varepsilon\phi_5, \varepsilon\phi_4) & Var(\varepsilon\phi_5) \end{bmatrix}$$

And

$$\sum \varepsilon = \begin{bmatrix} \operatorname{var}(\varepsilon\phi_1) & 0 & 0 & 0 & 0 \\ 0 & \operatorname{var}(\varepsilon\phi_2) & 0 & 0 & 0 \\ 0 & 0 & \operatorname{var}(\varepsilon\phi_3) & 0 & 0 \\ 0 & 0 & 0 & \operatorname{var}(\varepsilon\phi_4) & 0 \\ 0 & 0 & 0 & 0 & \operatorname{var}(\varepsilon\phi_5) \end{bmatrix}$$

Or

$$\begin{bmatrix} Var(e\phi_1) & \operatorname{cov} ar(e\phi_1, \varepsilon\phi_2) & \operatorname{cov} ar(e\phi_1, e\phi_3) & \operatorname{cov} ar(e\phi_1, e\phi_4) & \operatorname{cov} ar(e\phi_1, e\phi_5) \\ \operatorname{cov} ar(e\phi_1, e\phi_2) & Var(e\phi_2) & \operatorname{cov} ar(e\phi_2, e\phi_3) & \operatorname{cov} ar(e\phi_2, e\phi_4) & \operatorname{cov} ar(e\phi_2, e\phi_5) \\ \operatorname{cov} ar(e\phi_1, e\phi_3) & \operatorname{cov} ar(e\phi_3, e\phi_2) & Var(e\phi_3) & \operatorname{cov} ar(e\phi_3, e\phi_4) & \operatorname{cov} ar(e\phi_3, e\phi_5) \\ \operatorname{cov} ar(e\phi_1, e\phi_4) & \operatorname{cov} ar(e\phi_4, e\phi_2) & \operatorname{cov} ar(e\phi_4, e\phi_3) & Var(e\phi_4) & \operatorname{cov} ar(e\phi_4, e\phi_5) \\ \operatorname{cov} ar(e\phi_1, e\phi_5) & \operatorname{cov} ar(e\phi_5, e\phi_2) & \operatorname{cov} ar(e\phi_5, e\phi_3) & \operatorname{cov} ar(e\phi_5, e\phi_4) & Var(e\phi_5) \end{bmatrix}$$

CHAPTER 5

RESULTS AND DISUSSION

The econometric techniques used for estimation has specific assumptions that needs to be satisfy. This study uses SVAR, and it also possesses some assumption regarding stationary, causality and lag-length criteria. Therefore, before discussing the findings, the test result has been discussed.

5.1 Results of Unit Root Test

Conventional Augmented Dickey Fuller test is used to test the stationary property of all the series. The estimated ADF results with its p-values are shown in table 6.1. The results show that in below table all the variables are stationary at 1st difference.

Table 5.1: Results of ADF Test

Variables		t-Statistic	Prob.*	Results
GE	ADF Critical Value	-4.223949	**0.0019**	**1(1)**
	1% level	-3.610453		
	5% level	-2.938987		
	10% level	-2.607932		
GR	ADF Critical Value	-6.508942	**0.0000**	**1(1)**
	1% level	-3.679322		
	5% level	-2.967767		
	10% level	-2.622989		
OGAP	ADF Critical Value	-4.456067	**0.0010**	**I (1)**
	1% level	-3.610453		
	5% level	-2.938987		
	10% level	-2.607932		
INF	ADF Critical Value		**0.0000**	**1(1)**

		-7.767328		
	1% level	-3.610453		
	5% level	-2.938987		
	10% level	-2.607932		
DIR	ADF Critical Value	-5.364465	**0.0001**	**1(1)**
	1% level	-3.610453		
	5% level	-2.938987		
	10% level	-2.607932		

Source: Author Calculation

5.2 Lag Length Criteria

To apply Granger causality test and SVAR the maximum lag must be known, therefore lag length criteria has been used and findings are given below in table 6.2. There are different techniques are to determine the optimal lag length but the most commonly methods used are Akaike & Schwarz information criteria. AIC puts minimal penalty on adding lags and opposite in the case with Schwarz. This study uses AIC and the results indicate that the minimum lag length is one.

Table 5.2: Lag Length Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-111.273	22.2575	0.00044	6.459606	6.679539	6.536368
1	78.18825	315.7686	4.81E-08	-2.67713	-1.357526*	-2.216549
2	95.27636	23.73349	8.12E-08	-2.23758	0.18169	-1.393187
3	120.9039	28.47501	9.89E-08	-2.27244	1.246494	-1.044236
4	142.2594	17.79625	2.01E-07	-2.06997	2.548632	-0.457951
5	217.566	41.83702*	3.55e-08*	-4.864778*	0.853485	2.868951*

Source: Author Calculation

5.3 Granger Causality Test

Granger causality test is obliged to estimate the forecasting onetime series variable to another variable. In other words, we can say that this test checks the existing of causality relation between the variables. Although this granger causality tests also employs 01 lags according to lag length criteria. The findings of the granger causality test are shown below table

