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The Relative Effectiveness of Monetary and Fiscal Policy on Output in Ethiopia

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Abstract: Ethiopia had been taking number of Monetary and Fiscal policy actions in order to stabilize the macro economy like output since long time, however their relative effectiveness on output in Ethiopia has not yet clearly identified, therefore the objective of this study was to see the relative effectiveness of fiscal and monetary policy on Output in Ethiopia using quarterly data from 2001Q1-2021Q4 by using Structural vector autoregressive (SVAR) model. The monetary policy measured by Broad money (M2) and private sector credit, the government expenditure and budget deficit used as indicators for fiscal policy variables other variables such as Real effective exchange rate and Consumer Price Index are used as control variables. To see the contemporaneous effects of the variables and to analyze the data and draw conclusions and policy inferences the structural vector autoregressive model was employed. The empirical result showed that, the effect of monetary policy is much stronger than fiscal policy even though both policies are significant in affecting output. The findings are consistent with previous empirical findings. The implication of this is that, there should be more focus and confidence on both monetary and fiscal policy for the purpose affecting output and economic stabilization in Ethiopia. Hence, both fiscal and monetary policies should be used in a coordination to get better output.

Keywords: Monetary Policy, Fiscal Policy, Output, SVAR, Ethiopia

1. Introductions

1.1. Back Ground of the Study

The effects of monetary and fiscal policy on output have been a prominent area on macroeconomic policy and satiability of the economy. Monetary and fiscal policies are tools to correctly direct the economy and facilitate the growth and development of the country. Economists and policy makers have been working on identifying the effects of these policies to stabilize the economy.

The macro economic issues such as high employment, rising output of goods and services, and relatively stable prices are among others widely accepted national economic goals. Responsibility for economic stabilization actions to meet these goals has been given to monetary and fiscal authorities. But their relative effectiveness and impacts on affecting output is a controversial that has created argument among economists and policy makers. As quoted by Dawit Senbet [12], the seminal work of Andersen and Jordan [4] on the relative importance of fiscal and monetary policy for output stabilization (the St. Louis equation) caused many debates among economists for a long period. Their finding shows that monetary policy has a significant impact on nominal output stabilization while fiscal policy does not. This finding was in direct contradiction to the conventional wisdom of the time regarding the relative importance of monetary and fiscal policies [2]. On the other hand, after the 2008 financial crisis, as stated in Jawadi et al. [6] identifying whether fiscal policy or monetary policy's has significant impact on affecting the economy has become most important dialogue for Economics researchers and policy arena.

When we look at different economics theories on impacts of policies on affecting output and price, there are three basic theories: - The first theory is monetarist theory, according to monetarist theory, monetary policy can influence output but fiscal policy is largely ineffective. The Second is Keynesian macroeconomic theory, government expenditure as a component of aggregate demand can influence output, but monetary policy is largely ineffective. The third theory is real

business cycle theory, according to this theory government fiscal and monetary policy will be largely ineffective. It assumes that there are large random fluctuations in the rate of technological change. In response to these fluctuations, individuals rationally alter their levels of labor supply and consumption.

1.2. Statement of the Problems

Monetary and fiscal policies are the most dominant and influential policy instruments available for an economy through which macro-economic and financial systems can be controlled. A carefully designed monetary and fiscal policy might assure comprehensive macro-economic and financial systems. Unlikely, a policy that is constructed on wrongly consideration of the factors that affect its effectiveness might have a counter effect. In order to have a good economic policy, therefore, it is crucial to understand how effective both monetary and fiscal policy in affecting the intended macroeconomics variables.

Since long time, the scholars and researchers had been debating on the effectiveness of monetary and fiscal policies in affecting outputs and price. The major ones are monetarists, fiscalists and both policy coordination. Monetarists believe that monetary policy is a more powerful tool when used for macroeconomic stabilization [9, 8]. The others are the fiscalists/Keynesians whose policy faith is much in government expenditure and tax changes than in monetary policy and they considered as fiscal policy are more effective than monetary policy. According to Keynesian macroeconomic theory, government expenditure as a component of aggregate demand can influence output, but monetary policy is largely ineffective; this group is led by Keynes. On the other hand real business cycle theory, which states government fiscal and monetary policy, will be largely ineffective.

The controversy of effectiveness of the two polices in affecting output and price remained unanswered until today, some of the researchers support either of the two and others against the effectiveness of both monetary and fiscal policy. Accordingly Friedman and Meiselman [14] conducted an empirical study to test the validity of the Keynesian and monetarist theories using, in simplified single equation models. The results support the stability of the monetary model compared to the Keynesian multiplier model even though, there have been strong criticism on modeling oversimplification. In the same way, Jordan and Anderson [2] used a dynamic econometric model and concluded that monetary policy was more effective and faster in influencing the economy than fiscal policy.

The other researchers such as Belliveau and Stefan [5, 7] support both fiscal and monetary policies are effective in affecting output. In their analysis they used a simple approach to identify the influence of macroeconomic-policy instruments, based on the St. Louis equation and concluded that both monetary and fiscal policy is viable options for policymakers seeking to stabilize output. Similarly, (Adefeso, and Mobolaji [12] argues that both monetary and fiscal policies have significant impacts on output and hence they have prominent roles in pursuit of macroeconomic stabilization.

In Ethiopia National Bank of Ethiopia & Ministry of Finance is the lead policy advisor to government on monetary and fiscal policy. The National Bank of Ethiopia influences the level of economic activity by controlling money supply through instruments of monetary policy such as reserve requirements, discount rate and open market operations, standing central bank credit facility, setting floor deposit rates, direct inter-bank borrowing or lending mechanism, credit control and moral suasion. The bank uses these instruments either separately or in combination based on its policy target to be achieved and the ministry of finance working on fiscal policy side in order to influence the macroeconomic situations in the economy however; their relative effectiveness in affecting the intended goal remained questioned. As per the researcher knowledge there were limited amounts of researches done on the relative effectiveness of monetary and fiscal policy in output in this data periods and SVAR frame works. Therefore, this paper aimed to investigate the relative impact of monetary and fiscal policies on output in Ethiopia, based on structural vector autoregressive (SVAR) approach. The researcher used long run and short run analysis used some structural restrictions on short run in order to capture the contemporaneous effects in (SVAR) models frame works. This paper also analyzed impulse responses and variance decomposition in an attempt to explain the relative effectiveness of monetary and fiscal policy in affecting output in Ethiopia.

1.3. Objective of the Study

The main objective of this study is to examine the relative impacts of monetary and fiscal policy on output in Ethiopia.

1.4. Significance of the Study

The right choice of any effective macroeconomics policy may derive a country to better economic positions, while making policies it is important to understand the real effects of policy on some targeted variables. Therefore, this study will add some values to the existing literatures when it provides with some facts on this study. It will also serve as references for the further study on related areas in case of Ethiopia.

1.5. Limitations of the Study

Due to the inelastic nature of interest rate in Ethiopia, in this study the variables used for monetary policy are private sector credits and money supply whereas on some literatures mostly the central bank interest rates and short term interbank money markets are used as proxy for monetary policy. On the other hand the researcher used quarterly GDP that is calculated for NBE's internal consumption only which is not officially estimated by Ministry of Finance like annual GDP.

1.6. Organization of the Paper

The remaining sections of this paper organized as follows, in chapters two the theoretical and empirical literatures are discussed, chapter three included the methodology and model specification data types and sources, chapter four included the empirical result and analysis and finally in chapter five conclusion and policy implications are presented.

2. Literature Reviews

2.1. Theoretical Literature

The Monetary policy is all about the control of money supply by the monetary authority of a country mostly targeting on either inflation rates or interest rates to stabilize the macro economies such as price stability, exchange rates stabilities and low unemployment of the county. The actions of central banks or monetary authorities such as changing the interest rates, buying or selling of securities and the changes in the required reserve rates of commercial banks are the actions which the monetary policy consists. Whereas Fiscal policy is the ways by which a government regulates its spending levels and tax rates to manage and influence a country economy. These two policies are the most known policies that are used in various combinations to affect a country's macro-economic goals.

The impact of monetary policy on the economy and in particular on output and prices has long been a key issue in macroeconomic theory [15]. It is also of fundamental importance from a policy perspective given how necessary it is for central bankers to have a proper understanding of the consequences of their actions so as to determine at each moment while monetary stance is appropriate for reaching their final goal.

In the book the New Neoclassical Synthesis and the Role of Monetary Policy by Marvin Good Friend and Robert G. King [19] suggests a set of the major conclusions about the role of monetary policy. First, New Neoclassical Synthesis models suggest that monetary policy actions can have an important effect on real economic activity, persisting over several years, due to gradual adjustment of individual prices and the general price level. Second, even in settings with costly price adjustment, the models suggest little long-run trade-off between inflation and real activity. Third, the models suggest significant gains from eliminating inflation, which stem from increased transactions efficiency and reduced relative price distortions. Fourth, the models imply that credibility plays an important role in understanding the effects of monetary policy. These four ideas are consistent with the public statements of central bankers from a wide range of countries. It is in this role that they can inform-rather than confirm-the priors of central bankers.

The credibility of monetary policy appears intuitively to require a simple and transparent rule. The new synthesis suggests that such a monetary policy involves stabilizing the average markup of price over marginal cost. In turn, this implies a monetary policy regime of inflation targets, which vary relatively little through time. Although price stability has been long suggested as a primary objective for monetary policy, a number of major questions have arisen about its desirability in practice.

