ADDIS ABABA UNIVERSITY

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AN EMPIRICAL INVESTIGATION ON MONETARY AND FISCAL POLICY INTERACTION IN ETHIOPIA

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Addis Ababa, Ethiopia

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This is to certify that the paper prepared by Metaket Dagne, entitled: an empirical investigation on monetary and fiscal policy interaction in Ethiopia and submitted in partial fulfillment of the requirement of the Degree of Masters of Art in Applied Economic Modeling and Forecasting (Financial Policy Analysis and Planning) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abstract

An Empirical Investigation on Monetary and Fiscal Policy Interaction in Ethiopia

Metaket Dagne

Addis Ababa University, June 2014

To ensure sustainable growth, the interaction of monetary and fiscal policies- the two major macroeconomic policies- is paramount important. With the objective of investigating the interaction between fiscal and monetary policies on Ethiopian economy, the study used Vector Auto Regression (VAR) framework to compute impulse response and variance decomposition. Both trace and maximum Eigen value tests prove the existence of two co integrating vectors. The finding of the paper reveals that only fiscal policy proxied by government expenditure respond positively to a shock in money supply as a proxy of monetary policy which implies complementarity between the policies. But, monetary policy failed to react for the shocks of fiscal policy. Regarding with the adjustment of the model, all variables except that for GDP have at least one significant coefficient.

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List of Acronyms

ADF:	Augmented Dickey Fuller
AIC:	Akaike Information Criterion
DBE	Development Bank of Ethiopia
FPE	Final Prediction Error
FTPL	Fiscal Theory of Price Level
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
HQ	Hannan- Quinn
IMF	International Monetary Fund
IR	Impulse Response
LR	Likelihood Ratio
Max-Eig	Maximum Eigen Value
MoFED	Ministry Of Finance and Economic Development
NBE	National Bank of Ethiopia
SC	Schwarz Criterion
VAR	Vector Autoregressive
VD	Variance Decomposition
VECM	Vector Error Correction Model

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

There is a general awareness that the objective of macroeconomic policies is to ensure that the economy achieves stable growth which is free from any economic evils. Meaning, purposeful manipulation of policy instruments such that fluctuations in employment, production and prices are minimized and potential growth in real output is realized. There are two major groups of policy instruments- monetary and fiscal policy. Monetary instruments are employed by the central bank while fiscal instruments are employed by ministry of finance.

In real world, the interaction between these two policies is a recurring theme. The interaction may be either strategic complement- when the two policies tend to move together; or strategic substitute i.e., when the two policies tend to move in opposite direction to each other. In some cases there may not be any interaction so that the implementation of one policy doesn't affect the other. Buti, Roeger and Lint Veld (2001) suggest that the specific form of interdependence between fiscal and monetary policies i.e., the alternative between strategic substitutability and complementarity should not necessarily be interpreted in terms of conflict or cooperation, and might be shock dependent. In their model the bank targets inflation and nominal interest rate objective; whereas the fiscal authority pursues output and deficit targets.

Even if the central bank follows an inflation target policy and is deeply committed towards these targets, fiscal pressure can cast some doubt up on the ability of the central bank to curb inflation and anchor inflation expectations. Fiscal authority may independently determine the current and future budget, defining the share of revenues from bonds and seigniorage. This way the monetary authority faces restrictions imposed by the demand for bonds issued by the government, having to finance the difference between the revenue demanded by the fiscal authority and the value of bonds sold to the public by means of the revenue obtained from the issuance of currency. Therefore, as the fiscal authority's deficits cannot be financed only by the issuance of new bonds, the monetary authority may be coerced to issue currency and to put up with some inflation.

On the other hand the actions of the monetary authority will affect the management of public debt through a variety of channels, including the stance of monetary policy, the choice and design of central bank instruments, and the measures taken to promote the development of the domestic financial markets.

As Berard Laurens and Enrique G.dela piedra (1998) put it, without coordination between the monetary and fiscal policies, there are three possible scenarios. In the first scenario, the central bank is dominant; as a result, the monetary authority could determine the growth of the monetary base independently of the financing needs of the government. The financing possibilities in the domestic and foreign financial markets would then constrain the size of the budget deficit. Ultimately, the government could be forced to reduce its budget deficit to match available financing with the danger of not paying due regard to expenditure priorities to rely excessively on foreign financing to postpone "the day of reckoning" or finally, to place significant levels of debt in the domestic market which would led to very high real

interest rate. In the second scenario, the fiscal authority is dominant; as a result, it can determine the size of the budget deficit without consulting with the monetary authority. Given the financing possibilities in the bond market the monetary authority would then be obliged to supply whatever amount of needed financing in the form of monetary base including direct credit to the government. Finally in the third scenario, monetary and fiscal authorities behave as they are independent; as a result, the monetary and fiscal authorities could make inconsistent decisions regarding both the growth of the monetary base and the size of the budget deficit, respectively.

In Ethiopia, National Bank of Ethiopia (NBE) and Ministry of Finance and Economic Development (MoFED) are the two institutions responsible to enact and implement monetary and fiscal policies respectively. Accordingly, National Bank uses several monetary policy instruments to stabilize the general price level and foster economic growth of the country. On the other hand MoFED has the objective of ensuring faster, sustainable and equitable economic growth and improve the macroeconomic administration including debt sustainability.

1.2 Statement of the problem

The particular stance of monetary policy affects the capacity of the government to finance the budget deficit by changing the cost of debt service and by limiting and expanding the available sources of financing. At the same time, the financing needs of the government and its funding strategy will place constraints on the operational independence of the monetary authority (Bernard Laurens and Enrique G.de la Piedra, 1998).

The interaction between fiscal and monetary policy include from substitute extreme to complementary extreme. The two policies are complementary when both move in the same direction and they are substitute if vice versa. The fiscal authority may want to boost economic growth by stimulating government expenditure and increasing government borrowing (excluding money printing) this in turn leads to the rise in the general price level i.e., inflation. But, central bank who is responsible to stabilize the price level wants to increase interest rate, which increases the cost of borrowing for the government. Here comes the issue of conflict of interest between the two institutions as they have distinct objectives. This cope up with the Ethiopian proverb "If the two elephants fight the damage is on the grass" i.e., if the two big institutions contradict the damage is on the economy and finally on the people. Therefore there is no alternative other than coordination for successful implementation of macro policies.

From the very beginning, traditional literatures deals the interaction between fiscal and monetary policies when there is no independent rather subordinate central banks. In this case fiscal policy is active while monetary policy is passive. But in the recent periods most of the countries including Ethiopia has independent central bank owing the responsibility of enacting monetary policies. Therefore assuming subordinate central bank may not have sense. Thus, recent facts underscore the importance in evaluating the interaction between monetary and fiscal policies with independent central bank.

In Ethiopia, there is no exception regarding with independent fiscal and monetary authorities and distinct obligations given for them. Therefore, the interaction between these two macro policies is expected. But at what level and extent the interaction is? The whole paper will revolve around this central question.

1.3 Objective of the Study

The general objective of the study is to empirically investigate the interaction between fiscal and monetary policies on Ethiopian economy.

Specifically, the study;

- Assess macroeconomic performance of Ethiopia
- Explore factors that influence monetary and fiscal policies
- Point ways of policy coordination

1.4 Significance of the Study

Despite the existence of a vast and still growing literature on monetary and fiscal policies, relatively little attention has been given to the issue of monetary- fiscal policy interaction. Especially in Ethiopia there are only few literature related with this issue. Nevertheless, the paper will help to fill the gaps in knowledge and add to the existing knowledge. In addition the paper will serve as reference material for researchers interested in further investigation of fiscal monetary policy interactions.

1.5 Organization of the Paper

Aside from this introduction, the paper is organized in such a way that section two review the existing theoretical and empirical literatures related with the predetermined title of the paper. Chapter three is left of describing the macro economy of Ethiopia. Methodology and procedures of analyzing data is elaborated under chapter four. Chapter five provides the result and analysis accordingly. Finally some possible conclusions and recommendations are drawn on the last chapter- chapter six.

CHAPTER TWO

2. LITERATURE REVIEW

2.1Theoretical literature review

Classical economists and supporters of classical school of thought argued that efforts to change the demand side of the economy may benefit an economy in the short run, but causes harm in the long run. This is due to the fact that the economy was assumed to be at potential output, any expansionary policy could only lead to higher prices. Classical economists conceived of fiscal policy in much more limited terms than it is viewed today. They argued that expansionary or contractionary fiscal policies are unnecessary because there are market mechanisms - for example, the flexible adjustment of prices and wages- which serve to keep the economy at or near the natural level of real GDP at all times.