Table 5.3: Results of Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.
LRTAX does not Granger Cause LRGEXP	0.69725	0.6305
LRGEXP does not Granger Cause LRTAX	1.31047	0.2915
LOGOG does not Granger Cause LRGEXP	0.83323	0.5385
LRGEXP does not Granger Cause LOGOG	1.59344	0.0984***
CPI does not Granger Cause LRGEXP	1.6021	0.1961
LRGEXP does not Granger Cause CPI	0.39124	0.8501
DIR does not Granger Cause LRGEXP	2.91413	0.0331**
LRGEXP does not Granger Cause DIR	0.79701	0.5622
LOGOG does not Granger Cause LRTAX	0.73076	0.6071
LRTAX does not Granger Cause LOGOG	5.51559	0.0015*
CPI does not Granger Cause LRTAX	2.17847	0.0889***
LRTAX does not Granger Cause CPI	0.31839	0.8972
DIR does not Granger Cause LRTAX	1.24247	0.3193
LRTAX does not Granger Cause DIR	0.70312	0.6264
CPI does not Granger Cause LOGOG	0.30351	0.0906***
LOGOG does not Granger Cause CPI	0.49719	0.0775***
DIR does not Granger Cause LOGOG	0.83275	0.1388
LOGOG does not Granger Cause DIR	1.27391	0.3062
DIR does not Granger Cause CPI	2.84273	0.0363**
CPI does not Granger Cause DIR	4.00592	0.0083*

Source: Author Calculation

Note: *, **, and *** level of significance at 1, 5 and 10 percent respectively

Results of Granger causality rejects the null hypothesis that Government tax revenue does not granger cause government expenditure, because F-statistics (0.69725) and P-value (0.6305) are insignificant, which means government tax revenue has no impact on government revenue. On the other hand, results also doesn't reject the null hypothesis i.e. Government expenditure does not granger cause government tax revenue, because F –statistics (1.31047) and P-value (0.2915) are also insignificant. In other word we can say that government expenditure has no impact on

government tax revenue and there is no causality between government expenditure and government tax revenue accrue in Pakistan. In case of Pakistan due to higher level of budget deficit government borrowing more and add the interest burden which pushing the future expenditure as well as leading to higher taxes in future. Zinas and Samina (2007) examine the government revenue and tax causality and found that tax revenue does not cause government expenditure but government revenue cause tax revenue.

Relationship between output gap and government expenditure does not exist because null hypothesis output gap does not granger cause government expenditure, having F-statistics (0.83323) and P-value (0.5385) are insignificant. Granger relationship are existing between government expenditure and output gap because of significant F-value (1.59344) and P-value (0.0984). We can say that in case of Pakistan output gap has no impact on government expenditure, but government expenditure has impact on output gap.

According to pair wise Granger causality tests there is no granger relationship exist between consumer price index and government expenditure. Both null hypothesis CPI does not granger cause government expenditure and government expenditure does not granger cause consumer price index, are not rejected as their F-values (1.6021) (0.39124) and P-values (0.1961) (0.8501) are statistically insignificant respectively. In other words, we can say that government expenditure has no impact on CPI and CPI has no impact on government expenditure.

Interest rate and government expenditure have uni-directional granger connection because null hypothesis interest rate does not granger cause government expenditure having F-statistics (2.91413) and P-value (0.0331) is significant that means we can reject null hypothesis and the null hypothesis of government expenditure does not granger cause interest rate, is not rejected null hypothesis because F-statistics (0.79701) and P-value (0.5622) are insignificant. In other words, interest rate has impact on government expenditure, but government expenditure has no impact on interest rate.

Output gap does not granger cause government tax revenue, because F-statistics (0.73076) and P-value (0.6071) are insignificant, which means output gap has no impact on government revenue. On the other hand, results rejected the null hypothesis, that is Government tax revenue does not granger cause output gap, because F-statistics (5.51559) and P-value (0.0015) are

significant. So, we can say that government tax revenue has impact on output gap. Means there is a uni-directional relationship between output gap and government tax revenue.

According to granger causality result there is no relationship exists among the CPI and government tax revenue. The null hypothesis of consumer price index does not granger cause government tax revenue is not rejecting because of F-statistics (2.17847) and P-value (0.0889) is not significant. While null hypothesis, government revenue does not granger because CPI is not rejected since the F-statistics (0.31839) and P-value (0.8972) are also not significant. Both CPI and government revenue have no impact on each other.

According to pair wise granger causality test, there is no relationship exist between interest rate and government revenue, F-statistics (1.24247) and P-value (0.3193) are statistically insignificant so we cannot reject null hypothesis interest rate does not granger cause government revenue. On the other hand, F-statistics (0.70312) and P-value (0.6264) are also insignificant of government revenue and interest rate relationship. So, we can say that granger relationship does not exist between government revenue and interest rate and vice versa. Different results are consumer price index and output gap and output gap and CPI relation which F-statistics (0.30351), (0.49719) & P-values (0.0906), (0.0775) are significant. So, we can say that relationship exists between these variables and there is bidirectional causality among the variables.

Another null hypothesis that interest rate does not granger cause output gap cannot be rejected, because F-statistics (0.83275) and P-value (0.1388) are insignificant. In other words, we can say that interest rate has no impact on output gap. On other hand null hypothesis i.e. output gap also does not granger cause interest where insignificant F-statistics (1.27391) and P-values (0.3062). Granger relationship between output gap and interest rate do not exist and vice versa.