There was also the concept of quantity theory of money which began in 16th century which examining the interrelationships between money, output and prices. The Pigouvian Cash Balance Equation $M = k.P.Y$ of quantity theory of money (QTM) is the first formal framework to study the interactions amongst money, output and prices. This proposes a direct and proportional influence of monetary growth on price inflation assuming full employment condition. Since then, innumerable research works pertaining to this relationship and many heated debates have revealed the sheer complexity in the association between money, output and prices. Some of the divergent views include money non-neutrality proposition of Keynes vis-a-vis long run money neutrality proposition of the monetarist school; Philips curve philosophy of tradeoff between output growth and price stability [13], and its subsequent refutation in the long run by Phelps [10] and Friedman [15].

On the other hand, the Kensian economics was developed by the British economist John Maynard Keynes during the 1930s in an attempt to understand the Great Depression. Keynesian economics is considered a demand-side theory that focuses on changes in the economy over the short run. Keynes's theory was the first to sharply separate the study of economic behavior and markets based on individual incentives from the study of broad national economic aggregate variables and constructs. Based on his theory, Keynes advocated for increased government expenditures and lower taxes which now considered as fiscal policy to stimulate demand and pull the global economy out of the depression. Subsequently, Keynesian economics was used to refer to the concept that optimal economic performance could be achieved and economic slumps prevented by influencing aggregate demand through active stabilization and economic intervention policies by the government.

2.2. Related Empirical Literatures

The relative impacts of monetary and fiscal policy with regard to stabilizing macroeconomics variables have been influenced the attentions of researchers and macro economists since long time. Sims and Zha [11] explained that the actual effects of monetary policy shocks on output and prices has raised the questions in the minds of central bankers and academicians from the time of the Classical quantity theorists in the 20th century to the monetarists in the 1950s and 60s and until present day economists. The two fundamental propositions about the effect of the quantity of money on the economy predate the emergence of monetary economics as a recognized discipline of study. The first is that increases in the quantity of money that is not associated with corresponding increases in real output will eventually lead to inflation, and the second is that a shortage of money can depress the volume of economic activity. A considerable

literature has emerged, attempting to give credence or discordance to these propositions, using parsimoniously restricted multivariate time series models as Sims and Zha [11] explained.

On the other hand, there was a debate between the relative effectiveness of monetary and fiscal policies for and against the two policies in stabilizing the economy. The debate has started since time of (Fried and Meiselman, Darrat, [3] Garrison and Lee, Gramlich, Adefeso and Mobolaiji [11]. However, researches has not reached conclusions both police effectiveness that some results in favor of monetarists and others are fiscals and the third one is coordination of both policies. Accordingly, the monetarist is those economists who believe that monetary policy is more powerful tool in stabilizing macroeconomics; the advocators of theses policy are Friedman and Meiselman [10]. On the other hand Fiscalist commonly known as Keynesians whose policies are mainly on government expenditure and taxes changes than monetary policy, researchers such as Ajisaf and Folorunso [1]. The other argument in the relative importance of the two policies are those who argues in favor of both fiscal and monetary policies significantly in stabilizing the economy thus they should be used in coordination so as to get the intended objective of stabilizations [18].

Anderson and Jordan [4] studied, the relative importance of fiscal and monetary policy for output stabilizations in US using St Louis Equations, run single equations model by using monetary base and money stock as measure of money supply and high employment, government expenditure and receipts as fiscal policy with quarterly data from 1953 quarter ii to 1968 quarter ii. From their analysis they found that, the effect of money supply relative to government expenditure is greater, more predictable and faster on growth hence concluded monetary policy has significant impacts on nominal output stabilizations while fiscal policy does not.

However, the work of Anderson and Jordan had raised money criticism from other researchers. Modigliani as stated on Senbet [12] their model was on the basis of omitted exogenous non policy variable among the regressor. He generated artificial data by non-stochastic simulations of model, which present a known structure of hypothetical economy. Then he used data in the Anderson and Jordan type of equation to estimate the reduced form of parameters. Modigliani argued that the bias was caused by positive correlations between the money supply and omitted exogenous variables.

Gold field and Blinder [8] also found the endogeneity of policy could bias the estimate of both structural and reduced form equations, it is worse in the structural form. They suggest that the bias can be reduced, though not eliminated if policy responds to the economic activity with lags. However this is not problematic since development of Auto regressive model (VAR) model used as in Sim [11] explained, which we treat all the variables in the form of reduced equations in endogenous model.

Dawit Senbet [12] has continued to check the work of Anderson and Jordan the relative importance of monetary and fiscal policy for output stabilizations as taking seriously the Saint Louis Equations that caused many debates among the economists for many decades. The Senbet paper investigated the relative impacts of Monetary and fiscal policy on US real economic activities, using quarterly data between 1959 Q i to 2010 Q ii and employed granger causality test and vector auto regressive (VAR) model. From both granger causality test and vector auto regressive (VAR) model, he found monetary policy relatively better than fiscal policy in affecting real output in the St Louis equations frame work.

The other recent research that has been done on the relative impacts of monetary and fiscal policy on real output is the work of Kenneth AT, et al [3] which criticized the work of Senbet [12] in revealing that, the research was suffering from a serious model misspecifications due to ignoring the coin-integrating (long run) relationships that links the policy variables with the real side of the economy beyond the short run time span of average business cycle. The main argument of Kenneth AT, [2] is that, Senbt's paper ignored the co integrating, the long run relationships. Their finding was similar with Senbet in the short run business periods, that both fiscal and monetary policy Granger cause significant change in real economic activities. However, only fiscal policy matters for long run economic growth.

Batter and Hafer [3] conducted the research on developed countries such as United States of America, United Kingdom, Germen, Japan, Canada and France based the Saint Louis method and found that money growth is more important than fiscal actions in affecting Gross national product (GNP) growth.

In opposite to the above finding, other studies also support the fiscal policy than monetary policy in relatively affecting output, described that fiscal policy variables have greater impacts in economic growth than monetary policy variables. The researcher Mutuku and Koech [21] in Kenya also used Vector Autoregressive (VAR) model to analyze and found that monetary policy did not have significant impacts on real output.

Sen and Kaya [26] found that both monetary and fiscal policy have significant effects on economic growth of Turkey. But monetary policy is more effective tool in stimulating the growth than fiscal policy. Hence suggested that both polices are significant and they should be used jointly in efficient manners. Researchers had been continued to conduct the researches on relative effectiveness of monetary and fiscal policy in affecting output and prices in both developing and developed countries. In the above sections we more focused on developed countries. When we came to developing countries like Africa, the research conducted by Kareem *et al* (2013) by using regressions and correlations analysis to pursue the relative impacts of fiscal and monetary policies on the economic growth in Nigeria showed that both narrow and broad definitions of money have significant positive effects on economic growth while the fiscal policy does not.

The other researchers in Nigeria Apanisile O and Saibu M. O [25] study examined the effectiveness of both fiscal and monetary policies in mitigating external shocks on Nigerian economy. By using annual data from 1960 to 2011 to determine which macroeconomic policy was more effective in mitigating the possible adverse effects of external shocks and found that external shocks had hindered the effectiveness of domestic policy overtime. The result also showed that monetary policy is more effective than the fiscal policy, but suggested a coordination of both fiscal and monetary would give a better result.

This study of Shahid Ali et al [24] investigates the relative effectiveness of both types of policies in the context of modern panel data analysis in South Asian Countries during the period from 1990 to 2007 find out that, monetary policy has proved to be more effective in case of south Asian countries.

Ajisafe [1] also estimated the effects of the variables of fiscal and monetary policy on economic growth using Ordinary least square (OLS) methods and beta coefficient in Nigeria. He found that the impacts of monetary policy are larger and more predictable than fiscal policy on growth in Nigeria.

Ali *et al* [3] conducted a research on examining the effects of fiscal and monetary policy on economic growth in south Asia Countries by using annual data from 1990 to 2007 and used Autoregressive distribute lag (ARDL) model. They found money supply has significant positive impacts in both short and long run on economic growth. Thus they concluded that monetary policy is more powerful than fiscal policy in supporting economic growth in the south Asia Countries.

Havi and Enu [17] have conducted research in Ghana to see the relative effectiveness of monetary and fiscal policy in economic growth by using annual data covering from the year 1980 to 2012 and employed regression analysis. They found that money supply has positive significant impacts on Ghana Economy while the fiscal policy doesnot.

Mutuku Cyrus and Koech Elias [20] has conducted research on monetary and fiscal policy shocks on economic growth in Kenya using annual time series data from 1997 to 2010 and employed recursive vector autoregressive (VAR) model. In their analysis of variance decompositions and impulse response functions revealed that fiscal policy has a significant positive impacts on real output growth in Kenya, while monetary policy shocks are completely in significant while fiscal policy shocks significantly alters the real output for a periods of almost eight quarters.

Ajisafe and Folorunso [1] conducted a research using annual data from year 1970 to 1998 in Nigeria. They concluded monetary rather than fiscal policy exerts greater impacts on Economic activities in Nigeria that the emphasis in the fiscal activities is led to greater distortions in in the economy.

On this specific study area of Ethiopia, Tadesse, T., & Melaku, T. [27] had investigated the relative effectiveness of monetary and fiscal policies in affecting economic growth by employing Auto-Regressive Distributive Lag Model (ARDL) for the time spanning from 1975 to 2017. The proxies used in this study for monetary and fiscal policy were Broad money supply (M2) and government consumption expenditure respectively while real GDP at constant prices in 2010 is used as proxy for economic growth in Ethiopia and found that both monetary and fiscal policies have equal statistically significant and positive impact on economic growth in Ethiopia. Besides of equal effectiveness, the elasticity of real output with respect to fiscal policy variable is greater than the elasticity with respect to money supply which they showed fiscal policy is more effective than monetary policy in influencing Real GDP in the long-run.