Depending on the ways of increasing government spending, fiscal policy causes policy ills in the long run. If the government finances the deficit through borrowing from central bank i.e., through printing money, this lead to increase in the money supply which is equated to inflation. On the other hand, financing through borrowing increases the country's debt which in turn leads to an increase in higher interest rate and credit rationing that hinders the private sector. Finally, financing the deficit through higher taxation leads to decrease in private consumption and savings. Accordingly, classical economists believe that proper fiscal policy is when the government runs a balanced budget each and every year; and when the government creates conducive environment and maximum incentive for the private sector to produce and innovate.

Too much government spending takes away valuable economic resources needed by individuals and businesses i.e., crowding out the private sector will be created. Therefore, government spending should be limited to defense, police, a judicial system, transportation etc. In addition, taxes should be relatively low and regulations minimal.

For classical monetary policy does not change real variables like output or employment, it just changes the price level and money is neutral, a veil with no consequences for real economic magnitudes. This is due to the fact that all markets clear continuously and resources are fully utilized and thus aggregate employment and output are always at full employment or natural levels.

Unlike the Classicals, Keynesians believe government policies especially fiscal policy as the key tool of economic management. Demand side policies create jump start economic growth during sluggish economic downturn. They see the role of government as maintaining the economy at full employment. The way to do this was to manage the level of aggregate demand until the economy was at or close to full employment. If the economy was growing too fast beyond full employment, the fiscal policy should be essentially deflationary, and vice versa when below full employment.

Active fiscal policy is the use of government taxing and spending policy to stimulate demand in an economy. Especially during the economy experienced recession, private sector may not be willing to invest enough in productive assets and may not spend to increase output. In this case, the government should do what private sector failed to do- spend huge amount of money even the government can experience budget deficit. Because small amount of government spending may be swallowed to the private sector and become ineffective. But,

huge amount of spending provide more income to private individuals who will therefore spend more through consumption; which increases aggregate demand as consumption is one part of aggregate demand. Higher aggregate demand encourages private sector to invest more in order to meet the higher demand, higher production requires higher employment. As more people employed, individuals' income increased and hence consumption increased, which stimulate the economy and enhance economic progress cyclically, i.e., there exist multiplicative effect of fiscal policies. Another alternative is to lower taxes to stimulate the economy, but government spending is more preferred because governments spend all of their money whereas citizens may save part of their tax benefits.

For Keynesians, since the market failed to utilize resources fully, price fail to rise in proportion with a rising nominal money stock. The resulting rise in the real money stock, Keynesians claimed, lowers the rate of interest and thereby boosts investment spending and thus the level of national income. Therefore, monetary policy changes real economic variables like investment or employment and hence aggregate demand.

Milton Friedman and other monetarists advocate macroeconomic theory and policy that diverge significantly from those of the formerly dominant school. Perhaps one of the best known quotes from Friedman's work is that "inflation is always and everywhere a monetarist phenomenon".

Monetarists transform the equation of exchange in to the quantity theory of money by making the seemingly small assumption that velocity is stable in the short run. The equation is expressed as MV=PY. Where M is the supply of money and Vis the velocity of money, P is the average price level and Y is the total amount of goods and services produced. In the

short run, changes in the money supply are the dominant forces that change nominal GDP. In the long run, the economy is assumed to be at potential output, so changes in the money supply only lead to higher prices, rather than higher output.

Tight control of monetary and credit is required to maintain price stability because the main cause of inflation is an excess supply of money in an economy leading to in the words of the late monetarist economist Milton Friedman, "too much money chasing few goods". One monetarist policy conclusion is the rejection of fiscal policy in favor of a monetary rule. Friedman contended that government should seek to promote economic stability, but only by controlling the rate of growth of the money supply. On the contrary, time lag makes fiscal policy too difficult to use to manage the economy effectively.

Most of important contributor of neoclassical economics including Hicks, Modigliani, Solow, Tobin and others argued that countercyclical fiscal policy was to use both taxes and spending, in a depression, the best way to increase demand was to increase both public investment and private investment through tax breaks, so as to equalize social marginal rates of return on both. While the potential of monetary policy to smooth fluctuations was generally acknowledged, one feels that fiscal policy was still the instrument of predilections that policy was thought of as fiscal policy in the lead with accommodating monetary policy in tow.

The fiscal theory of price level (FTPL) says that, unless special steps are taken to ensure that appropriate fiscal policies are taken, the goal of price stability may remain elusive regardless of how tough and independent the central bank is. Under FTPL, price stability requires not only an appropriate monetary policy, but also an appropriate fiscal policy. Because fiscal

policy receives so much attention in this new view about the determinants of the price level, Michal Woodford has called it the FTPL (J. Christiano and J. Fitzgerald, 2000).

FTPL highlighted that, if government solvency is not guaranteed, monetary policy will not be able to control the price level. In order to ensure stability, fiscal policy has to react sufficiently strongly to a rise in the interest rate in the event of inflationary pressures by increasing the primary surpluses. The main point emphasized by FTPL is that the inter-temporal government budget constraint and the fiscal policy are the determining factors for the price level. This argument runs counter to the traditional theory of price determination, in which the stock of money and monetary authority are the only determinant of the price level.

2.2 Empirical literature review

The interaction between monetary and fiscal policy is well researched area for developed countries though the dimension of investigation differs. But, little researches have been done for less developed economies.

Marco Buti et al (2001), on their attempt to provide a simple analytical setting for assessing the interactions of monetary and fiscal authorities when the fiscal authority is subject to upper limits on the budget deficit, found that the gains from cooperation are ambiguous and necessarily small under demand shocks, but there are positive gains from coordination under supply shocks. Their Nash solution also supports the result. On the other hand Dixit and Lambertini (200, 2001) proves fiscal discretion destroys monetary commitment when the monetary authority has only partial control over inflation, which is also directly affected by the fiscal policy stance. In addition, if final targets differ (example, the central bank is an inflation hawk and the fiscal authority aims at pushing output beyond its natural level), a race

between monetary and fiscal policy would lead to equilibrium levels of output and inflation far away from the preferred choices. Hence, agreement on the final targets between monetary and fiscal authorities is paramount in order to lead to a final situation which is close to the authorities preferred choices, even without formal cooperation.

Literature on the issue of interaction between monetary and fiscal policies is large and extensive in the case of Brazilian economy. Raphael Ornellas and Marcelo S. Portugal (2001) use the dynamic stochastic general equilibrium (DSGE) model for the period 1999-2009 to assess the interdependence between fiscal and monetary policies and reveals that Brazil is under low fiscal dominance by comparing with USA, Canada, Mexico and S.Korea. according to Loyo(1999), economies under low fiscal dominance, have less difficulty in attaining their goals regarding inflation target policies. This may be due to the provision of relatively free mandate for the monetary authority to influence the price level.

Similarly, Fialho and Portugal (2005) use the autoregressive vectors to examine the predominance of a monetary and fiscal dominance regime and argue that the macroeconomic coordination between monetary and fiscal policies in Brazil was virtually a substitute and predominantly monetary policy during the post Real plan period. On the other hand S.Moreira et al (2007) found that monetary policy is passive whereas fiscal policy is active.

David Dodge (2002), Governor of the Bank of Canada, in his paper to show Canadian experience said that inflation targets are joint targets- they are not just the Bank's targets- they are also the targets of the government of Canada. According to him, cooperation rather than coordination in the form of sharing information and analysis is most effective if long term objectives and frameworks of monetary and fiscal policies have created. The

government thinks how changes in fiscal policy affect inflation and, consequently interest rates, the Bank also consider in similar fashion. Therefore, sharing of information is to the mutual benefit of both parties. This view is similar with Paul Hilbers (2005); communication and incorporating transparency in to monetary and fiscal policy is a key to their effectiveness. He also deals both direct and indirect channels through which fiscal policy can affect monetary policy. From the very beginning, if excessive expansionary fiscal policy is financed by the central bank, an expansionary fiscal policy leads to expansionary monetary policy this in turn leads to inflation which contradicts with the objective of the central bank since almost all central banks aims at combating higher inflation. On the other hand financing deficit through domestic borrowing intensifies crowding out problem, because too little or too expensive credit will be available for the private sector. This exerts negative impact on economic growth, which would certainly be a concern of central bankers. Excessive dependence on foreign funds on its part results balance of payment risks, which again would be worrying to central banks. Fiscal policy can also affect monetary policy through taxation especially direct taxes which increase the price level directly. Finally, perceptions and expectations of large government debt reduce the confidence on government's financial position which may be a potential destabilizing factor on bond and foreign exchange markets.