In case of interest rate and CPI both null hypotheses are rejected where F-statistics (2.84273), (4.00592) and P-values (0.0363), (0.0083) are significant. Relationship between both variables is existing and there is bi-directional causality among interest rate and consumer price index.

The overall results, of Granger causality shows that some variables have two-way causality between them where as for others one-way causality exists. Government expenditures, Tax revenues and CPI are found to have impact on output gap while for interest rate the strength of

relationship is weak. It is also important to note that two-way causality exist between CPI and output gap.

5.4 Empirical Analysis of SVAR Model and Impulse Response Function

5.4.1 The Recursive Approach

The recursive approach has been established by Sims (1980) and suggests that use of Cholesky decomposition (recursive ordering) to estimate vector auto regressive (VAR) model. This approach is applied for the shocks of fiscal variables analysis by Fatas and Mihov (2001). The recursive approach restricts *B* to a *k*-dimensional identity matrix and $A_0$to a lower triangular matrix with percent diagonal, which implies the decomposition of the variance-covariance matrix. The recursive approach is implicitly an informal ordering of the variables in the model. The results of the shocks depend on the order in which variables of the model are arranged. In this study ordering of the variables are as follow: Government expenditures is ordered first, Government revenue at second, third ordering is output gap, Inflation is placed fourth and the ordering of domestic interest rate is last. The ordering of the variables shows that connection among the structural error term e_t and reduced form disturbances u_t takes the subsequent form

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \varphi_{gr,ge} & 1 & 0 & 0 & 0 \\ \varphi_{ogap,ge} & \varphi_{ogap,gr} & 1 & 0 & 0 \\ \varphi_{\inf,ge} & \varphi_{\inf,gr} & \varphi_{\inf,ogap} & 1 & 0 \\ \varphi_{dir,ge} & \varphi_{dir,gr} & \varphi_{dir,ogap} & \varphi_{dir,\inf} & 1 \end{bmatrix} \begin{bmatrix} u_{ge_t} \\ u_{gr_t} \\ u_{ogap_t} \\ u_{\inf_t} \\ u_{dir_t} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e_{ge_t} \\ e_{gr_t} \\ e_{ogap_t} \\ e_{\inf_t} \\ e_{dir_t} \end{bmatrix}$$

Government expenditure is placed first mean it does not respond contemporaneously to shock to further variables in the model. Changing in the government expenditures, unlike in government revenue, are greatly not related to the other variables. In case of output gap, it does not respond contemporaneously to the government revenue shock. Consumer price index does not respond contemporaneously to the shock of government revenue and interest rate, but it is responding contemporaneously by government expenditure shock. Inflation affected contemporaneously by government expenditure shock output gap shock but not respond contemporaneously interest rate and government revenue shock. Government revenue does not respond contemporaneously to domestic interest rate shock, but revenue affected by respond of contemporaneously government

expenditure, output gap, and inflation shock. Domestic interest rate is responding contemporaneously by all shocks in the model. This recursive approach of traditional VAR has become under strong criticism from the various economic experts. According to them identifications imposed based on Cholesky decomposition is not theoretically based and not consistent with economic theory. Cooley and Leroy (1985) criticized that and argue that this type of shock is not pure shock but rather linear combination of structural disturbance. Therefore, through this approach it is very difficult to access the dynamic effects of the variables. To overcome this criticism Blanchard and perotti introduce another approach and impose restriction with the basis of economic theory.

5.4.2 The Blanchard Perotti approach

Blanchard and Perotti (2002) describe that the identification approach depends on conventional information about government taxes timing of tax collection and transfer system to estimate the instinctive reaction of government expenditure and taxes to economic activity. This study follows the Perotti (2005) identification approach, in which he analyses the fiscal shocks' impacts on output and inflation. The relationship among the structural disturbances e_t and reduced form disturbances $u_t$can be written as

$$u_{ge_t} = \alpha_{ge,gr}{}^{u_{gr_t}} + \alpha_{ge,ogap}{}^{u_{ogap_t}} + \alpha_{ge,\inf}{}^{u_{\inf_t}} + \alpha_{ge,dir}{}^{u_{dir_t}} + e_{ge_t}$$

$$u_{gr_t} = \alpha_{gr,ge}{}^{u_{ge_t}} + \alpha_{gr,ogap}{}^{u_{ogap_t}} + \alpha_{gr,\inf}{}^{u_{\inf_t}} + \alpha_{gr,dir}{}^{u_{dir_t}} + e_{gr_t}$$

$$u_{ogap_t} = \alpha_{ogap,ge}{}^{u_{ge_t}} + \alpha_{ogap,gr}{}^{u_{gr_t}} + \alpha_{\inf,ge}{}^{u_{\inf_t}} + \alpha_{ogap,dir}{}^{u_{dir_t}} + e_{ogap_t}$$

$$u_{\inf_t} = \alpha_{\inf,ge}{}^{u_{ge_t}} + \alpha_{\inf,gr}{}^{u_{gr_t}} + \alpha_{\inf,ogap}{}^{u_{ogap_t}} + \alpha_{\inf,dir}{}^{u_{dir_t}} + e_{\inf_t}$$

$$u_{dir_t} = \alpha_{dir,ge}{}^{u_{ge_t}} + \alpha_{dir,gr}{}^{u_{gr_t}} + \alpha_{dir,ogap}{}^{u_{ogap_t}} + \alpha_{dir,\inf}{}^{u_{\inf_t}} + e_{dir_t}$$