Zewudu Teshome [29] has also continued to investigate the relative effect of monetary policy and fiscal policy on economic growth in Ethiopia. Employed annual time series data from a period of 2009 to 2019. And the finding revealed that monetary policy proxy by interest rate has significantly a negative effect on the Ethiopian economic output. Also, the study found that fiscal policy proxy by government expenditure has significantly and positively influenced the economic growth in Ethiopia. Finally, the study exposed that fiscal policy is somewhat influential than monetary policy in altering economic growth of Ethiopia. He suggested that both fiscal and monetary policies should be implemented simultaneously to ensure macroeconomic stability.

Zerayehu S. [28] has used Vector Autoregressive Error Correction (VECM) model to analyze the monetary policy and macro-economic shocks in Ethiopia, estimation and analysis of monetary policy reaction function. He used variables such as domestic credit as the most indicators of monetary policy performance, net foreign assets, Consumer price index, Real Gross Domestic Product (RGDP), Real effective exchange rate (REER) and Fiscal gap (FG) and he founded that both net foreign asset and GDP are statistically significant and positively influence domestic credit in the long run dynamics model. It is only consumer price index that has a positive impact in the short run dynamics. All other explanatory variables negatively influence domestic credit in the short-run dynamics model. The effect of monetization of fiscal deficit on monetary policy depends on the endogenity and exogenity of fiscal deficits in the long run dynamics model and the speed of adjustment or feedback effect towards long run equilibrium takes many years to make a full adjustment when there is a shock to the system.

2.3. Monetary Policy Frame Work in Ethiopia

The principal objective of the monetary policy of the National Bank of Ethiopia is to maintain price & exchange rate stability and support sustainable economic growth of Ethiopia. Price stability is a proxy for macroeconomic stability which is vital in private sector economic decision on investment, consumption, international trade and saving. Finally, macroeconomic stability fosters employment and economic growth. Maintaining exchange rate stability on the other hand is considered as the principal policy objective of NBE so as to be competitive in the international trade and which use to exchange rate intervention as policy tool for

monetary policy to affect both foreign reserve position and domestic money supply [22].

To achieve NBEs' Monetary Policy objectives, NBE set money supply as an intermediate target. The operational target is an economic variable that the central bank wants to influence, largely on a day-to-day basis, through its monetary policy instruments. The growth of base money/reserve money is being used as operational target of the National Bank of Ethiopia.

The introduction of a wide range of monetary instruments by central banks engenders competition, efficiency and transparency and broadens financial intermediation in the banking system. It also promotes liquidity management of commercial banks and gradually leads to the development of well-functioning money and financial markets which could serve as catalysts for economic growth and development. So far, the use of wide range of monetary instruments has been extremely limited in Ethiopia due to the underdevelopment of the money market and the virtual non-existence of a financial market.

A standing central bank credit facility is another instrument used to enhance the financial capacity of commercial banks and to promote financial intermediation and efficiency. The key advantages of such standing credit facility are transparency and predictability of accessing central banks' resources to cover short-term needs. This credit facility gives banks an assurance that, when confronted with problems of shortfall in the clearing and a lack of alternatives for raising immediate funds in the inter-bank market, they can settle the clearing with the central bank's funds at a reasonable interest rate which has a clear relationship with short term market interest rates. Other monetary policy instruments used and to be used include, reserve requirement, setting of floor deposit interest rate (until interest rate is fully deregulated), direct borrowing/lending in the inter-bank money market and introducing re-purchase, agreement (repo/reverse repo operations), use of selected credit control when necessary, and moral Suasion.

Though, there had been number of researches done intensively in an attempt to find the relative effectiveness of monetary policy and fiscal policy in affect output (economic growth), however, they did not reach in conclusion with regards to the relative effectiveness of the two polices in affecting output. The effects of these policies differ from country to country and methods sample periods and ways of analysis, hence they did not reach any common conclusions in generals. As far as the researcher's information's there was limited researches done in Ethiopian with the relative effectiveness of monetary and fiscal policy in affecting output Ethiopia with the data periods this research has and SVAR frame works. Therefore this study would assist in adding further literatures in the areas and also the study used structural vector autoregressive models (SVAR) model by using quarterly data on both fiscal and monetary variables in order to get conclusions for relative impacts of fiscal and monetary policy on output.

3. Econometric Method, Data Descriptions and Model Set Up

3.1. Econometric Method and Data Descriptions

To examine the relative effectiveness of monetary and fiscal policy on output, the researcher used the Anderson and Jordan (1968) methods based on the Saint Louis equations frame works. It Expressed as:

$$\text{Output } Y = f(\text{Monetary policy Variables (M), Fiscal policy Variable (F) and other variables that influence economic performance (Z)}) \quad (1)$$

Y= output (Gross domestic Product (GDP).

M=Monetary policy variables (Money supply (M2) and private sector credit (PSC).

F= Fiscal policy variables (Government spending (G) and Budget deficit (BD).

Z= other variables that affect economic activities (CPI) and real effective exchange rates index REERI). The author analysis some evidence about the relative effectiveness of monetary and fiscal policy on output in Ethiopia. This empirical analysis used quarterly data for the period 2001Q1-2021Q4. The natural logarithm (Ln) data on real gross domestic product (LnRGDP), broad money (LnMS), credit to private sector (LnPSC), General government expenditure (LnGE), government budget deficit (LnBD), real effective exchange rate indices (LnREER) and consumer price indices (LnCPI) are variables included.

In this research money supply or broad money and private sector credits are used as proxy for monetary policy, the General government expenditures and budget deficit used for fiscal policy proxy. In Ethiopian monetary policy frame work the operating target is reserve money or high power money, but in this research money supply which is broad money is used as monetary policy proxy variable since it includes reserve money and used widely in different literatures. The sign of budget deficit variable changed to positive in order to have convenience conversion to natural log s and the output also interpreted accordingly. The other variable such as consumer price index and real effective exchange rate index are other control variables that mostly influence the output levels. The relative impact of monetary and fiscal policy variable shocks on real gross domestic product is the main objectives of the paper. In the most literatures for advanced monetary system the main proxy variables for monetary policy are interest rates and others short term monetary instruments, but in Ethiopia we do not have dynamic market based interest thus, the author used broad money or commonly money supply and credit to private sector as proxy for monetary policy. Data sours for all variables are from National Banks of Ethiopia.

3.2. Vector Autoregressive (VAR) Versus Structural Vector Autoregressive (SVAR)

The vector autoregressive (VAR) model is a workhouse multivariate time series model that relates current observations of a variable with past observations of itself and past observations of other variables in the system. The Vector autoregressive (VAR) model also constitute a general approach to modeling multivariate time series. A critical drawback of these models in their standard form is their missing ability to describe contemporaneous relationships between the analyzed variables. This becomes a central issue in the impulse response analysis for such models, where it is important to know the contemporaneous effects of a shock to the economy. Usually, researchers address this by using orthogonal impulse responses, where the correlation between the errors is obtained from the (lower) Cholesky decomposition of the error covariance matrix. This requires them to arrange the variables of the model in a suitable order. Therefore, an alternative method to this approach is to use so-called structural vector autoregressive (SVAR) models, where the relationship between contemporaneous variables is demonstrated more directly.

Structural vector Autoregressive (SVAR) models include restrictions that allow us to identify causal relationships beyond those that can be identified with reduced form or recursive models. These causal relationships can be used to model and forecast impacts of individual shocks, such as policy decisions in our case the relative impacts of monetary and fiscal policy Shocks to target variable output. Moreover, the main aim of Structural vector Autoregressive (SVAR) model analysis is not the parameter estimations but the dynamic response of impulse response and variance decomposition, because the estimated coefficient exhibits limited significance so the inference should rely on the dynamic interaction of the variables. The analysis of impulse response and variance decomposition is to analyze the effects of monetary and fiscal policy on output. In most economics researches the structural vector autoregressive (SVAR) was widely used to analyze the impacts of monetary and fiscal policy on the output and used broadly in policy analysis. As it first introduced by Sims [11], SVAR had been used to analyze the effects of money on output, the relative importance of supply and demand shocks on business cycles [16], the effects of fiscal policy or the relation between technology shocks and worked hours [17] among many other applications of the model.

We have three types of restrictions most commonly in SVAR model such as zero short-run restrictions, zero long-run restrictions and sign restrictions. In the identifications of the structural VAR model, we need to impose certain restrictions on the parameters in the model. Broadly-used identification systems were on that impose the short run restrictions which were commonly used by Sims (1986) and the long run restrictions which were used by Blanchard and Quah [8]. In this research the short run restrictions are used.

Short run restrictions: - (Zero short-run restrictions) (Cholesky identification) this identification scheme assumes that some shocks have no contemporaneous effect on one or more of the endogenous variables. For example, we may believe that shocks to y3 do not have an immediate impact on y2 in the following equations. For a multivariate model the short run restrictions are as follows:-

$$Y1,t = \alpha 11y1,t-1 + \alpha 12y2,t-1 + \alpha 13y3,t-1 + \beta 11\varepsilon 1,t + \beta 12\varepsilon 2,t + \beta 13\varepsilon 3,t$$

$$Y2,t = \alpha 21y1,t-1 + \alpha 22y2,t-1 + \alpha 23y3,t-1 + \beta 21\varepsilon 1,t + \beta 22\varepsilon 2,t + \beta 23\varepsilon 3,t$$

$$Y3,t = \alpha 31y1,t-1 + \alpha 32y2,t-1 + \alpha 33y3,t-1,t + \beta 31\varepsilon 1,t + \beta 32\varepsilon 2,t + \beta 33\varepsilon 3,t$$

When we assume that shocks to y3 have no contemporaneous impacts on y2 this implies that $\beta 23 = 0$, in the form of B matrix as follows:-

$$B = \begin{bmatrix} \beta 11 & \beta 12 & \beta 13 \\ \beta 21 & \beta 22 & 0 \\ \beta 31 & \beta 32 & \beta 33 \end{bmatrix}$$

Zero long-run restrictions, this identification scheme is built on the theory that some shocks have no long-run cumulative effects on one or more of the endogenous variables. This is based on, the economic theory of money neutrality and the implication that monetary policy has no long-run effects on output [23].