Blanchard (2004) argue that the attempt of fiscal authority to increase public debt cause an increase in interest rate to keep inflation within the target and hence lead the rise in the cost of debt service, debt level, the default probability and the country premium, triggering capital outflows. Under flexible exchange rate, this will lead to depreciation of exchange rate that affects inflation expectations and eventually inflation itself. Melitz (1997) found that

monetary and fiscal policies have tends to move in opposite directions for nineteen OECD countries over the period 1960-1995. On the other hand, Attiya Y. Javid et al (2008) estimate a model of unrestricted VAR for Pakistan and argue that evidence is less clear to infer that authorities are following a certain type regime during the sample period of 1970-2007.

Campbell Leith and Simon Wren-Lewis (2000) separate the regime as active and passive regime then test the impact on both regimes. Therefore,, in the active regime, real interest rates rise if inflation is above target and fiscal policy must ensure that the government debt is stabilized. In the passive regime, fiscal policy is not self stabilizing, and stability requires that real interest rates are reduced when there is excess inflation. If fiscal policy is passive, then stability following demand shocks may be increased by making monetary policy more passive. They conclude that, even though the passive policy is undesirable when the overall stability of inflation and output are considered, a passive policy may lead to lower inflation following a positive demand shock than an active policy. They also found the different impact of different fiscal instruments. The impact of tax changes on consumption is substantially smoothed. But, if the fiscal authority chooses government spending, then the strength of any fiscal feedback rule could in principle influence inflation and design of an optimal monetary policy.

Dixit and Lambertini (2003), using a static Barro-Gordon type model, demonstrate that a conflict of interests does make the outcome sub optimal in a model of monetary and fiscal interactions with a conservative central bank and a benevolent fiscal authority.

In a simplified rational expectation model with partial adjustment mechanism for monetary policy and infinitely lived consumer Semih Emre Cekin (2013) test the monetary and fiscal

policy interactions in Turkey. The result confirm that the pre 2001 was characterized by a regime that was not insulated against fiscal shocks (monetary passive/ fiscal active) where as the post 2001 period experienced a switch to a regime in which the interest and inflation rates are solely influenced by the shocks of the monetary policy rule (monetary active/ fiscal passive). By referring Krueger (1995) and A. Kibrit Ciolgu (2002), the author argue that emergence of inflation during the decades between 1950 and 1990 (close to 80% in the 1990s) is mainly attributable to monetization of high budget deficit as a result of inefficiently running state economic enterprises, exchange rate devaluations and inflation inertia.

If the fiscal authority is benevolent but acts strategically, then delegating monetary policy to an inflation conservative agency usually increases stabilization bias and so reduces social welfare. Any distortion to the social objectives can bring the two policy makers in to conflict with each other in a way that nearly always reduces social welfare. The choice of fiscal instrument is also important; taxes are more useful in stabilizing debt, but have a large effect on domestic demand (Andrew p. Blake and Tatiana Kirsanova, 2011).

Cem Cebi(2011) demonstrates that over the post crisis period monetary policy in Turkey reacted to inflation aggressively but only weakly reacts to the output gap. Fiscal policy played an important role in debt stabilization, but the author did not find any evidence on active stabilization of output gap by fiscal means.

Increasing the monetary policy commitment to inflation target significantly reduces the volatility of inflation and its correlation with output growth. However, a higher commitment to inflation target results in a higher state of variance of inflation being explained by fiscal shock (Marcos Valli Jorge and Fabia A. de Carvalho, 2010).

In India, fiscal policy has impact on the implementation of monetary policy. Even after the elimination of automatic monetization of fiscal deficit and prohibition on direct borrowing of government from Reserve Bank, fiscal policy continues to impinge on the outcome of monetary policy (Janak Raj et al, 2011). By using VAR they proved that monetary policy reacts strongly in a counter cyclical manner by raising the policy rate. While fiscal policy response remains largely pro cyclical. The authors also reveal the finding compatible with crowding out problem; i.e., an increase in fiscal deficit leads the level of output beyond potential in the very first quarter. Then the impact dies out in the subsequent quarters, and finally negative. Therefore, rising fiscal deficit may lead to hardening of the borrowing cost of more efficient private sector thus, crowding out private sector investment and lower output growth.

Interactions between monetary and fiscal policy crucially depends on the specification of policy variables that fiscal policy uses. However, a general rule is that when monetary policy is capable of dealing with sticky price adjustment, a primary concern of fiscal authority should be remedy the resource allocation. In some cases, concerns of the central bank and fiscal authority are to be interplayed. Such an example is when there are limitations to monetary policy; fiscal policy has the additional concern acting as a stabilization policy (Yasushi Iwamoto, 2005). On the other hand Von Hagen et al (2001) find that the interdependence between the two policy makers is asymmetric: looser fiscal stances match monetary contractions, where as monetary policies broadly accommodate fiscal expansions.

Muscatelli et al (2002) estimated VAR models for a number of G7 countries and found that the form of interdependence between the two instruments is asymmetric and differs across countries. For some countries there seems to be no clear monetary reaction, although for

Germany there are some signs that monetary policy tends to offset fiscal policy shocks. In contrast, fiscal policy tends to be a strategic substitute for monetary policy, for most of the countries.

One of the papers from Eastern Africa region especially Kenya is by Morekwa et al (---). Their attempt to test the fiscal-monetary mix reveals that coordination is not for the entire sample period. For some year there is coordination, while for some other years there is no coordination. In addition they were tried to test policy dominance using VAR method and argue that monetary policy is dominant in Kenya. But, they conclude that although there are a number of years when polices were not coordinated, the situation is not potentially dangerous for the economy.

Chuku A. Chuku (---) apply a state- space model with Markov Switching and show the variables dichotomizes into phases that exhibit declining and growing interaction. The evidence indicates that monetary and fiscal policies in Nigeria have interacted in a counteractive manner for most of the sample period (1980-1994). For the other periods the author do not observe any systematic pattern of interaction between the two policy variables, although between 1998 and 2008 some form of accommodativeness can be inferred.

Alfredo Baldini and Marcos Poplawski Ribeiro (2008) test fiscal and monetary anchors for price stability for sub-Saharan Africa including Ethiopia. In the case of Ethiopia, the surplus was negatively correlated and the impulse response analysis was inconclusive. In addition the pass through analysis result suggested that inflation variability could be mostly explained by both domestic debt growth and money growth. The authors also conclude that countries with chronic budget deficits and high nominal public liabilities seem to have been more prone to fiscal dominant regimes and high inflation.

CHAPTER THREE

3 LESSONS FROM ETHIOPIA

3.1 Introduction

Even though there is a dispute on statistics by how much the country is growing, it is obvious that the country is in a good sign of economic progress. International organizations report the growth rate of the country around 7 percent, while the government of Ethiopia announces a double digit growth for the last ten years. According to the African development bank, the main driving force for the recent growth of the country is improvement in agricultural sector due to favorable climatic condition and improved supply of fertilizers. On the other hand IMF proved that the public sector-led growth strategy calls for substantial external financing and state mobilization of domestic resources, has provided an important imputes to growth. Combined with pro poor spending that has averaged more than 12 percent of GDP over the past decade, this has helped improve living standards.

Table 3.1. Sectoral contribution to GDP and growth.

Year		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Real GDP growth		11.5	12.7	11.5	11.8	11.2	10.0	10.6	11.3	8.8	9.7	10.9
contribution to GDP growth	agriculture	8.0	6.4	5.2	4.4	3.3	2.8	3.5	4.1	2.1	3.0	4.3
	industry	1.6	1.3	1.4	1.3	1.3	1.2	1.1	1.7	2.0	2.3	1.5
	service	2.5	5.1	5.3	6.4	7.0	6.3	5.8	5.4	4.7	4.5	5.3
GDP per capita growth rate		8.6	9.7	8.8	8.1	7.5	7.3	7.8	8.7	6.2	7.0	8.0

Source: National Bank of Ethiopia

From the above table, we can observe that Ethiopia experienced an average of 10.9% growth of the past decade. But per capita GDP is still the lowest amount (500 USD in 2012/13) though registered 8% average growth rate for the last decade. When we see the sectoral contribution to GDP growth, the figure depicts the structure of the economy. Agriculture, around 84 % of the country's population engaged in contributed to 4.3% out of 10.9 GDP growths. This calls question about the contribution to and the benefit of the rural society from the country's growth.