In the above system equations of the reduced form disturbances has 17 unknown parameters and whereas ten distinct elements to examine so it not identified. Blanchard and Perotti approach suggest achieving identification add some restrictions on these seventeen parameters. For these stance interest payments on government total debt excluding from the definition of net tax revenues and government expenditures, the semi elasticity set to be zero for this two fiscal tools to interest rate innovation, i.e $a_{ge,dir}$ and $a_{gr,dir}$ while Justification of this assumption appear for government spending play no role when analysing its impacts but in case of taxes this

assumption slightly controversial. As government containing particularly investment and public consumption do not react automatically to the variation in output gap thus, we put $a_{ge,ogap}$ =0. Different in case of price elasticity although, some part of goods and services and government spending are likely to be react to the inflation. An extensive approach Perotti (2005) was adopt and price elasticity of government spending is set to be -0.5. Although Bilquees (2004**)** setting this elasticity to zero found results are significant. This paper uses external information about price elasticities and output gap of net taxes and implies Bilquees (2004**)** estimated elasticity values of net taxes. Finally, the parameters we set $\beta_{ge,gr}$ =0 which show that decision of government spending is prior to revenue decision. The relation among structural error term and reduced form after imposing these restrictions can be written in matrix form:

$$\Gamma U_t = BV_t$$

Where $V_t$is the vector containing the orthogonal structural shocks.

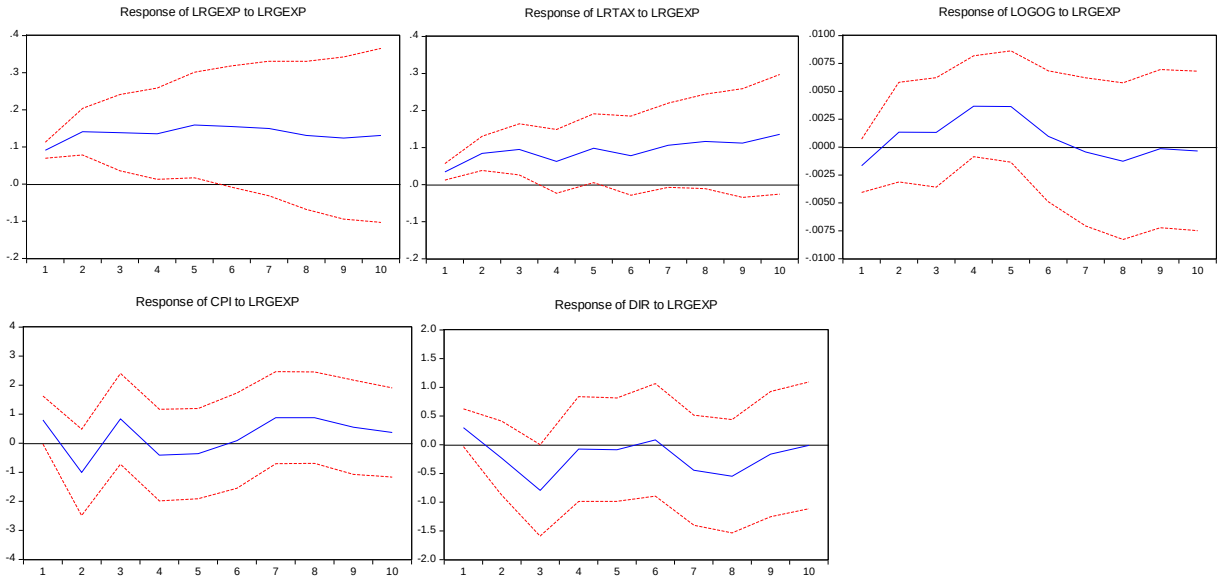
$$\Gamma U_t \begin{bmatrix} 1 & 0 & 0.5 & 0 & 0 \\ \varphi_{ge,gr} & 1 & 0 & \varphi_{\inf,gr} & 0 \\ \varphi_{ge,ogap} & 0.96 & 1 & \varphi_{\inf,ogap} & 0 \\ \varphi_{ge,\inf} & 0.71 & \varphi_{\text{ogap,inf}} & 1 & 0 \\ \varphi_{ge,dir} & \varphi_{gr,dir} & \varphi_{ogap,dir} & \varphi_{\inf,dir} & 1 \end{bmatrix} \begin{bmatrix} u_{ge_t} \\ u_{gr_t} \\ u_{ogap_t} \\ u_{\inf_t} \\ u_{dir_t} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e_{ge_t} \\ e_{gr_t} \\ e_{ogap_t} \\ e_{\inf_t} \\ e_{dir_t} \end{bmatrix}$$

Linear combinations of the orthogonal structural shocks according to the reduced-form residuals of from: $U_t = \Gamma^{-1} BV_t$

5.5 Impulse Response

For investigation of dynamics we have generated impulse response function to trace the directional reaction of one standard deviation shock of a variable to of order. Having identified government expenditure, government revenue, output gap, inflation and interest rate, we can study their effect and predict forecasting in the economy.