In this analysis the model the equations expressed as:-

$$\begin{aligned} LNGDP_t = {} & C_{10}+C_{11}*LNGDP\ (t\text{-}n) + C_{12}*LNMS_{(t\text{-}n)} + C_{13}*LNPSC_{(t\text{-}n)} + C_{14}*LNGE_{(t\text{-}n)} \\ & + C_{15}*LNBD_{(t\text{-}n)} + C_{16}*LNREER_{(t\text{-}n)} + C_{17}*LN\ CPI_{(t\text{-}n)} + \varepsilon_{1,t} \end{aligned}$$

$$\begin{aligned} LNMS = {} & C20_{+}C_{21}*LNGDP\ (t\text{-}n) + C_{22}*LNMS_{(t\text{-}n)} + C_{23}*LNPSC_{(t\text{-}n)} + C_{24}*LNGE_{(t\text{-}n)} \\ & + C_{25}*LNBD_{(t\text{-}n)} + C_{26}*LNREER_{(t\text{-}n)} + C_{27}*LN\ CPI_{(t\text{-}n)} + \varepsilon_{2,t} \end{aligned}$$

$$\begin{aligned} LNPSC = {} & C_{30+}C_{31}*LNGDP\ (t\text{-}n) + C_{32}*LNMS_{(t\text{-}n)} + C_{33}*LNPSC_{(t\text{-}n)} + C_{34}*LNGE_{(t\text{-}n)} \\ & + C_{35}*LNBD_{(t\text{-}n)} + C_{36}*LNREER_{(t\text{-}n)} + C_{37}*LN\ CPI_{(t\text{-}n)} + \varepsilon_{3,t} \end{aligned}$$

$$\begin{aligned} LNGE = {} & C_{40+}C_{41}*LNGDP\ (t\text{-}n) + C_{42}*LNMS_{(t\text{-}n)} + C_{43}*LNPSC_{(t\text{-}n)} + C_{44}*LNGE_{(t\text{-}n)} \\ & + C_{45}*LNBD_{(t\text{-}n)} + C_{46}*LNREER_{(t\text{-}n)} + C_{47}*LN\ CPI_{(t\text{-}n)} + \varepsilon_{4,t} \end{aligned}$$

$$\begin{aligned} LNBD = {} & C_{50+}C_{51}*LNGDP\ (t\text{-}n) + C_{52}*LNMS_{(t\text{-}n)} + C_{53}*LNPSC_{(t\text{-}n)} + C_{54}*LNGE_{(t\text{-}n)} \\ & + C_{55}*LNBD_{(t\text{-}n)} + C_{56}*LNREER_{(t\text{-}n)} + C_{57}*LN\ CPI_{(t\text{-}n)} + \varepsilon_{5,t} \end{aligned}$$

$$LNREER = C_{60+} C_{61}*LNGDP\ (t\text{-}n) + C_{62}*LNMS_{(t\text{-}n)} + C_{63}*LNPSC_{(t\text{-}n)} + C_{64}*LNGE_{(t\text{-}n)} + C_{65}*LNBD_{(t\text{-}n)} + C_{66}*LNREER_{(t\text{-}n)} + C_{67}*LN\ CPI_{(t\text{-}n)} + \varepsilon_{6,\,t}$$

$$LNCPI = C_{70+}C_{71}*LNGDP\ (t\text{-}n) + C_{72}*LNMS_{(t\text{-}n)} + C_{73}*LNPSC_{(t\text{-}n)} + C_{74}*LNGE_{(t\text{-}n)} + C_{75}*LNBD\ (t\text{-}n) + C76*LNREER\ (t\text{-}n) + C77*LN\ CPI\ (t\text{-}n) + \varepsilon_{7},\ t$$

Where ε, t is the error terms at time t and n, is number of lag operators in the VAR.
In the matrix form a structural vector Autoregressive (SVAR) with n lags is as follows:-

$$B_0 Y_{t\,=} C_o + C_1 Y_{t\text{-}1} + C_2 Y_{t\text{-}2\,+} \text{----} + C_n Y_{t\text{-}n} + \varepsilon_t \quad (2)$$

Where, c_0 is a k × 1 vector of constants, B_0 is contemporaneous effects, C_i is a k × k matrix (for every y_i = 0... n) and ε_t is a k × 1 vector of error terms. The main diagonal terms of the C_0 matrix (the coefficients on the i^{th} variable in the i^{th} equation) are scaled to 1. The error terms εt (structural shocks) satisfy three conditions, first, (Every error term has a mean of zero), second E (ε_t ε'$_t$) = Ω (the contemporaneous covariance matrix of error terms is a $k \times k$ positive-semi definite matrix denoted Ω) and thirdly E($\varepsilon_t \varepsilon`_{t\text{-}n}$) = 0 for any non-zero n. There is no correlation across time. In particular, there is no serial correlation in individual error terms. In additions to the three conditions in the definition above, with the particularity that all the elements in the off diagonal of the covariance matrix E (εt εt') = Σ are zero. That is, the structural shocks are uncorrelated.

To represent the models in the simplified methods let assume the above model with two variables structural VAR (1) for our case with the inverse of B_o.

$$Y_{t\,=} B^{-1}{}_0 C_o + B^{-1}{}_0 C_1 Y_{t\text{-}1} + B^{-1}{}_0 C_2 Y_{t\text{-}2\,+} \text{----} + B^{-1}{}_0 C_n Y_{t\text{-}n} + B^{-1}{}_0\ \varepsilon_7 \quad (3)$$

Then let $B^{-1}{}_0 C_{o=} C$, $B^{-1}{}_0 C_1 = Ai$ for i=1…… n and $B^{-1}{}_0\ \varepsilon_{t\,=}$ et
Now we get the n^{th} order reduced VAR as follows;

$$Y_t = C + CA_1 Y_{t\text{-}1} + A_2 Y_{t\text{-}2} + \text{----} + An\ Y_{t\text{-}n+\,\varepsilon t} \quad (4)$$

In the reduced form all right hand side variables are predetermined at time *t*. As there are no time *t* endogenous variables on the right hand side, no variable has a direct contemporaneous effect on other variables in the model. However, the error terms in the reduced VAR are composites of the structural shocks $e_t = B_0^{-1}\varepsilon_t$. Thus, the occurrence of one structural shock $\varepsilon i_{,t}$ can potentially lead to the occurrence of shocks in all error terms $e_{j\ t,}$ thus creating contemporaneous movement in all endogenous variables. Consequently, the covariance matrix of the reduced VAR can have non-zero off-diagonal elements, which allowing non-zero correlation between errors terms, for more details please look Blanchard and Quah [23] and also Sim [11]. Although we can estimate coefficients, the aim of SVAR model analysis is not mainly to estimations parameter rather dynamic response of impulse response and variance decomposition that is because the estimated coefficient exhibits limited significance for the inference and it should rely on the dynamic interaction of the variables. In this analysis of impulse response and variance decomposition were used to see the relative effects of monetary and fiscal policy on output will be shown in the next sections of this paper. Therefore the Structural VAR is summarized using impulse response functions and variance decompositions of forecast errors. In this research the author used e-views 10 soft were in order to estimate impulse response functions and variance decompositions of forecast errors on the next sections of results and analysis.

4. Results and Discussions

4.1. Unit Root Test

The Augmented Dickey- Fuller and the Phillips Perron unit root tests were applied to test the existence of unit root. Otherwise, estimating relationships with non-stationary variables results in spurious regression and Wooldridge, 2004). The unit root test is assumed both at the intercept and intercept plus trend regression forms, and the results of the test for the variables at level and first difference using ADF test presented in table 1 below.

Table 1. *Augmented Dickey-Fuller test at level trends and intercept.*

No	Null Hypothesis	t-statistics	test Critical value 1%	test Critical value 5 %	test Critical value 10 %	P-values	With	Decisions
1	H0: LNGDP has a unit root	-1.9287	-4.0834	-3.4700	-3.1620	0.6298	trends and intercept	fail to reject H0
2	H0: LNMS has a unit root	-2.7442	-4.0784	-3.4677	-3.1606	0.2224	trends and intercept	fail to reject H0
3	H0: LNPSC has a unit root	-2.2726	-4.0784	-3.4677	-3.1606	0.4435	trends and intercept	fail to reject H0
4	H0: LNGE has a unit root	-2.9202	-4.0784	-3.4677	-3.1606	0.1620	trends and intercept	fail to reject H0
5	H0: LNBD has a unit root	-1.0131	-3.5144	-2.8981	-2.5864	0.7452	intercept	fail to reject H0
6	H0: LNREER has a unit root	-1.1624	-3.5133	-2.8977	-2.5861	0.6871	intercept	fail to reject H0
7	H0: LNCPI has a unit root	-2.8907	-4.0769	-3.4670	-3.1602	0.1711	trends and intercept	fail to reject H0

Source: Own compilations from E-views 10 output.

As we can refer from table 1 above all the variables are non-stationary at level with the trends and intercept, hence we fail to reject the null hypothesis that states the variables have unit root at level. Since the non-stationary variables are not recommended enough to analysis time series data it is expected to use the data at first difference as shown in the table two below.