On the other hand, the industrial sector contributed on average 1.5% of the country's growth rate. The five year growth and transformation plan (GTP) of the country from 2010/11-2014/15 gives high emphasis for the industrial sector even to boost over the agricultural sector. After the completion of the third year of growth and transformation plan in 2012/13, the industrial sector contributed only 2.3% out of the total 9.7% growth rate of the country. The number is very low for the country who envisaged the industrial sector leading economy. The service sector, though lower emphasis contributed 5.3% on average for the last 10 years.

Ethiopia is one of the most egalitarian with a Gini coefficient of 33.6 and it has consistently maintained this distribution in the last ten years. Ethiopia stands out among comparable African countries regarding relatively even income distribution, although there are likely differences between rural and urban populations. (IMF country report 2013).

3.2 Some insights from fiscal policy

Ministry of Finance and Economic Development (MoFED) is responsible government institution to enact and implement fiscal policy of the country with a mission to make real prosperous Ethiopia by formulating development policies, preparing development plan and

budget, mobilizing and administering external resources, installing modern, efficient, effective and accountable finance and property administration and controlling system.

With the objective to become middle income country by 2025, the government of Ethiopia extensively engaged on economic activities. An accurate overall fiscal stance of the consolidated public sector (including public enterprises) is difficult to gauge, although it would seem considerably more expansionary. And this expansionary fiscal policy of the government has prons and cons to the economy.

A few years ago, international agencies, particularly IMF was against fiscal expansionary policy of Ethiopia because it will hinder the private sector from economic activity; and an economy with low private sector participation is vulnerable according to IMF. But, the Ethiopian stance is that, the fiscal expansion is on infrastructure and other investments that are complement to the private sector. In addition, the expenditure is for pro-poor so that the peoples living condition is improved.

Table 3.2: Fiscal Related Indicators

Year	2003 /04	2004 /05	2005 /06	2006 /07	2007 /08	2008 /09	2009 /10	2010 /11	2011 /12	2012 /13	Average
Revenue to GDP ratio	6.3	6.2	7.0	7.0	8.6	10.6	12.8	14.8	20.3	22.3	11.6
Tax to GDP ratio	4.9	4.9	5.1	5.6	6.9	7.6	10.3	12.7	16.9	19.2	9.4
Budget deficit GDP ratio	1.2	1.9	2.2	2.0	2.1	0.8	1.2	1.8	1.7	3.0	1.8
Share of capital expenditure	40.3	46.5	47.9	51.7	51.4	53.0	55.1	56.8	58.7	59.2	52.1
Debt to GDP ratio	36.9	29.7	28.0	16.3	17.0	17.7	25.0	33.1	34.3	37.2	27.5

Source: National bank of Ethiopia

When we see the structure of fiscal policy, government expenditure is the one aggressively implemented by MoFED. In 2004, out of the total expenditure only 40 percent was allocated for capital expenditure; i.e., majority of government expenditure was not spent on long term productive sectors. On the other hand, during 2012/13, 59 percent of total expenditure is for capital expenditure. For the country aiming progress via massive government intervention, majority of government expenditure should be invested on productive activities which in turn will facilitate the participation of private sector. In relation with budget deficit, the higher amount is registered during 2012/13 (3 percent of the country's GDP). This is the manifestation of the government's massive involvement in the economy and the construction of mega projects including Renaissance dam and Rail ways. Let alone other projects, Renaissance dam requires 10 percent of the country's 2012/13 GDP.

On the other hand, the country's capacity to generate domestic revenue from tax and non tax sources is very limited. The revenue authority failed to collect revenue compatible with the economy's progress. Ten year average of 2003/04-2012/13 revenue to GDP ratio is 11.6 while tax revenue is 9.4. The figure is very low for the country with aggressive fiscal expansion.

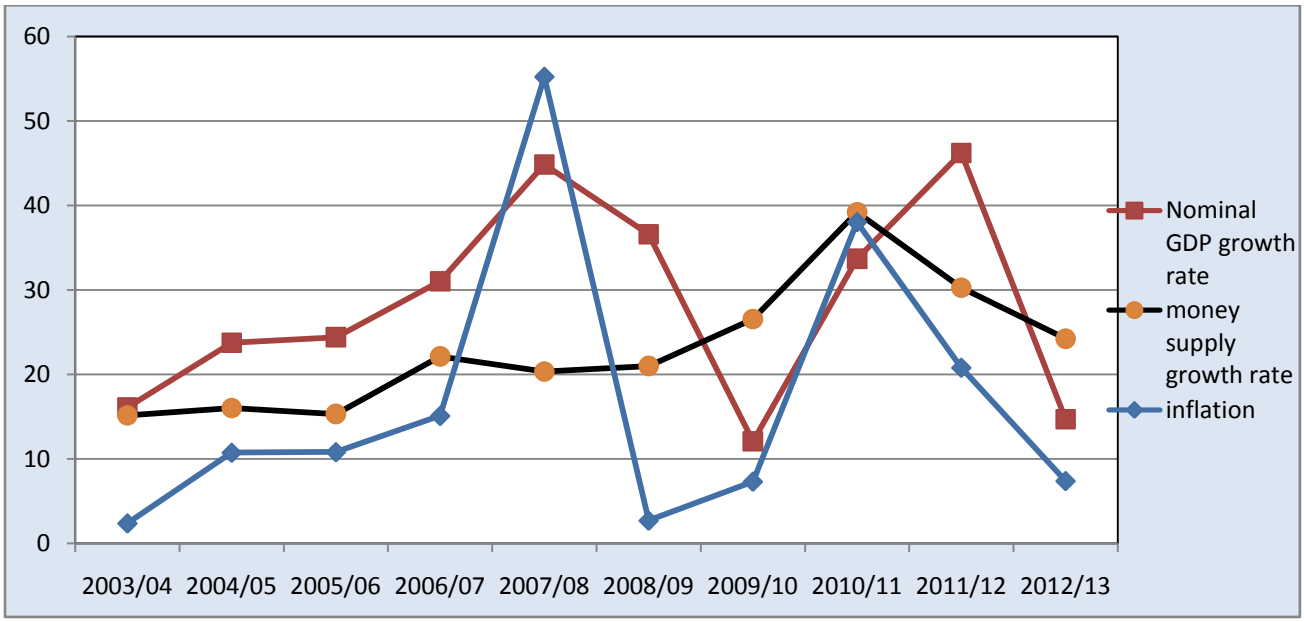
3.3 Some insights from monetary policy

National Bank of Ethiopia, NBE is the responsible body of enacting and implementing monetary policy. The mission of the monetary policy of NBE is to maintain price and exchange rate stability, to foster a sound financial system and undertake such other functions as are conducive to the economic growth of Ethiopia. So as to maintain price and exchange rate stability and support sustainable economic growth, NBE determine the optimal quantity of money or the optimal rate of growth of monetary stock.

Even though, rich countries announced expansionary fiscal and monetary policy, NBE and IMF authorities agreed on a restrained monetary stance to sustain single digit inflation. They also noted that how nominal interest rates were necessary to finance public investment but agreed on the need to have positive or near zero real interest rates. And IMF acknowledged the NBE's monetary policy stance has contributed to the decline of inflation to single digits. But, IMF is against the NBE's directive requiring banks to hold NBE bills equivalent to 27 percent of their lending since it has been distortionary and has triggered unnecessary portfolio adjustment by banks (IMF country report, 2013). In Ethiopia commercial banks are highly profitable. In addition, the required NBE bill is provided for Development Bank of Ethiopia (DBE) to provide credit for private sector in the prioritized investment areas. Therefore, IMF should take in to account the economic contribution of this directive.

Limited number of monetary instruments and infant financial market are the problems that hinder monetary policy from full success. In Ethiopia, financial services are provided mainly by banks and sometimes by microfinance. And these banks and micro finances are limited not only in number and branches but also their accessibility mainly for rural society. But, NBE devotes several efforts to promote financial inclusion.

Fig1: Inflation, Money supply and Nominal GDP growth rate



Source: National bank of Ethiopia

The above figure shows the trends of inflation and growth rates of nominal GDP and money supply growth rate. From 2003/04-2006/07, all of the variables showed relatively smooth trend. But after 2006/07, fluctuation comes in! In 2007/08 inflation reached to its highest ever level of 55 percent; but in the next year it was reduced to 2.7 percent. Since then inflation increased dramatically until it was reduced to single digit in 2012/13.