5.5.1 Impact of Government Expenditure Shock



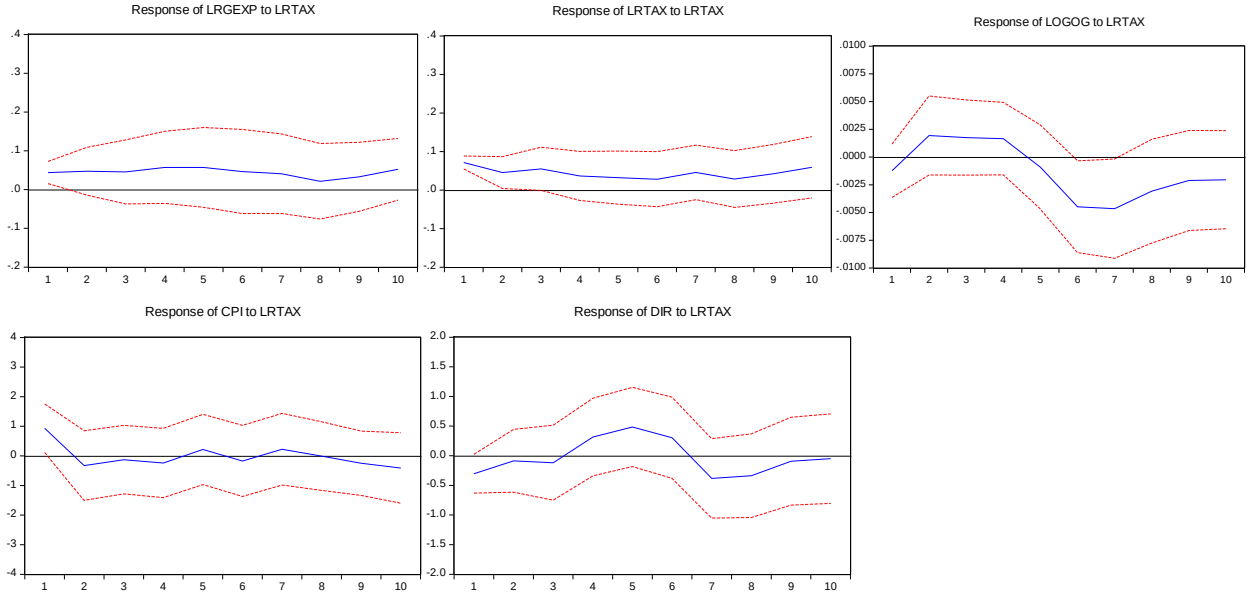
With imposing of restrictions, the impulse response function in figure 1 shows that response of endogenous variables to a positive shock in government spending. Initially government expenditure is positive and upward trend up to second quarter due to its own shock. After second quarter slightly down for 4th quarter. Slightly variation in government expenditure own shock but it is positive and remains consistently positively over the next period. Thus, it brings a permanent effect.

The graph of impulse response function indicates that response of endogenous variables to a positive shock in government expenditures. Response of government revenue is positive and increases till third period. After third period government revenue slightly falls and after that upward trend is observed in government revenue and this effect is positive and persists in the remaining period. Government expenditures decrease in case of tight fiscal policy and rise due to expansionary fiscal policy. These findings are theoretically consistent because high government revenues are required to finance government expenditures and this relationship are statistically significant. A positive shock in government expenditures leads to an unbalanced initially output gap. The initial response of output gap is positive and shows an increasing trend till 4th year and after that it becomes constant for one year. After that output gap response is negative and down ward and it would be zero output gap in response of government expenditure shock in ninth period and then reminds around zero. A significant divergence is observed till 4th period and then it converges to zero. These results indicate the theoretical foundation of Keynes when

government expenditure increase aggregate demand increase and inflationary pressure accrue in the economy in short run and out gap also increase in short run. As the development expenditures increases with the passage of time output increases which cover the output gap in the economy. The positive gap indicates that actual output is greater than potential due to increase in aggregate demand. But over the long run the economy comes to the balanced point where output gap is zero.

In case of consumer price index according to impulse response function, a positive shock in government expenditures leads to inflation decrease in the 1st period. The initial response of inflation is negative and downward. After second year inflation trend of inflation is upward and moves upward after one year. In years of four to six it remains constant after that it would be increasing and remains constant after wards which are a good sign. According to Keynes when expansionary fiscal policy is adopted, government expenditures leads the aggregate demand and inflation also increases in short run, but it becomes and stable in long run. In case of interest rate, impulse response function indicates a positive shock of government expenditures leads to decreases in interest rate initially. The response of interest rate will be initially negative and downward in first two years after that it would be upward and converge to the zero line. After six year it is decreasing and after eight year it again converges to zero line. In this case due to increase in government expenditures, interest rate decreases in most of the time and remains unaffected in remaining time. According to Keynes when the government borrows more for financing the public spending interest rate also increase which leads the crowding out effect. In short run up to third quarter interest rate decreasing after that it is increasing and close to the zero line.