Table 2. *Augmented Dickey-Fuller test at First difference with trends and intercept.*

No-	Null Hypothesis	t-statistics	test Critical value 1%	test Critical value 5 %	test Critical value 10 %	P-values	With	Decisions
1	H0: D(LnGDP) has a unit root	-11.4534	*-4.073859	**-3.465548	***-3.159372	0.0000	trends & intercept	fail to accept the H0
2	H0: D(LNMS) has a unit root	-14.8116	*-4.07842	**-3.467703	***-3.160627	0.0001	trends & intercept	fail to accept the H0
3	H0: D(LNPSC) has a unit root	-4.8965	*-4.07842	**-3.467703	***-3.160627	0.0008	trends & intercept	fail to accept the H0
4	H0: D(LNGE) has a unit root	-4.8838	*-4.07842	**-3.467703	***0.0008	0.0000	trends & intercept	fail to accept the H0
5	H0: D(LNBD) has a unit root	-12.5658	*-4.07686	**-3.466966	***-3.160198	0.0001	trends & intercept	fail to accept the H0
6	H0: D(LNREER) has a unit root	-6.8720	*-4.07534	**-3.466248	***-3.15978	0.0000	trends & intercept	fail to accept the H0
7	H0: D(LNCPI) has a unit root	-4.1327	*-4.07686	**-3.466966	***-3.160198	0.0085	trends & intercept	fail to accept the H0

Source own Compilations from E-views 10 output.
* Significance @ 1 %, ** @ 5 % and *** @ 10 %

All the variables have no unit root in the first difference at all the three levels of significance and hence the variables are stationary at the first difference with trends and intercept as we can see from the table 2 above. Therefore, we can use the series data for further analysis.

4.2. Co Integrations Test

Table 3. *Unrestricted Cointegration Rank Test (Trace).*

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.578195	195.9146	125.6154	0.0000
At most 1 *	0.428311	127.7208	95.75366	0.0001
At most 2 *	0.350493	83.54718	69.81889	0.0027
At most 3 *	0.258381	49.45533	47.85613	0.0351
At most 4	0.186145	25.84069	29.79707	0.1336
At most 5	0.106484	9.568860	15.49471	0.3154
At most 6	0.008497	0.674169	3.841466	0.4116

Source: Own Compilations from E-views 10 output
Trace test indicates 4 cointegrating equations at the 5 percent level significance.

Table 4. *Unrestricted Co-integration Rank Test (Maximum Eigenvalue).*

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.578195	68.19380	46.23142	0.0001
At most 1 *	0.428311	44.17360	40.07757	0.0163
At most 2 *	0.350493	34.09184	33.87687	0.0471
At most 3	0.258381	23.61465	27.58434	0.1487
At most 4	0.186145	16.27183	21.13162	0.2094
At most 5	0.106484	8.894691	14.26460	0.2950
At most 6	0.008497	0.674169	3.841466	0.4116

Source own Compilations from E-views 10 output.
The Max-eigen value test indicates there are at least 3 Co-integrating equations at the 5 percent levels of significance. Here we can see from table 3 and 4 both the Unrestricted Cointegration Rank Test (Trace) and Maximum Eigenvalue tests the series has long run co-integrations.

4.3. Lag Length Criteria

Table 5. *VAR Lag Order Selection Criteria Endogenous variables: LNGDP LNMS LNPSC LNGE LNBD LNREER LNCPI.*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-25.0374	NA	5.25E-09	0.800935	1.009362	0.884499
1	577.4864	1084.543	5.16E-15	-13.03716	-11.36974*	-12.36864
2	655.6446	127.007	2.56E-15	-13.76611	-10.6397	-12.51265
3	713.1446	83.37497	2.22E-15	-13.97861	-9.393213	-12.1402
4	827.0954	145.2873*	5.03e-16*	-15.60239*	-9.557993	-13.17902*

Source: Own compilations Based on E-views 10 output
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Based on the above information criteria of sequential modified LR test statistic at 5 percent level, final prediction error, Akaike information criterion and Hannan-Quinn information the maximum lag selected for this SVAR is lag four. Hence for further analysis of this model lag four was used in the following sections.

4.4. VAR Residual Serial Correlation LM Tests

Table 6. *VAR Residual Serial Correlation LM Tests.*

VAR Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Sample: 1 84		
Included observations: 80		
Lags	**LM-Stat**	**Prob**
1	70.97551	0.0217
2	70.47324	0.0239
3	60.19176	0.1312
4	62.30176	0.0961

Source: Own compilations Based on E-views 10 output.

There is no serial correlations in the series as we can see from the table above, we fail to reject the null hypothesis which state there is no serial correlations since p values greater than 5 percent at the selected lag.

4.5. VAR Residual Normality Tests

Table 7. *VAR Residual Serial Residual Normality Tests.*

VAR Residual Normality Tests				
Orthogonalization: Cholesky (Lutkepohl)				
Null Hypothesis: residuals are multivariate normal				
Sample: 1 84				
Included observations: 80				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	0.393418	2.063703	1	0.1508
2	0.178032	0.422605	1	0.5156
3	-0.065979	0.058043	1	0.8096
4	-0.638195	5.430576	1	0.0198
5	-0.372010	1.845218	1	0.1743
6	-0.234471	0.733022	1	0.3919
7	-0.239527	0.764976	1	0.3818
Joint		11.31814	7	0.1253

Source: Own compilations Based on E-views 10 output.

The residual are multivariate normally distributed as indicated in the table above, which indicated that the null hypothesis are accepted since the p values are above 5 percent, therefore the residuals are normally distributed.

4.6. VAR Residual Heteroskedasticity Tests

Table 8. *VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares).*

Sample: 84					
Included observations: 80					
Joint test:					
Chi-sq	**df**	**Prob.**			
1593.593	**1568**	**0.3205**			
Individual components:					
Dependent	**R-squared**	**F(56,23)**	**Prob.**	**Chi-sq(56)**	**Prob.**
res1*res1	0.865896	2.651944	0.0061	69.27169	0.1096
res2*res2	0.611322	0.645982	0.9070	48.90577	0.7380
res3*res3	0.610668	0.644206	0.9083	48.85344	0.7398
res4*res4	0.781350	1.467691	0.1567	62.50796	0.2562
res5*res5	0.684749	0.892103	0.6463	54.77993	0.5211
res6*res6	0.635424	0.715840	0.8455	50.83394	0.6702
res7*res7	0.836255	2.097541	0.0266	66.90040	0.1511
res2*res1	0.638970	0.726905	0.8345	51.11763	0.6598
res3*res1	0.818201	1.848458	0.0534	65.45612	0.1814
res3*res2	0.635879	0.717248	0.8441	50.87036	0.6689
res4*res1	0.802117	1.664824	0.0899	64.16934	0.2120
res4*res2	0.663060	0.808238	0.7458	53.04477	0.5874
res4*res3	0.636726	0.719878	0.8415	50.93811	0.6664
res5*res1	0.777959	1.439007	0.1697	62.23671	0.2639
res5*res2	0.579287	0.565521	0.9574	46.34299	0.8178
res5*res3	0.746695	1.210707	0.3136	59.73559	0.3416
res5*res4	0.634380	0.712622	0.8487	50.75040	0.6732
res6*res1	0.726143	1.089027	0.4241	58.09145	0.3982
res6*res2	0.745007	1.199975	0.3223	59.60057	0.3461
res6*res3	0.691315	0.919813	0.6131	55.30518	0.5011
res6*res4	0.702248	0.968672	0.5554	56.17988	0.4681
res6*res5	0.677946	0.864581	0.6793	54.23566	0.5419
res7*res1	0.713648	1.023584	0.4932	57.09183	0.4343
res7*res2	0.779771	1.454231	0.1626	62.38171	0.2598
res7*res3	0.659393	0.795117	0.7608	52.75147	0.5986
res7*res4	0.750159	1.233191	0.2958	60.01275	0.3325
res7*res5	0.613293	0.651366	0.9028	49.06340	0.7327
res7*res6	0.655373	0.781051	0.7767	52.42986	0.6108

Source: Own compilations Based on E-views 10 output
There residuals are homoscedastic as shown above table.

Table 9. *Roots of Characteristic Polynomial.*

Root	**Modulus**
-0.993898	0.993898
0.980494 - 0.095847i	0.985168
0.980494 + 0.095847i	0.985168
4.84e-06 + 0.962453i	0.962453
4.84e-06 - 0.962453i	0.962453
0.912636 + 0.235382i	0.942502
0.912636 - 0.235382i	0.942502
-0.862898	0.862898
0.741876 - 0.436213i	0.860617
0.741876 + 0.436213i	0.860617
0.182020 - 0.830124i	0.849845
0.182020 + 0.830124i	0.849845
0.028087 + 0.847360i	0.847826
0.028087 - 0.847360i	0.847826
0.416501 - 0.666269i	0.78574
0.416501 + 0.666269i	0.78574
-0.738638	0.738638
-0.119941 + 0.702169i	0.712339
-0.119941 - 0.702169i	0.712339
-0.294200 - 0.546732i	0.620862
-0.294200 + 0.546732i	0.620862
0.570055 + 0.182821i	0.598654
0.570055 - 0.182821i	0.598654
-0.559598 - 0.129405i	0.574365
-0.559598 + 0.129405i	0.574365
0.116447 + 0.222810i	0.251404
0.116447 - 0.222810i	0.251404
No roots lie outside the unit circle	
VAR satisfies the stability conditions	

Source prepared by the Author from e-views output.

4.7. Vector Autoregressive Stability Test

As mentioned in the above diagnostic tests all test fits well VAR model and then we move to VAR estimations once we checked the VAR stability using the AR root test. The result depicted in the table 7 below show that all the Eigen value in the estimated model lays in the unit root circles that is their values less than one, hence the structural vector autoregressive model satisfies the stability conditions.

4.8. Impulse Response Functions (IRF)

The Impulse response functions give a hint on the dynamic

impact to a system of a shock or change to an input. Impulse response analysis is an important step in econometric analyses, which employ vector autoregressive models. Their main purpose is to describe the evolution of a model's variables in reaction to a shock in one or more variables. This feature allows tracing the transmission of a single shock within an otherwise noisy system of equations and thus, makes them very useful tools in the assessment of economic policies. The following sections the recursive short-run impulse response with some restrictions in the short run and long run (shock) of monetary and fiscal policy proxy variables and other variables on output (GDP) are shown.