Money supply, which may be questioned for higher inflation rate increased incredibly and reached 31 percent of nominal GDP in 2010/11. After that period, money supply growth rate reduced to 24 percent in 2012/13 which is better as compared with 39 percent growth in 2010/11. On the other hand nominal GDP registered a remarkable growth in the last decade. The average growth rate was 28 percent and very high growth rate was registered in 2011/12 by 46 percent.

There are some manifestations of interaction between monetary and fiscal authorities. First and foremost, fiscal authorities consider inflation when they formulate their policy particularly when they allocate the country's budget. Some of the considerations of MoFED are the last five years economic growth, inflation, amount of domestic financing, exchange rate, etc. (MoFED). Here, the amount of money supply is not explicitly stated, rather the document simply says the amount of domestic borrowing to finance budget deficit (may or may not be from NBE). On the other hand NBE assesses domestic conditions including fiscal trends, liquidity of the banking system, inflation and exchange rate trends (National Bank of Ethiopia)

CHAPTER FOUR

4. METHODOLOGY AND EMPIRICAL PROCEDURES

4.1Methodology

Taking the cue from Janak Raj et al (2011) and Andrew Hughes Hallet (2008), variables are selected and incorporated in the model. The time frame for the study is between the years 1974/75 and 2012/13. The major reason for selecting this time period is the availability of all required data. The source of all data is from National Bank of Ethiopia (NBE) and Ministry of Finance and Economic Development (MoFED). The procedure adopted in this analysis is firstly, I try to determine order of integration (stationarity), then testing the existence of co integration (long run equilibrium relationship) between the variables. Finally, estimation is conducted by using VAR and interpretation is conducted via impulse response (IR) and variance decomposition (VD).

4.2 Model specification

Within a Vector Auto Regression (VAR) framework, the concept of impulse response is deployed to assess whether or not monetary and fiscal policies are interacted in Ethiopian economy. The vector of the VAR model, therefore, incorporates four variables- Real GDP (Y), Government expenditure (G), inflation (INF) and money supply (Ms). Money supply is the proxy for monetary policy while government expenditure is proxy for fiscal policy. Therefore a VAR (P) model for four dimensional vector Y_t is given by:

$$\vec{y}_t = \delta + \Theta_1 \vec{y}_{t-1} + \ldots\ldots\ldots\ldots + \Theta_p \vec{y}_{t-p} + \vec{\varepsilon}_t$$

Where; $\vec{y}_t = \begin{bmatrix} y_t \\ G_t \\ Ms_t \\ Inf_t \end{bmatrix}$ $\delta = \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \end{bmatrix}$ $\vec{\varepsilon}_t = \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \end{bmatrix}$

$$\Theta = \begin{bmatrix} \theta_{11} & \theta_{12} & . & . & . & \theta_{1p} \\ . & . & & & & . \\ . & & . & . & & . \\ \theta_{41} & \theta_{42} & . & . & . & \theta_{4p} \end{bmatrix}$$

$\varepsilon_{1t}.....\varepsilon_{14}$ are white noise processes (independent of the history of $\vec{y}_t$) that may be correlated.

4.3 Stationarity and unit roots

For (many of) time series data stationarity is unlikely to exist. Therefore, before conducting any test we need to ensure that variable series are stationary individually. A series X_t is said to be integrated of oreder d denoted by $X_t \sim I(d)$ if it becomes stationary after differencing d times and thus X_t contains d unit roots. If a series is I(0) it is said to be stationary at level. To determine whether a series is stationary or non stationary, unit root test developed by Fuller (1976) and Dickey and Fuller (1981) is used. The Augmented Dickey Fuller test (ADF) is based on the estimation of the following regression.

$$\Delta X_t = \alpha\alpha_0 + \alpha_1 t + \alpha_2 X_{t-1} + \sum_{j=1}^{p} \alpha_j X_{t-j} + \varepsilon_t$$

Where Δ is the first difference operator, t is the linear time trend, ε_t is the normally distributed error term and p is the lag length. The additional lagged terms are included to

ensure that the errors are uncorrelated. In this ADF procedure, the test for a unit root is conducted on the coefficient of X_{t-1} in the regression. If the coefficient is significantly different from zero, then the hypothesis that X_t contains a unit root is rejected. Rejection of the null hypothesis implies stationarity of the variable.

Precisely, the null hypothesis is that the variable X_t is non stationary series (H_0:α_2=0) and is rejected when α_2 is significantly negative (H_1:α_2<0). If the calculated value of ADF statistic is higher than McKinnon's critical values, then the null hypothesis (H_0) is not rejected and the series is non stationary or not integrated of order zero, I(0). Alternatively, rejection of the null hypothesis implies stationarity. Failure to reject the null hypothesis leads to conducting the test on the difference of the series, so further differencing is conducted until stationarity is reached and the null hypothesis is rejected. If the time series (variables) are non stationary in their levels, they can be integrated with I(1), when their first differences are stationary. However, if the variables that are non stationary separately have the same stochastic trend then it points that the variables have a stationary linear combination. This in turn implies that the variables are co integrated; therefore, there exists long run equilibrium among the variables.

4.4 Co integration test

Once the unit roots are confirmed for data series, the next step is to examine whether there exists long run equilibrium relationship among the variables. This calls for co integration analysis which is significant so as to avoid the risk of spurious regression. Co integration analysis is important because if two non stationary variables are co integrated, a vector auto regression model in the first difference is miss- specified due to the effects of a common trend. If co integration relationship is identified, the model should include residuals from the

vectors (lagged one period) in the dynamic VECM system. In this stage, Johansen's co integration test is used to identify co integration relationship among the variables. The Johansen method applies the maximum likelihood procedure to determine the presence of co integrated vectors in non stationary time series. The testing hypothesis is the null of non co integration against the alternative of existence of co integration using the Johansen maximum likelihood procedure. The method involves estimating the following unrestricted VAR model of order p:

$$Y_t = A_0 + A_1 Y_{t-1} + ... + A_P Y_{t-p} + \varepsilon_t$$

$$\text{Or } Y_t = A_0 + \sum_{j=1}^{p} A_J Y_{t-j} \quad + \varepsilon_t$$

Where Y_t is k- dimensional vector of non stationary variables, and ε_t is a vector of white noise residual. A_j is an n×n matrix of estimable parameters. The above VAR can be written alternatively as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t$$

$$\text{Where } \Pi = \sum_{i=1}^{p} A_i - I \quad \text{and } \Gamma_i = -\sum_{j=i+1}^{p} A_j A_j$$

Δ is the difference operator, and I is an n×n identity matrix; Π is the p×p matrix of coefficients, conveys information about the long run relationship between Y_t variables and the rank of Π is the number of linearly independent and stationary linear combinations of variables studied. Thus, testing for co integration involves testing for the rank of Π matrix r

by examining whether the Eigen values of Π are significantly different from zero. Johansen and Juselious (1990) propose two test statistics for testing the number of co integrating vectors (or the rank of Π) in the VAR model.

The first is the maximum Eigen value test, which tests the null hypothesis of r co integrating vectors against the alternative of r+1 vectors. This test utilizes the r+1st largest Eigen value in the following likelihood ratio:

$$\lambda_{max} = -Tln(1 - \lambda_{r+1})$$

The second test statistic, known as the trace statistic provides a test for a more general alternative hypothesis (r≤n) and is computed as:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \ln(1-\lambda_{ri})$$

4.5 Impulse response and variance decomposition

Since the individual coefficients in the estimated VAR models are difficult to interpret, the impulse response function is estimated. The impulse response function traces out the response of the dependent variable in the VAR system to shocks in the error terms. Put in other words, impulse response function show the response of each variable in the system to shock from system variable. An alternative method of analysis of an estimated VAR, closely related to impulse response functions, is to decompose the forecast errors at different horizons into contributions from different disturbances.

4.6 Vector error correction model

Once the co integration is confirmed to exist between variables, then the third step entails the construction of error correction mechanism to model dynamic relationship. The purpose of the error correction model is to indicate the speed of adjustment from the short run equilibrium to the long-run equilibrium state.