5.5.2 Impact of Government Revenue Shock

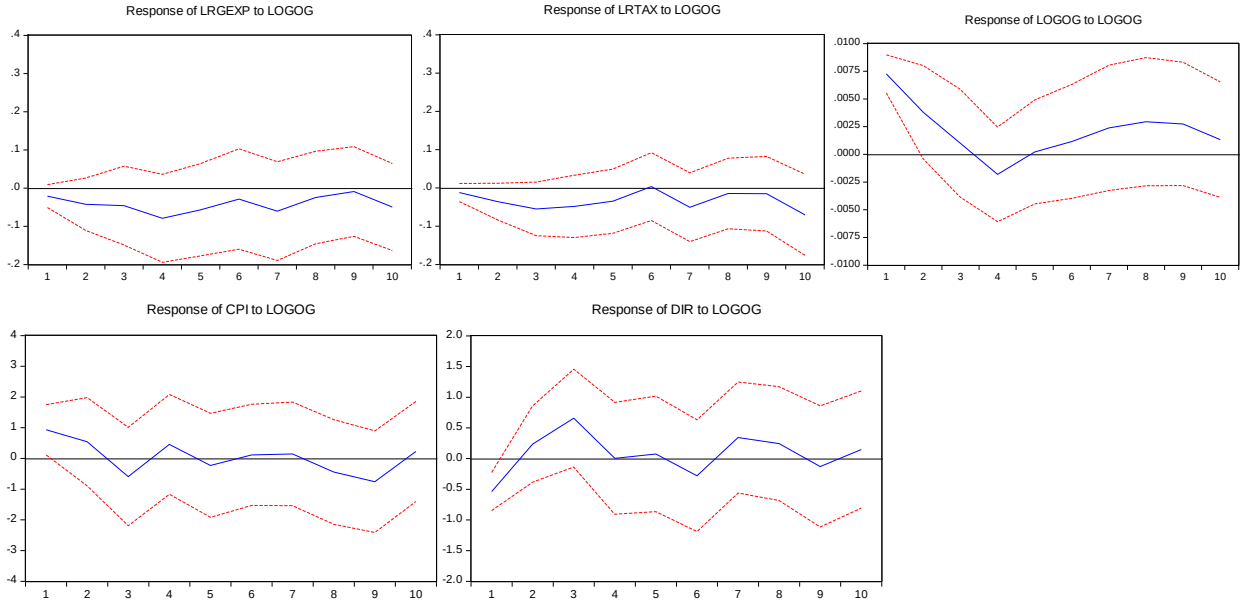


With imposing of restrictions, the impulse response function in figure 2 shows that response of endogenous variables to a positive shock in government revenue. Initial response of government expenditure is positive. From 7th to 8th period, a slight decline is observed which not a significant decline is therefore, response of government expenditures on revenue is positive and permanent. Our results in accordance with Keynes balance budget theory which indicates that there is long run and positive relationship between government revenue and expenditures because when government revenue increases government has more option to spare in public spending. Impact of positive shock in government revenue on itself is positive and persist same over the long period of time, thus it brings the permanent effect.

A positive shock of government revenue leads to output gap increase in the 1st period. Than initial response of output gap is positive with constant trend up to three and half years. After that it observed a down-ward trend and remains negative till 5th years and then becomes constant again for one year and then starts increasing slowly. Initially due to increase in revenue, economic activities increase causing the output gap to positive and it persist, but theory says that positive output for the three years brings with it inflation. Inflation causes aggregate demand to decrease and thus output decreases causing output gap to be negative. Impulse response in case of responses of government revenue leads to decline in inflation, the initial response of inflation is negative and downward, after that inflation response is insignificant. It converges to zero line after 1st year thus it has a very temporary impact on inflation. Result of Impulse response

function are puzzling since theoretical frame work identifies that increase in government revenue through taxes has less effect on inflation these results are insignificant in case of Pakistan. Government revenue has a minimal effect on inflation. In case of interest rate if one standard deviation shock is given to government revenue then initially interest rate and close to zero for three year. After that response of interest rate would be increasing till sixth year and after that it has again decreasing trend. After eight periods response of interest rate up-warding and it would converge to the zero line in tenth quarter.