4.8.1. Recursive Short-Run Impulse Response and Restrictions

Based on the theories and some economic facts, restrictions in SVAR model is to capture the contemporaneous impacts of some variables on others. Hence, the researcher imposed some short run restrictions on the variables such as money supply, private sector credit, government spending, which considered as no immediate impacts on output and also the impacts of budget deficit on government spending was restricted. The estimated coefficients are attached in the annex. The restricted matrix explained as flows below.

Table 10. *Structural VAR –identifications*

Structural VAR Estimates
Sample (adjusted): 2002Q1 2021Q4
Included observations: 80 after adjustments
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)
Convergence achieved after 31 iterations
Structural VAR is over-identified

Table 11. *The SVAR outputs.*

Model: e = Su where E[uu']=I						
S =						
C(1)	0	0	0	0	0	0
0	C(5)	0	0	0	0	0
0	C(6)	C(11)	0	0	0	0
0	C(7)	C(12)	C(16)	0	0	0
C(2)	C(8)	C(13)	0	C(19)	0	0
C(3)	C(9)	C(14)	C(17)	C(20)	C(22)	0
C(4)	C(10)	C(15)	C(18)	C(21)	C(23)	C(24)

Source prepared by the Author from e-views output.

As shown the figure 1 below we impose the recursive short run impulse response functions results of monetary, fiscal policy proxy variables and other variables on real gross domestic product. As RGDP is the main target variable here researcher tried to see the accumulated response of real GDP to the shocks of SVAR innovations in order to identify the relative shocks and their dynamic behaviors of the endogenous variables. The proxy for monetary policy variables shock 2 (lnms) and shock 3 (lnpsc) highly positive and continuously affecting GDP as shown in figures below. When compare with fiscal policy shock 4 (lnge) and shock 5 (lnbd) variables responses of GDP to monetary is earlier than fiscal policy variables. The response for money supply shock is after 3 quarters and the response to private sector credit is also after 3 quarters and raising fast. Whereas, the responses of GDP to fiscal policy variables government expenditure remained almost zero for about 7 quarters become positive after and response of GDP to budget deficit remains zero to 5 quarters and become negative after. The budget deficit we used as inverse sign because budget deficit is negative for a convenience of the data analysis we make it positive the result is assumed as inversely. In the short run impulse response, researcher made restrictions in order to capture the contemporaneous impacts on the main variables to avoid the contemporaneous impacts as seen from the figures 1 and 2 the variables are not immediately responding to the shocks for first 3 quarters, but the fiscal policy variables are too lags to responds compared with monetary policy.

When we look at the real effective exchange rate index and consumer price index shocks to the real gross domestic products. The real effective exchange rates index (shock 6) and consumer price index (shock 7) are negative for entire period, hence the response of real gross domestic product to these shocks are negative as shown in figures below. This might be associated with larger imports and lower exports which possibly affects output negatively and inflations has negative impacts on output.

4.8.2. Recursive Long-Run Impulse Response

The Figure 3 shows the shock of monetary, fiscal policy proxy variables and other variables on real gross domestic product on recursive long run response functions (F triangular matrix). The RGDP is the main target variable here as seen in the figure 3 the accumulated response of real GDP to the shocks of SVAR innovations and the proxy for monetary policy variables are remained the same with short run periods except that the response was immediate in the long run. The GDPs response for monetary policy shocks remained the same both in the long run and short run as shown in figures 3 below. The shock one is GDP to its own; shock 2 and shock 3 are money supply and private sector credits which used as proxy for monetary policy. Based on the figure depicted below, shocks on

money supply and private sector credits are affecting the levels of output immediately and positively. Shock 4 and shock 5 are the shocks of government expenditures and budget deficit on output in the long run impulse responses to GDP which considered in this paper as fiscal policy variables see figure 3 below. The responses of fiscal policy variables is not immediate, for government expenditure it is negative for about more than 9 periods and it became positive after 9 periods on the other hand the shocks of budget deficit is positive and close to zero for about 6 periods and then it dies with in the 7 periods and back to zero on this recursive long-run impulse response accumulated response SVAR innovations. In the figure 3 below the shocks (lnbd) is negative, but inverse is used for data analysis deficit has negative signs and we changed positive for the analysis. For relative comparing of the two shocks of monetary and fiscally policy variables monetary variables are more positive and consistent to GDP than fiscal policy variables. The reasons for government spending negative on output may be associated with the impacts of tax on consumers and business. As government spending might increases through tax revenue and possibly via direct finance by printing money, hose consequence negative for households and business, hence that affect output negatively through consumptions and investments.

4.9. Variance Decomposition

The variance decompositions of the real gross domestic product endogenous and strongly influencing its own for the longer time periods, which accounts more than 45.0 percent on average from the total variations. The bigger variations come from both private sector credit and money supply apart from real GDP. During the stronger variations of output is from private sector credit which is 30.5 percent on average and the variations of money supply 10 percent on average.

On the other hand, the variations from fiscal policy proxy variables, government expenditure (shock 4) and budget deficit (shock 5) has the larger 3.5 percent and the smaller 0.85 percent The variations from shock 7 to shock 6 also grater next to the shock 2 and shock 3 that it is about 7.0 to 3.0 percent on average. Except the variations of real GDP the other variations dies out when the time goes. Therefore, from both impulse response and variance decompositions analysis we get the same results that, though both policies are significant the variations by monetary shocks are greater than the fiscal policy in affecting outputs, and this result supported by other literatures such as Have and Enu [17], Dawait Senbet [12], Hussian [16], Rakic and Radenovic, Sanni et al and Ali et al [3] just to mentions some among others.

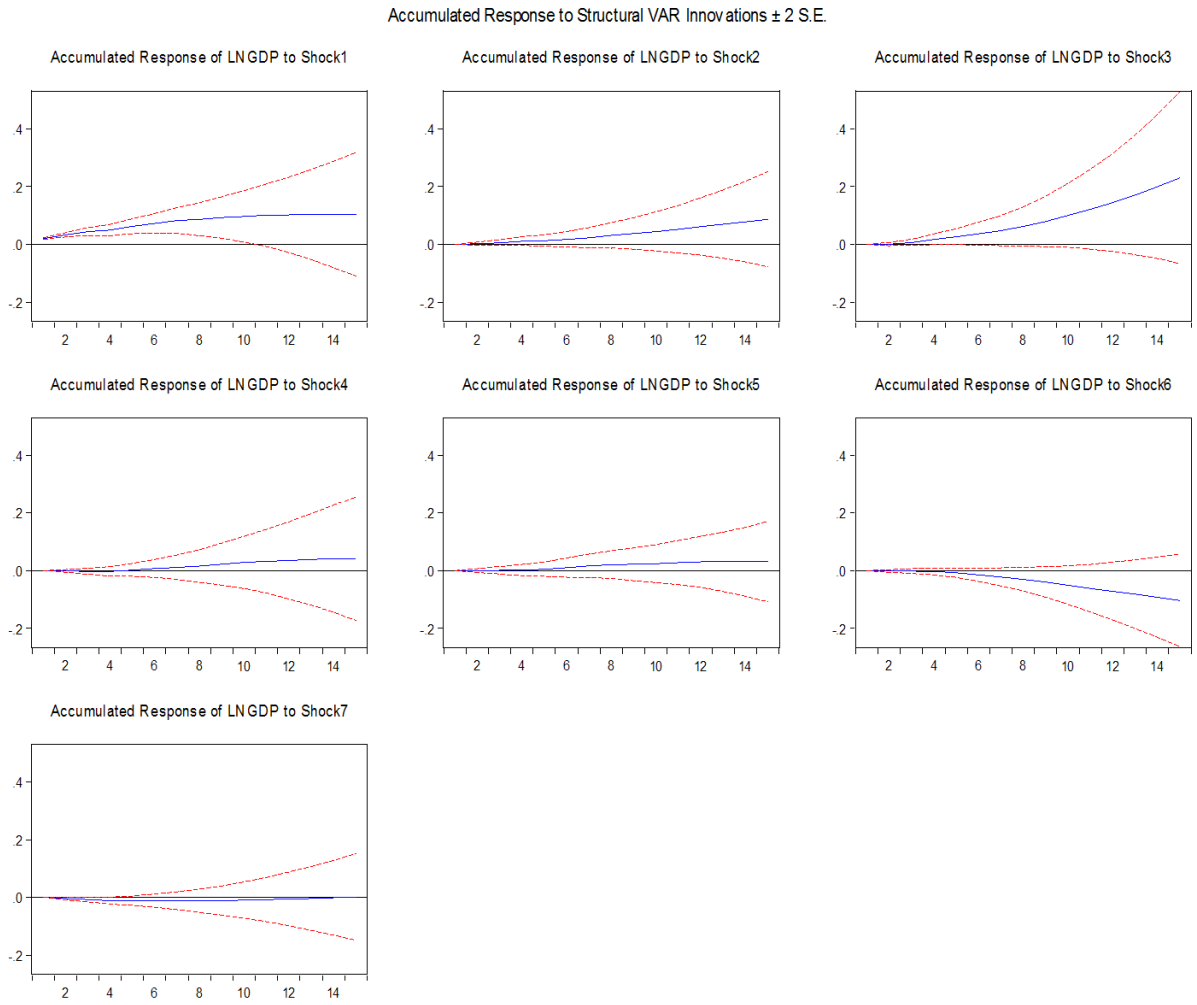

Figure 1. *Accumulated Response of output to short run structural VAR innovations.*