A Vector Error Correction Model (VECM) is a restricted VAR designed for use with non-stationary series that are known to be co integrated. Once the equilibrium conditions are imposed, the VECM describes how the examined model is adjusting in each time period towards its long-run equilibrium state. Since the variables are supposed to be co integrated, then in the short-run, deviations from this long-run equilibrium will feedback on the changes in the dependent variables in order to force their movements towards the long-run equilibrium state. Hence, the co integrated vectors from which the error correction terms are derived are each indicating an independent direction where a stable meaningful long-run equilibrium state exists.

The VECM has co integration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge on their co integrating relationship while allowing for short-run adjustment dynamics. The co integration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state.

In this study the error correction model as suggested by Hendry (1995) has been used. The general form of the VECM is as follows:

$$\Delta X_t = \alpha_0 + \lambda_1 EC_{t-1}^1 + \sum_{i=1}^{m} \alpha_i \Delta X_{t-i} + \sum_{j=1}^{n} \alpha_j \Delta Y_{t-j} + \varepsilon_{1t}$$

$$\Delta Y_t = \beta_0 + \lambda_2 EC_{t-1}^2 + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \beta_j \Delta X_{t-j} + \varepsilon_{2t}$$

Where Δ is the first difference operator; EC_{t-1} is the error correction term lagged one period; λ is the short-run coefficient of the error correction term ($-1 < \lambda < 0$); and ε is the white noise. The error correction coefficient (λ) is very important in this error correction estimation as the greater co-efficient indicates higher speed of adjustment of the model from the short-run to the long-run.

The error correction term represents the long-run relationship. A negative and significant coefficient of the error correction term indicates the presence of long-run causal relationship. On the other hand, the lagged terms of ΔX_t and ΔY_t appeared as explanatory variables, indicating a short-run cause and effect relationship between the two variables.

CHAPTER FIVE

5. EMPIRICAL RESULTS

5.1Test results for unit roots

As we underlined earlier, a necessary step when testing for causality is first to test for stationarity of the series involved. Therefore, we should test for the existence of unit roots in the level variables as well as in their first differences. The test that is used here is the Augmented Dickey-Fuller (ADF). The null hypothesis tested is that the variable under investigation has a unit root, against the alternative that it does not. In each case the lag-length is chosen by minimizing the Schwarz information criteria.

The test is performed sequentially. The author first test stationarity around none zero constant then stationarity around a linear time trend is tested. As shown in the first half of table 5.1 below, the null hypothesis that the level variables contain unit roots cannot be rejected. Then, I test for stationarity about a deterministic time trend. Again the null hypothesis that each of the time series has a unit root cannot be rejected; the result is reported in the third column of table1. The bottom half of table1 reports the results of testing for unit roots after differencing the data once. Since the data appear to be stationary; both tests reject the null hypothesis.

Table 5.1: Test result of stationarity

Variables	ADF stat			
	Stationarity around a non-zero mean	probability	Stationarity around a linear time trend	probability
lG	1.458027	0.9989	-0.278204	0.9885
lGDP	4.107142	1.0000	1.070210	0.9998
Linf	0.237112	0.9715	-1.111283	0.9138
Lms	3.016203	1.0000	2.437422	1.0000
5%critical values	-2.941145		-3.533083	
DlG	-5.374100	0.0001	-4.371180	0.0071
DlGDP	-1.837287	0.3570	-6.204719	0.0001
Dlinf	-5.500233	0.0001	-5.561578	0.0003
Dlms	-3.322796	0.0209	-4.584967	0.0040
5%critical values	-2.943427		-3.540328	

Hence, the results of Table 5.1 are consistent with the null hypothesis that the variables are each integrated of order one.

5.2 Test results for co-integration

In the next step, the co integration between the stationary variables has been tested by the Johansen's Trace and Maximum Eigen value tests. Since the Johansen co-integration method is sensitive to the choice of the lag length, before estimation of coefficients, it is necessary to determine the lag length, k, of the VAR equation, which should be high enough to ensure that the errors are approximately white noise, but small enough to allow estimation. Our choice of k is based on the Akaike's Final Prediction Error (FPE) criterion. Table 5.2 below reports the test of Johansen's unrestricted co-integration test.

Table 5.2 results of Johansen's co integration test

Date: 04/04/14 Time: 17:10
Sample: 1975 2013
Included observations: 37
Series: LG LGDP LINF LMS
Lags interval: 1 to 1

Selected (0.05 level*) Number of co integrating relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	2	2	1	1
Max-Eig	1	2	2	1	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

The above table provides five alternatives on the deterministic terms to be included in the model. The summary of all five sets of assumption yields disagreement on the number of co integrating vectors. The third assumption- intercept without trend in co integration equation- is better because if the model allow a trend in the co integrating equations, which is not as

compatible with the idea of an equilibrium relationship; though the model with trend in the co integrating equation can be useful if there is a trend stationary series in the model.

Accordingly, the Trace test indicates the existence of two co integrating equations at 5 per cent level of significance. And, the maximum Eigen value test makes the confirmation of this result. Thus, there exists long-run equilibrium relationship in the model.

5.3. Estimation and Lag selection criteria

To estimate the VAR model, each equation is estimated as an OLS regression on the explanatory variables. The important practical issues are the selection of the appropriate model and the interpretation of the results. It is important to determine the lag length or the order of VAR by using different criteria. Here, five criteria namely the likelihood ratio test (LR), the final prediction error (FPE), Akaike information criterion (AIC), Schwarz criterion (SC) and the Hannan-Quinn (HQ) were deployed. Unfortunately all of the criteria choose the VAR model with order of one i.e., lag length of one. In the situation where there is disagreement between the criteria and uncertainty about the lag length, it is a good idea to look at the residual correlogram. For the time being there is no disagreement and select P=1.

Table 5.3: lag selection criteria

VAR Lag Order Selection Criteria
Endogenous variables: LMS LG LGDP LINF
Exogenous variables: C
Date: 04/02/14 Time: 16:38
Sample: 1975 2013
Included observations: 36

Lag	LogL	LR	FPE	AIC	SC	HQ
0	6.070177	NA	1.05e-05	-0.115010	0.060937	-0.053600
1	200.0392	334.0577*	5.36e-10*	-10.00218*	-9.122443*	-9.695126*
2	210.3747	15.50329	7.62e-10	-9.687483	-8.103964	-9.134793
3	224.6566	18.24907	9.20e-10	-9.592032	-7.304727	-8.793701

* 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

After the lag length is identified, the next step is VAR estimation. The VAR estimation results are just the coefficient estimates for each equation in the VAR. Each column of the table (appendix 2) corresponds to an equation. The coefficient estimates can be presented as follows:

$GDP=-0.2+GDPt\text{-}_1+0.02Mst\text{-}_1 -0.01Gt\text{-}_1+0.02INFt\text{-}_1$

$Ms=-3.8+0.22GDPt\text{-}_1+0.92Mst\text{-}_1-0.01Gt\text{-}_1+0.06INFt\text{-}_1$

$G=-8.88+0.54GDPt\text{-}_1+0.18Mst\text{-}_1+0.59Gt\text{-}_1+0.06INFt\text{-}_1$

$INF=-12.58+0.58GDP_{t\text{-}1}+0.13Mst\text{-}_1-0.21Gt\text{-}_1+0.76INFt\text{-}_1$

It is difficult to interpret the individual coefficients as we do in regression models, because the usual hypothetical about the marginal effect of a single variable is often not practically sensible. Therefore impulse response and variance decomposition is used to interpret the model

5.4 Impulse Response and variance decomposition

An impulse response analysis examines the effect of current and past shocks on the time series in Yt. For example, a one unit shock $\varepsilon_{1,t}$ has the effect of increasing $y_{1,t}$. The impulse response function of the model is given by the graph under appendix 3 and the impulse response functions are shown using the solid lines. The dotted lines define confidence intervals, and if these confidence intervals include zero then it can be concluded that the impulse response is not significantly different from zero. By taking it in to account we can describe the impulse response graph column by column.

The first column describes the response of each variable to one unit shocks to money supply equation residuals. The first graph shows a highly significant response of money supply to money supply equation residual. On the other hand government expenditure as fiscal policy instrument respond after third lag and the effect disappears after 6 lags. The implication is that an unforeseen one unit increase in money supply growth has impact on the rise to government expenditure three years in to the future. But GDP and inflation failed to respond the shocks of money supply equation residual.

Following similar fashion, the second column of the impulse response graph reveals that there is no evidence that shocks to government expenditure, have any significant effects on all variables. Contrary to this all variables significantly respond for the shock of GDP. Finally the fourth column of graphs showed that inflation shocks have some significant effects on future inflation, up to four years in to the future, but there is no evidence that inflation shocks affect other variables. From this we can conclude that only fiscal policy respond positively to monetary policy- complementarity of fiscal and monetary policy.