5.5.3 Impact of Output Gap Shock

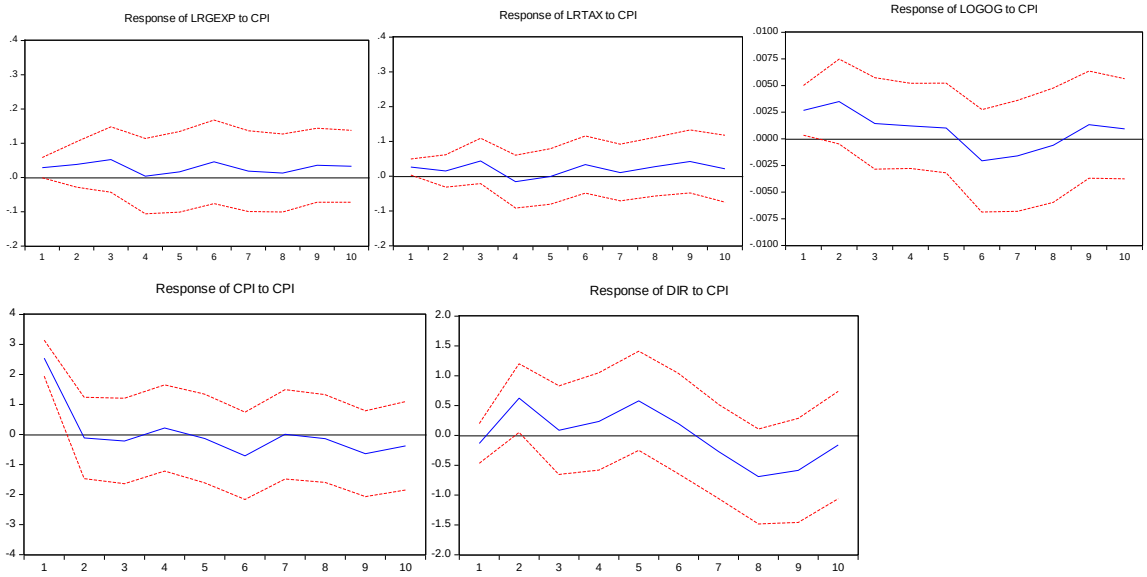


Positive shock in output gap causes government expenditure to remain negative till tenth period. Results indicate that an increase in output gap puts an inflationary pressure that in turns in signals that the economy needs to reduce aggregate demand thus government expenditures decreases. A positive shock in output gap leads to a decline in government revenue initially. Government revenue decreasing during first four years and after that converges to zero line in six year and it is negative divergence. Results indicate that when output gap increases positively, there will be more output than the potential. The economy will be having surplus thus it doesn't need to finance its projects through revenue, thus revenue decreases. The effect of output gaps on government expenditures and revenues are same and it has a long term effected. Shock of output gap on its own is negative and decreasing trend up to third period. After that output gap is zero in fourth year and negative for smaller time. Output gap start moving upward and positive after that and diverge from zero line with smaller fluctuation. An increase in output gap causes the prices

to increase. The increase in price thus causes affects actual output negatively thus, output gap starts declining once it gets negative the inflationary pressure eliminated due to employment prevailed in the economy thus the need to increase actual output starts again.

The graph of impulse response function indicates that when one positive shock in output gap initially inflation response is decreasing for third year. After that it would be increasing for two years downward in four and five years and converge to zero for next two years. Inflation response show decreasing trend in next two years after nine year it would be upward and converge to zero line. According to New Classical, if the policy change is unanticipated, any change can affect the economic variables but only in the short run but when the households gets to know about the situation, the variables come back to the initial level.

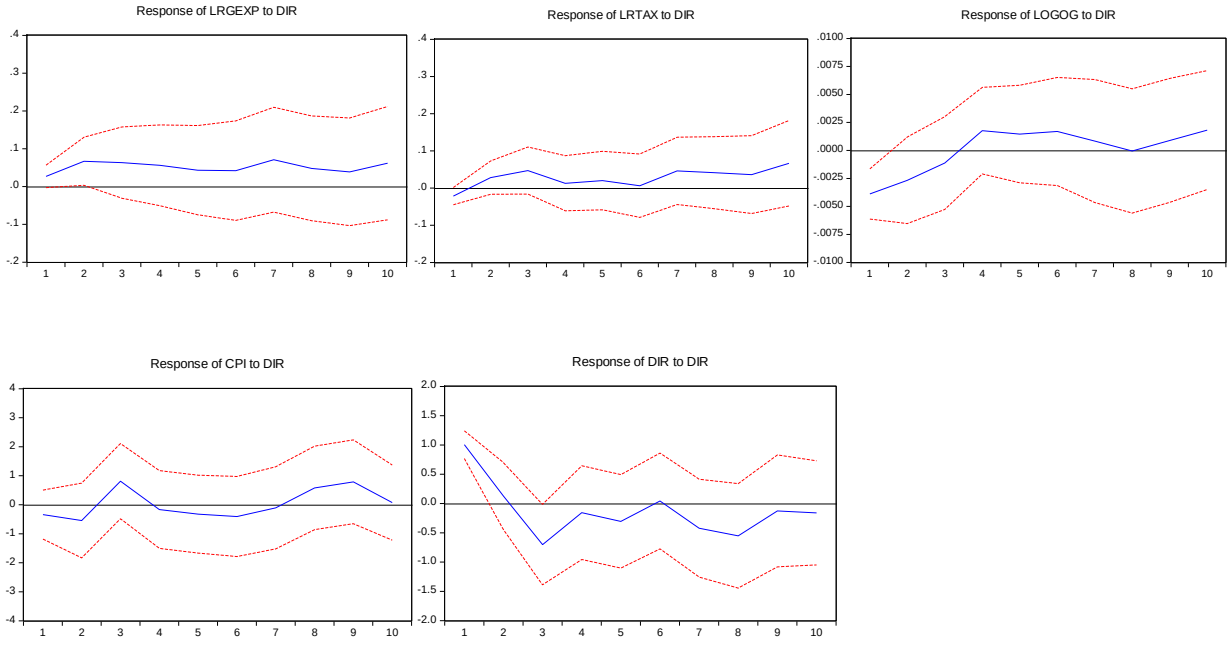
5.5.4 Impact of Inflation Shock



Above figure shows the responses of endogenous variables to a positive shock in inflation. The results show that initial response is positive, but it is gradually decreasing after second years. After second years it would be decreasing and moving slightly above the zero line. Results indicate that an increase in general price level causes the expenditures to increase, thus government will increase the expenditures by less than 0.5 percent and this effect persist over the long period of time to increase. Initial response of government revenue is positive and upward with constant rate. The increase in inflation beings an increase in government expenditures thus to finance expenditures, government increase revenue, but this effect is significant till 3rd period.