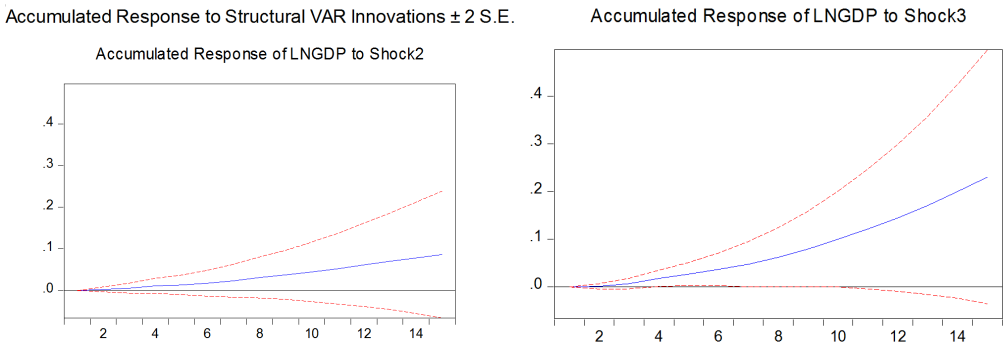

Figure 2. *Monetary Policy variables shocks and response of GDP.*

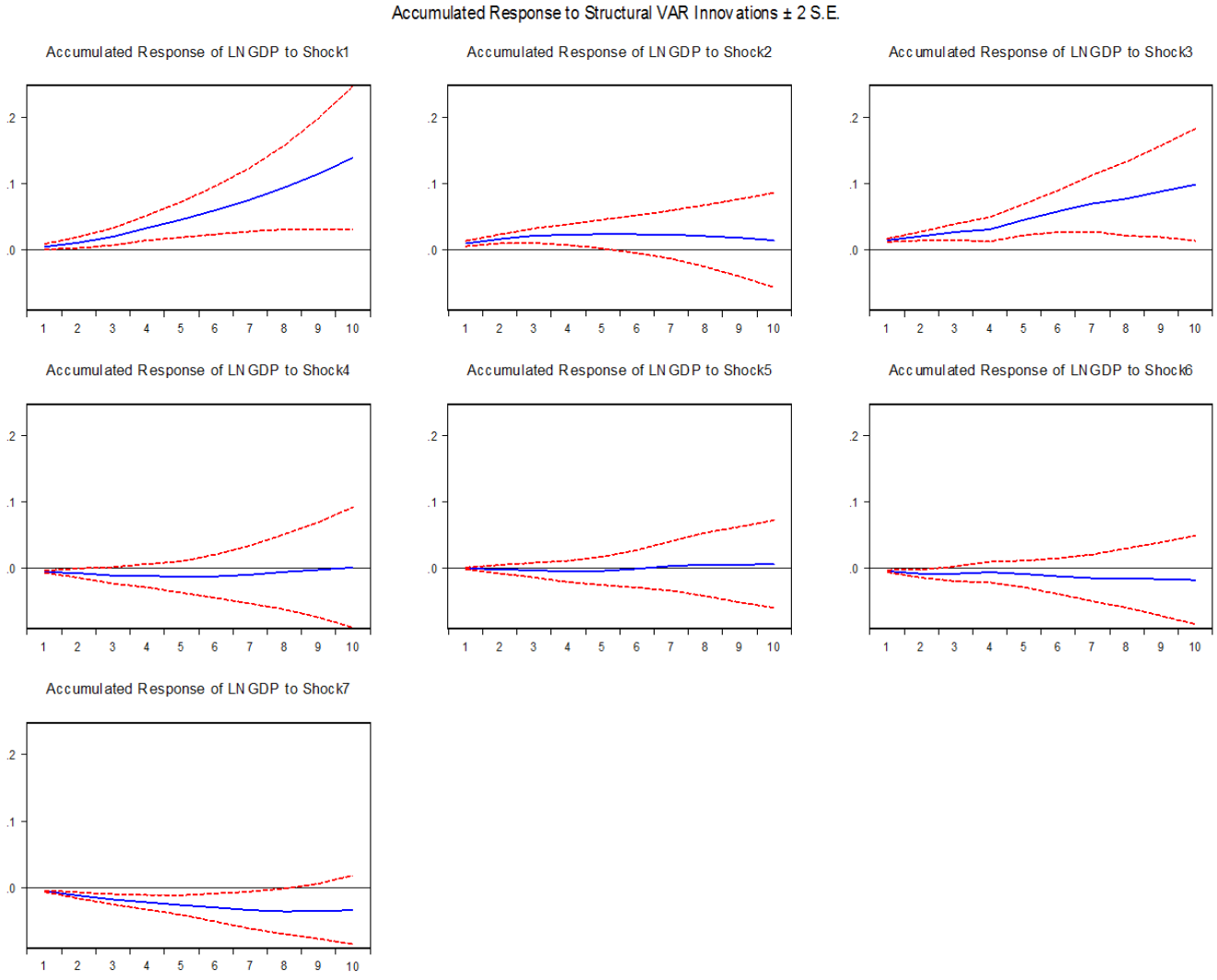

Figure 3. *Recursive Long runs Impulse Response Functions (F triangular).*

Table 12. *Variance Decomposition of LGDP to Using the Structural VAR factors.*

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5	Shock6	Shock7
1	0.020144	5.468108	22.87191	50.42411	8.081659	0.102555	5.167314	7.884340
2	0.024387	10.58231	23.17131	41.41292	6.155979	0.304377	6.398126	11.97498
3	0.027988	18.01573	20.74647	36.14194	6.253510	0.519758	4.857449	13.46514
4	0.031684	31.37375	16.37538	29.78602	4.906715	0.703853	4.472098	12.38219
5	0.037473	33.68977	11.80157	36.16108	3.768801	0.532615	3.838365	10.20781
6	0.042588	37.31369	9.148494	37.28330	3.005941	0.971680	3.644936	8.631960
7	0.047310	41.12718	7.417722	36.28413	2.675978	1.623353	3.208552	7.663087
8	0.051602	47.46014	6.419752	32.43596	2.889997	1.525828	2.697086	6.571232

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5	Shock6	Shock7
9	0.056867	52.27926	5.495013	30.54524	2.698872	1.256502	2.310970	5.414147
10	0.062733	57.46883	4.901401	27.58922	2.515905	1.054442	1.944473	4.525730
11	0.068317	61.73778	4.383335	24.96628	2.360397	1.031124	1.642301	3.878783
12	0.073623	65.78911	4.009074	21.98975	2.304266	0.935205	1.500413	3.472178
13	0.079344	69.14099	3.659311	19.58941	2.120339	0.813700	1.373790	3.302455
14	0.085770	72.28559	3.407552	17.16233	1.860132	0.707791	1.286879	3.289723
15	0.092041	74.94126	3.170714	15.19068	1.625755	0.615183	1.230801	3.225606
	Average	45.24	9.8	30.46	3.55	0.85	3.04	7.06

Source Authors Compilations from E-views 10 output.

5. Conclusion and Policy Recommendations

5.1. Conclusions

In this paper, the relative effectiveness of monetary and fiscal policy on Ethiopian economy is examined. To Achieve the objective of the paper the researcher employed the long-run and short SVAR model to the quarterly data for Ethiopia from the period 2001:Q1-2021:Q2. The findings showed that both monetary and fiscal policies are effective on output determinations. Though, the relative effectiveness of monetary policy is much stronger than that of fiscal policy, Fiscal policy which was measured by government expenditures and government budget deficits has effect on output. According to the result from variance decomposition, on average the variations of government expenditures and budget deficit accounted about 3.6 and 0.85 percent changes in GDP for the 15 periods. Whereas the monetary policy proxy variables are on average 30.5 percent variations of GDP from Private sector credit and 9.8 percent variations of GDP from money supply during the 15 periods of the variation's hence monetary policy variables are stronger than fiscal one.

On the other hand, based on the recursive structural result fiscal policy proxy variable government expenditure negative the shorter periods for about 8 periods long run, even though, positive in short run periods. This is not the case for monetary policy variables; the monetary policy variables are positive and consistently strong in both short and longer periods. The magnitudes of the effects of monetary policy variables on GDP are relatively higher compared to fiscal policy variables. Private sector credit which is a proxy variable for monetary policy is the most effective variable.

Therefore we can infer from the above analysis that monetary policy is dominant to fiscal policy for the period we examined.

The findings, also reveals that -the effects of monetary and fiscal policies on output are different from each other and the effectiveness of the first appears to be much stronger and larger in all cases.

5.2. Policy Recommendations

The following recommendations are forwarded:

1) If the two policies are used in a together manner, keeping others things constant, it is possible to use in a manner that should be coordinated so as to get better output.

Though the relative effectiveness of monetary policy on output is stronger, it doesn't nullify the effect of fiscal policy, thus it is advised to use the two policies in a coordinated manner to get better output.

2) Fiscal and monetary Authority may have the right policy stances so that they can have right decisions whenever they face a challenge in macroeconomic managements and stabilizations, hence there should be more emphasis and confidence on both monetary and fiscal policy for the purpose stabilization output.
3) In the short periods the government expenditures are less effective and even negative to real GDP, thus there should be good fiscal deficit management and fiscal authority should manage its deficit and budget in a way that is more productive.
4) Evaluating the existing policy coordination of the two institutions (Ministry of Finance and National Bank of Ethiopia) would be the area for further study.