In order to take in to account the contemporaneous correlation between the shocks in different equations, variance decomposition can be used as an alternative method. However, when using a cholesky ordering it is important to check the robustness of the results to the ordering. The ordering Ms G GDP INF is selected which means that it is assumed that a shock to money supply growth can contemporaneously affect government expenditure, GDP and inflation; a shock to government expenditure contemporaneously affect GDP and inflation and a shock to GDP affect inflation. However shocks to inflation are assumed to have no contemporaneous effect on the preceding variables. Alternatively G Ms GDP and INF is evaluated.

Accordingly, the ordering of Ms G GDP INF (appendix 4) depicted that the largest percentages in all cases are in the graphs on the main diagonal, showing that most forecast error variance is due to each variables own shock. GDP growth shocks play a significant role in forecast errors in all variables, while money supply also helps to forecast errors in inflation. Alternative ordering of G Ms GDP INF also yields the same result.

5.5 Vector Error correction Model

An error correction model is parameterized so that the variables tend to revert back to the equilibrium relationship that is specified by the co integrating vector. From appendix 5 the estimated co integrating vectors are:

$$\hat{\beta} = \begin{bmatrix} 1 & 0 \\ 1 & 0 \\ 2.5 & 1.27 \\ -1.94 & -0.81 \end{bmatrix}$$

The estimates can be presented as

Gt=-14.62-2.5INF+1.94Mst

GDPt-1= 10.76-1.27INFt+0.81Mst

The signs of the coefficients have been reversed because we have taken the variables to the other side of the equation. The estimated adjustment coefficients are reported in the rows corresponding to cointEq1 and cointEq2. Then the full VECM equation of each variables includes estimates of their respective columns (appendix 5).

If there is co integration, there exist some adjustment coefficients that are significant. But it is difficult to interpret the adjustment coefficient estimates beyond checking whether they are significant. Accordingly, all variables except that for GDP have at least one signicficant adjustment coefficient.

$$\text{Adjustment coefficient}=\begin{bmatrix} -0.48 & 0.96 \\ 0.01 & 0.02 \\ -0.37 & 0.56 \\ -0.03 & 0.18 \end{bmatrix}$$

Even if it is difficult to be sure which impulse responses are showing significant effects without confidence intervals, we can observe some effects of the variables with each other. Similar with the impulse response result of the stationary VAR, all variables respond significantly to GDP shocks. Money supply still failed to respond to government expenditure while government expenditure responds positively. Money supply and inflation also respond one another. Therefore, money supply responds to shocks of all variables except government expenditure (appendix 6)

CHAPTER SIX

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

In real world, the interaction between monetary and fiscal policies is not new issue. The interaction may be either strategic complement- when the two policies tend to move together or strategic substitute i.e., when the two policies tend to move in opposite direction to each other. In some cases the implementation of one policy doesn't affect the other- no interaction. Usually the monetary authority follows inflation target policy and is deeply committed towards these targets, while the fiscal authority aim at higher employment and economic growth even with the cost of inflation. Therefore, the policy decision is suboptimal without cooperation.

In Ethiopia, Ministry of Finance and Economic Development (MoFED) is responsible government institution to enact and implement fiscal policy while National Bank of Ethiopia (NBE) is responsible for monetary policy. Even though the two institutions have distinct objectives, there are some manifestations of interaction between these authorities. Fiscal authorities consider inflation when they formulate their policy particularly when they allocate the country's budget.

The study investigates the interaction between monetary and fiscal policy in Ethiopia using VAR framework. Accordingly, four variables- government expenditure, money supply, GDP and inflation were included in the model and the ADF test reveals unit root of all level variables and stationarity of their first difference.

Since the usual hypothetical about the marginal effect of a single variable and the interpretation of "holding all other variables constant" is often not practically sensible, we can't interpret the individual coefficients as we do in regression model; rather impulse response and variance decomposition are better. The impulse response of the model proves the complementarity between monetary and fiscal policies, i.e., they tend to move in the same direction. Fiscal policy responds positively to the shocks of monetary policy though monetary policy failed to respond to fiscal shocks. In order to check the contemporaneous effects of each policy, variance decomposition was deployed. As the cholesky criteria is dependent on the ordering of the variables, both Ms G GDP INF and G Ms GDP INF ordering was tested. The results of both ordering depicted that the most forecast error variance is due to each variables own shock. GDP growth shocks play a significant role in forecast errors in all variables, while money supply also helps to forecast errors in inflation.

As the existence of co integration implies the presence of some significant adjustment coefficients, the VEC estimation is conducted to see the adjustment coefficients, though it is difficult to interpret the adjustment coefficients beyond checking whether they are significant. Accordingly, all variables except GDP have at least one significant coefficient.

6.2 Policy Implications

International organizations including IMF, sometimes oppose Ethiopia's expansionary policy from the ground of aggravating inflation. But Ethiopia proved the possibility to grow fastly with reduced inflation. Therefore, the policy implication of such empirical evidence may be that, the government of Ethiopia and other policy planning bodies should device prudential norms and policies that do not reversed due to external influences

Even though NBE assesses the situation related with fiscal trend, the results from the model proved that monetary policy doesn't respond to the shocks of fiscal policy. Therefore, for the existence of optimal result, NBE should consider fiscal policy at the time of policy formulation and implementation.

Finally, it is better if both monetary and fiscal authorities to cooperate in terms of information sharing.

References

Andrew Hughes Hallett (2008) *coordination without explicit cooperation: monetary-fiscal interactions in area of demographic change* European commission economic papers 305.

Andrew P.Blake and Tatiana Kirsanova (2011) *Inflation conservatism and monetary- Fiscal policy interactions*

Alferdo Baldini and Marcos Poplawski Ribeiro (2008) *Fiscal and monetary anchors for price stability: Evidence from sub-Saharan Africa*; IMF working paper WP/08/121

Attiya Y.Javid, Umaima Arif, and Abdul Sattar (2008) *Testing the Fiscal theory of price level in case of Pakistan:* The Pakistan development review 47:4 part II winter 2008

Bernard Laurens and Enrique G.dela Piedra (1998) *coordination of monetary and fiscal policies* International Monetary Fund working paper series WP/98/25

Blanchard, O. (2004) *Fiscal Dominance and Inflation Targeting: Lessons from Brazil.* (NBER Working Paper No 10389).

Campbell Leith and Simon Wren- Lewis (2000) *Interactions between monetary and fiscal policy rules*: The economic Journal, vol. 110 No. 462, conference papers March 2000

Cem Cebe (2011) *The interaction between monetary and fiscal policies in Turkey: an estimated New Keynesian DSGE model*: central Bank of Turkey, working paper 11/04

Chuku A. Chuku (---) *Monetary and fiscal policy interactions in Nigeria: An application of a state- space model with Markov- Swithing Journal of Applied Statistics Vol. 1 No.1*

David Dodge (2002) *The interaction between monetary and fiscal policies*; Canadian public policy Vol, 28 No 2 June 2002 University of Toronto press

Dixit, A., Lambertini, L., (2000). .*Fiscal Discretion Destroys Monetary Commitment*; Working Paper, Princeton and UCLA.

Dixit, A., Lambertini, L., (2001). .*Monetary-Fiscal Policy Interactions and Commitment Versus Discretion in a Monetary Union*.. Working Paper, Princeton and UCLA.

Dixit A., and L. Lambertini. 2003. *Interactions of Commitment and Discretion in Monetary and Fiscal Policies*. American EconomicReview 93 (5): 1522–42

E. Loyo. *Tight money paradox on the loose: a fiscalist hyperinflation*. manuscript, Harvard University, 1999

Janak Raj, J.K Khundrakpam and Dipika Das (2011) *An empirical analysis of monetary and fiscal policy interaction in India* : Reserve Bank of India working paper series 15/2011

Kibritcioglu, A. (2002): *Causes of Ination in Turkey: A Literature Survey with Special Reference to Theories of Ination*. Forthcoming in: Ination and Disination in Turkey

Krueger, A. O., (1995). *Partial Adjustment and Growth in the 1980s in Turkey*, NBER Chapters, in: Reform, Recovery, and Growth: Latin America and the Middle East, pages 343-368 National Bureau of Economic Research, Inc.