Impulse response function indicates that due to a positive shock in inflation response of output gap will be initially down ward and after fifth year response would be zero. After that output gap would be positive and moving upward. Response of output gap after nine year would be positive and converge to the zero line till last year. According to theoretical phenomena due to in inflation, the output gap will reduce because inflation affects the economic activities by affecting aggregate demand thus actual output starts declining. Once the gap become negative, the inflationary pressure reduces, and actual output starts increasing. Response of inflation on its own shock initially downward for two years and converge to zero line in second year. After that it would be negative and lies near to zero line for six year. After six year in would be upward and again converges the zero line. In case of inflation to interest rate one positive shock in inflation leads to increase in interest rate initially it is positive and up warding. After second year it would be variation but positive up to seven year. After seven-year interest rate response decreases and negative till last year. When inflation increases, then the central bank to control inflation raises interest rate it causes an increase in the cost of borrowing due to which borrowing and thus money supply to decreases leading to decline in inflation in the next periods.

5.5.5 Impact of interest rate shock



In case of interest rate one positive shock in interest rate is leads to government expenditure the initial response of government expenditure is positive. Government expenditures increases and

constantly persists until the 10th period. Due to increase in interest rate, the investment from private sector declines, thus government sector can rely on funds borrowed by central bank. In this way, government expenditures will increase, and it is impact is permanent. Graph of impulse responses shock in interest rate shows that one standard deviation shock in interest rate leads government revenue to increase. Initially government revenue present zero response while in first three period after that it is moving upward slightly and converge to zero in six period. Overall shock in interest rate causes a slight permanent increase in tax revenue because due to increase in cost of borrowing, government will rely more on taxes to finance its expenditures.

In case of response of output gap to shock in interest rate, initial response of output gap is positive but upward trend. This initial response is positive due to increase in interest rate in response saving increases and adverse effect of output gap upward trend. After seven years response of output gap is positive and close to zero. Response of output gap due to interest rate shock is positive but its impact reduces over the time and after third lag it remains positive in the remaining time however the overall effect after third lag is minimal so domestic interest rate effects output gap positively for a very short time period. The similar results is found in the study of Alam & Waheed (2006) who examined that positive shock of interest rate leads to decrease the actual output and ultimately increase the output gap. Due to one standard deviation shock in interest rate the initial response of inflation is negative and after second year it is moving upward and downward after three years. Inflation responses due to interest rate shock after third period response is positive but decreasing trend and converge the zero line in fourth period. In other words, after a slight decline in the first period inflation significantly increase in the 2^{nd} period and after wards its impact eliminated. The initial declines in inflation is due to the reason that when interest rate increases people borrow less money, consumer have less money to spend, saving of the economy to shrink and inflation to decrease. Previous studies also indicate same results as Anzuini et al. (2012) estimate that shock of easy monetary policy lead to inflation, while, Arreitable & Mitcheali (2014) examine that increasing interest has adverse effect on consumer price index. Response of interest rate on its own shock initially positive and decreasing trend after third year it would be negative and remain negative till last year.

CHAPTER 6

Conclusion and Policy Recommendation

Through recursive approach effect of government revenue on output gap is positive but statistically insignificant and the values of government revenue and inflation are positive and highly significant which is due to the reason that government revenues are mostly come from indirect taxes. In case of interest rate positive and significant results indicate that there is a relationship between government revenue. As most of the coefficients in the model estimated through recursive approach are insignificant and few of the restrictions are not making appropriate sense through impulse response function. The model estimated using Blanchard and perotti (2002) approach has been reported.

Results of Blanchard and perotti (2002) approach shows a positive and significant role of government revenue and government expenditure in explaining the variation in inflation and output gap in Pakistan. The statistical results suggest that that government expenditure shocks have positive effect on inflation, interest rate and output gap. The output gap multipliers of government expenditures are decreasing over the period of four years. Positive shock in government expenditures increase the output gap and have a significant impact on consumer price index. These government spending shock also increase the domestic interest rate in short runs. Increase in government expenditures doesn't have a permanent effect on output gap because the shocks in demand side factor don't have permanent impact on GDP. It is observed that a positive shock in government expenditure creates a long-term impact on revenue that shows most of the public spending is financed through taxation. On the other hand, positive shock in government tax revenue leads to higher inflation and a higher output gap over the period of six year and after that output gap due to tax revenue shock is decreasing and comes close to zero in long run. Increase in government tax revenue also translated into high interest rate in short run. Overall this study concludes that fiscal policy innovations have significant impact on output gap and inflation.

6.1 Policy Recommendations

The recommendations considering empirical results are as follow:

- After measuring the output gap, it is analysed that fiscal authorities run the economic activity via revenue policies, while discretionary spending policies are more favourable to boost up the economic growth and have comparable greater impact at the time of negative output gap.
- Government spending should be made to increase the output in the long run, in the time of recession.
- After analysing the trends in tax and non-tax revenue, it is observed that financial position of Pakistan is not so strong, and the economy mostly rely on non-tax resources. Tax to GDP ratio of Pakistan as compared to other developing countries is very low. Fiscal authorities should rethink about the federal and provincial tax structure in Pakistan, and the tax base should be wider and there is need to make the method of tax collection more efficient.

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