Appendix

Table 13. *Structural VAR Estimates With some restrictions*

Structural VAR Estimates						
Sample (adjusted): 2002Q1 2021Q4						
Included observations: 80 after adjustments						
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)						
Convergence achieved after 47 iterations						
Structural VAR is over-identified						
Model: e = Su where E[uu']=I						
S =						
C(1)	C(5)	C(11)	C(16)	C(19)	C(22)	C(24)

Structural VAR Estimates						
Sample (adjusted): 2002Q1 2021Q4						
Included observations: 80 after adjustments						
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)						
Convergence achieved after 47 iterations						
Structural VAR is over-identified						
0	C(6)	C(12)	C(17)	C(20)	C(23)	0.578 * C(24)
0	C(7)	C(13)	C(18)	C(21)	-6.07 * C(22) + 5.1 * C(23)	-3.13 * C(24)
0	C(8)	C(14)	3.86 * C(16) + 6.96 * C(17) - 0.194 * C(18)	11.3 * C(19) - 3.4 * C(20) + 1.36 * C(21)	3.01 * C(22) + 3.53 * C(23)	5.04 * C(24)
C(2)	C(9)	4.17e-10 * C(8) + C(15)	0	-161 * C(19) + 225 * C(20) - 33.7 * C(21)	44.1 * C(22) + 53 * C(23)	74.7 * C(24)
C(3)	C(10)	2.64 * C(11) + 2.98 * C(12) + 0.455 * C(13) - 0.332 * C(14) - 0.0225 * C(15)	1.36 * C(16) + 0.666 * C(17) + 0.52 * C(18)	2.52 * C(19) - 0.96 * C(20) + 0.764 * C(21)	-2.12 * C(22) + 2.93 * C(23)	-0.422 * C(24)
C(4)	0.351 * C(5) + 1.63 * C(6) + 0.917 * C(7) - 0.13 * C(8) - 0.0155 * C(9) - 1.69 * C(10)	-4.12 * C(11) - 3.41 * C(12) + 0.146 * C(13) + 0.433 * C(14) + 0.0226 * C(15)	-2.45 * C(16) - 0.402 * C(17) + 0.0618 * C(18)	-2.88 * C(19) + 0.207 * C(20) - 0.0294 * C(21)	-2.71 * C(22) + 0.0569 * C(23)	-2.67 * C(24)
including the restriction(s)						
F =						
NA	0	0	0	0	0	0
NA	NA	0	0	0	0	0
NA	NA	NA	0	0	0	0
NA	NA	NA	NA	0	0	0
NA	NA	NA	NA	NA	0	0
NA	NA	NA	NA	NA	NA	0
NA	NA	NA	NA	NA	NA	NA
	Coefficient	Std. Error	z-Statistic	Prob.		
C(1)	0.014387	0.005050	2.848839	0.0044		
C(2)	0.078510	0.248142	0.316393	0.7517		
C(3)	-0.092142	0.008040	-11.46113	0.0000		
C(4)	-0.038340	0.005881	-6.518954	0.0000		
C(5)	0.010890	0.003304	3.295760	0.0010		
C(6)	0.005391	0.002209	2.441006	0.0146		
C(7)	-0.043389	0.036274	-1.196141	0.2316		
C(8)	-0.056345	0.018316	-3.076318	0.0021		
C(9)	-0.359390	0.139227	-2.581327	0.0098		
C(10)	-0.009849	0.016874	-0.583652	0.5595		
C(11)	-0.013535	0.002265	-5.976064	0.0000		
C(12)	0.000854	0.001992	0.428901	0.6680		
C(13)	-0.034322	0.030200	-1.136482	0.2558		
C(14)	-0.128074	0.014610	-8.766241	0.0000		
C(15)	-0.227472	0.125906	-1.806682	0.0708		
C(16)	-0.002416	0.001631	-1.481161	0.1386		
C(17)	0.010654	0.001827	5.832322	0.0000		
C(18)	-0.072191	0.021836	-3.306011	0.0009		
C(19)	0.003635	0.002331	1.559379	0.1189		
C(20)	-0.003798	0.002062	-1.841829	0.0655		
C(21)	-0.070478	0.025738	-2.738255	0.0062		
C(22)	-0.011146	0.001784	-6.248227	0.0000		
C(23)	0.010955	0.001339	8.182702	0.0000		
C(24)	-0.005754	0.000470	-12.24078	0.0000		
Log likelihood	630.5036					
LR test for over-identification:						
Chi-square(4)	141.0710		Probability	0.0000		
Estimated S matrix:						
0.014387	0.010890	-0.013535	-0.002416	0.003635	-0.011146	-0.005754
0.000000	0.005391	0.000854	0.010654	-0.003798	0.010955	-0.003325
0.000000	-0.043389	-0.034322	-0.072191	-0.070478	0.123515	0.017984
0.000000	-0.056345	-0.128074	0.078773	-0.041939	0.005093	-0.029030
0.078510	-0.359390	-0.227472	0.000000	0.937961	0.089461	-0.429687
-0.092142	-0.009849	-0.001159	-0.033710	-0.041010	0.055716	0.002430
-0.038340	0.002395	-0.012710	-0.002823	-0.009202	0.030788	0.015384
Estimated F matrix:						
-2.638755	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Structural VAR Estimates						
Sample (adjusted): 2002Q1 2021Q4						
Included observations: 80 after adjustments						
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)						
Convergence achieved after 47 iterations						
Structural VAR is over-identified						
-6.139558	0.170458	0.000000	0.000000	0.000000	0.000000	0.000000
-5.881268	-0.180138	0.267022	0.000000	0.000000	0.000000	0.000000
-4.940178	-0.125820	0.072070	0.393144	0.000000	0.000000	0.000000
-6.228547	-0.417553	-0.010610	0.664835	0.711864	0.000000	0.000000
-1.308263	-0.085830	-0.032825	0.058866	-0.052634	0.102420	0.000000
-4.048036	-0.002783	-0.077626	-0.191628	-0.149136	0.302194	0.142967

Table 14. *Structural VAR Estimates Without restrictions.*

Structural VAR Estimates						
Sample (adjusted): 2002Q1 2021Q4						
Included observations: 80 after adjustments						
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)						
Convergence achieved after 65 iterations						
Structural VAR is just-identified						
Model: e = Phi*Fu where E[uu']=I						
F =						
C(1)	0	0	0	0	0	0
C(2)	C(8)	0	0	0	0	0
C(3)	C(9)	C(14)	0	0	0	0
C(4)	C(10)	C(15)	C(19)	0	0	0
C(5)	C(11)	C(16)	C(20)	C(23)	0	0
C(6)	C(12)	C(17)	C(21)	C(24)	C(26)	0
C(7)	C(13)	C(18)	C(22)	C(25)	C(27)	C(28)
	Coefficient	Std. Error	z-Statistic	Prob.		
C(1)	-2.638755	0.208750	-12.64073	0.0000		
C(2)	-6.163355	0.487944	-12.63128	0.0000		
C(3)	-5.879067	0.466481	-12.60301	0.0000		
C(4)	-5.059385	0.402757	-12.56188	0.0000		
C(5)	-6.657299	0.538119	-12.37144	0.0000		
C(6)	-1.217174	0.097366	-12.50099	0.0000		
C(7)	-3.685022	0.292542	-12.59656	0.0000		
C(8)	0.168789	0.013344	12.64911	0.0000		
C(9)	-0.181609	0.033025	-5.499058	0.0000		
C(10)	-0.143871	0.043449	-3.311234	0.0009		
C(11)	-0.482130	0.103699	-4.649332	0.0000		
C(12)	-0.073837	0.013204	-5.591828	0.0000		
C(13)	0.048369	0.024135	2.004103	0.0451		
C(14)	-0.266014	0.021030	-12.64911	0.0000		
C(15)	-0.060310	0.041662	-1.447600	0.1477		
C(16)	0.053498	0.096347	0.555259	0.5787		
C(17)	0.025990	0.011665	2.228127	0.0259		
C(18)	0.046018	0.023551	1.953975	0.0507		
C(19)	0.370190	0.029266	12.64910	0.0000		
C(20)	0.558825	0.085516	6.534712	0.0000		
C(21)	0.088383	0.009111	9.700284	0.0000		
C(22)	-0.082221	0.022342	-3.680154	0.0002		
C(23)	0.654906	0.051775	12.64911	0.0000		
C(24)	-0.013658	0.005747	-2.376546	0.0175		
C(25)	-0.029504	0.021248	-1.388570	0.1650		
C(26)	0.050488	0.003991	12.64911	0.0000		
C(27)	0.126223	0.018613	6.781433	0.0000		
C(28)	0.140532	0.011110	12.64911	0.0000		
Log likelihood	701.0391					
Estimated S matrix:						
0.004710	0.009634	0.014304	-0.005727	-0.000645	-0.004579	-0.005656
0.004923	0.006139	-0.001357	0.013348	0.000105	0.005929	-0.003269
0.152680	-0.022293	0.021553	-0.027376	-0.022270	0.058026	0.017677
0.009825	-0.055517	0.128387	0.079206	-0.037896	0.007129	-0.028535
-0.172899	-0.398389	0.254865	-0.068799	0.877871	0.112459	-0.422369
-0.022489	-0.000126	-0.004843	-0.012620	-0.018730	0.027079	0.002389
-0.009044	0.006549	0.010151	0.006792	0.002536	0.012730	0.015122

Structural VAR Estimates						
Sample (adjusted): 2002Q1 2021Q4						
Included observations: 80 after adjustments						
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)						
Convergence achieved after 65 iterations						
Structural VAR is just-identified						
Estimated F matrix:						
-2.638755	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
-6.163355	0.168789	0.000000	0.000000	0.000000	0.000000	0.000000
-5.879067	-0.181609	-0.266014	0.000000	0.000000	0.000000	0.000000
-5.059385	-0.143871	-0.060310	0.370190	0.000000	0.000000	0.000000
-6.657299	-0.482130	0.053498	0.558825	0.654906	0.000000	0.000000
-1.217174	-0.073837	0.025990	0.088383	-0.013658	0.050488	0.000000
-3.685022	0.048369	0.046018	-0.082221	-0.029504	0.126223	0.140532

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