Lawrence J. Christiano and Terry J Fitzgerald (2000) *Understanding the fiscal theory of the price level*, NBER working paper series 7668., April, 2000

Marco Buti, Warner Roeger and Jan In't Veld(2001), *stabilizing output and inflation: policy conflicts and cooperation under a stability pact*; journal of common market studies vol 39 No 5

Marcos Valli Jorge and Fabia A.de Carvalho (2010) *Fiscal and monetary policy interaction: A simulation based analysis of a two country new Keynesian DSGE model with heterogeneous households*

Melitz, J. (1997) *Some Cross-country Evidence about Debt, Deficits and the Behaviour of Monetary and Fiscal Authorities*. (CEPR Discussion Paper No. 1653).

M.L. Fialho and M.S. Portugal (2005) *Monetary and fiscal policy interactions in Brazil: an application of the fiscal theory of the price level*. Estudos Econômicos (São Paulo), 35:657–685, 2005

Morekwa E. Nyamongo, Moses M.sichei and Nahanson K.Mutai (---) *The monetary and fiscal policy interactions in Kenya*; Research department, central bank of Kenya

Paul Hilbers (2005) *Interaction of Monetary and Fiscal policies: why central bankers worry about government budget*

Raphael Ornellas and Marcelo S. Portugal (2001), *fiscal and monetary interaction in Brazil*

Semih Emre Cekin (2013) *Monetary and fiscal policy interactions in Turkey : A Markov Switching approach*

Tito Belchior S. Moreira, Geraldo da silva e Souza and Charles Lima de Almeida (2007) *The fiscal theory of the price level and the interaction of monetary and fiscal policies: the Brazilian case*

Yasushi Iwamoto (2005) *Interaction between monetary and fiscal policy and the policy mix: theoretical consideration and Japanese experience;* university of Tokyo, September 2005

Yasushi Iwamoto (2005) *Interaction between monetary and fiscal policy and the policy mix: theoretical consideration and Japanese experience*

V. Anton Muscatelli, patrizio Tirelli and Carmine Trecroci (2002) *Monetary and fiscal policy interactions over the cycle: some empirical evidence*

von Hagen, J., Hughes Hallett, Strauch, R., 2001. *Budgetary Consolidation in EMU*. Economic Papers No. 148. March 2001. European Commission; Brussels

Directives

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National bank of Ethiopia; NBE's monetary policy frame work, February 2009

APPENDIX

Appendix one: co integration

Date: 04/04/14 Time: 17:10
Sample: 1975 2013
Included observations: 37
Series: LG LGDP LINF LMS
Lags interval: 1 to 1

Selected (0.05 level*) Number of co integrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	2	2	1	1
Max-Eig	1	2	2	1	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
		Log Likelihood by Rank (rows) and Model (columns)			
0	172.6063	172.6063	178.5652	178.5652	184.8679
1	194.0936	194.2477	194.7426	196.1253	199.4768
2	198.2289	206.3136	206.5715	208.1514	211.3728
3	201.6761	210.1514	210.3732	213.6215	215.6555
4	202.2605	213.1381	213.1381	216.4086	216.4086
		Akaike Information Criteria by Rank (rows) and Model (columns)			
0	-8.465205	-8.465205	-8.571091	-8.571091	-8.695563
1	-9.194248	-9.148524	-9.013116	-9.033800	-9.052798
2	-8.985345	-9.314248*	-9.220083	-9.197371	-9.263396
3	-8.739246	-9.035210	-8.993147	-9.006566	-9.062461
4	-8.338406	-8.710166	-8.710166	-8.670736	-8.670736
		Schwarz Criteria by Rank (rows) and Model (columns)			
0	-7.768592	-7.768592	-7.700325	-7.700325	-7.650643
1	-8.149328*	-8.060066	-7.794043	-7.771189	-7.659572
2	-7.592119	-7.833945	-7.652703	-7.542915	-7.521863
3	-6.997714	-7.163062	-7.077461	-6.960265	-6.972622
4	-6.248566	-6.446173	-6.446173	-6.232590	-6.232590

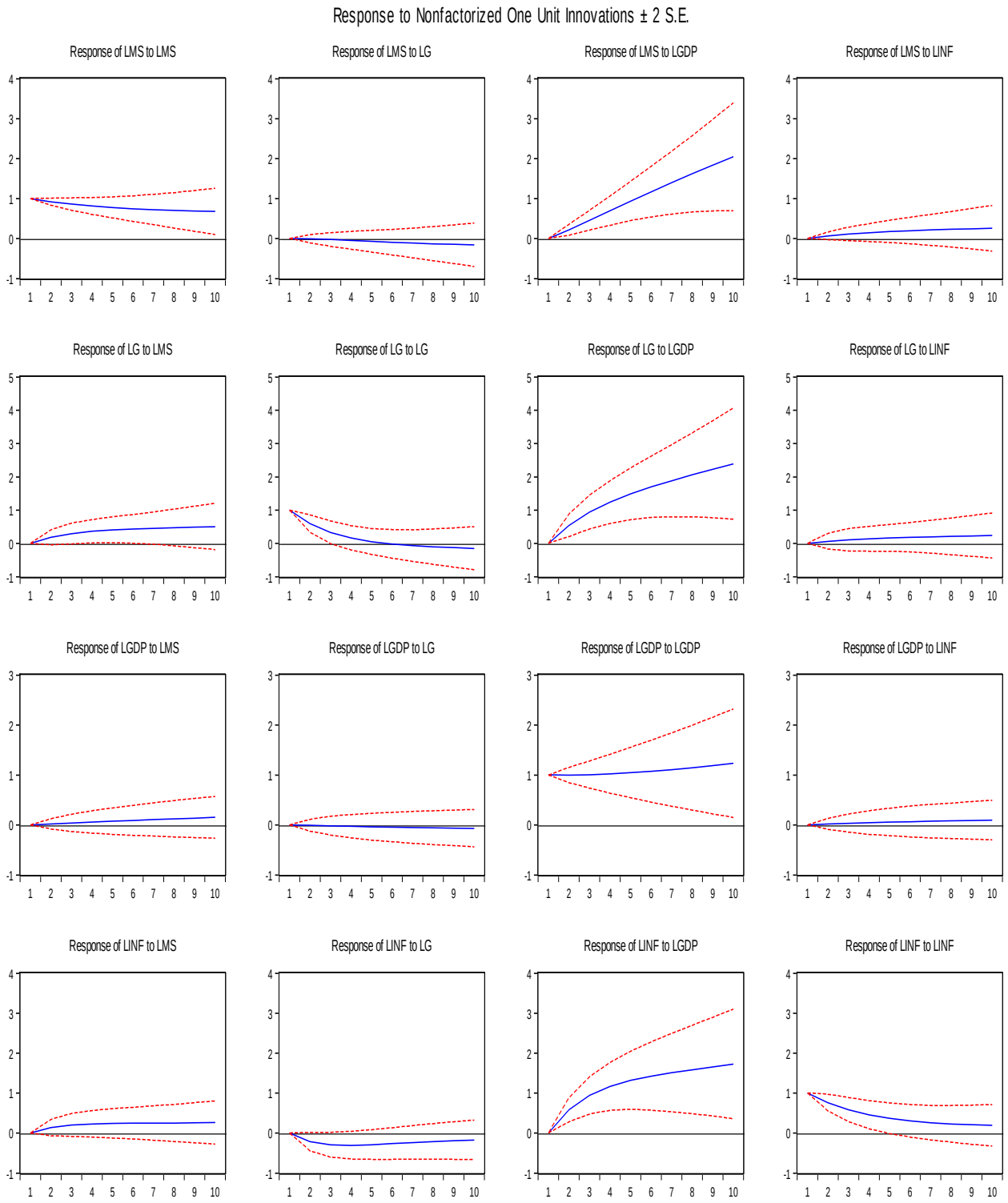
Appendix two: VAR estimation

Vector Autoregression Estimates
Date: 04/02/14 Time: 16:40
Sample (adjusted): 1976 2013
Included observations: 38 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LMS	LG	LGDP	LINF
LMS(-1)	0.922159	0.179931	0.020174	0.134353
	(0.04517)	(0.11274)	(0.05094)	(0.10012)
	[20.4145]	[1.59600]	[0.39603]	[1.34194]
LG(-1)	-0.006255	0.591513	-0.009375	-0.211780
	(0.05202)	(0.12984)	(0.05867)	(0.11531)
	[-0.12023]	[4.55563]	[-0.15980]	[-1.83666]
LGDP(-1)	0.220556	0.542081	0.997843	0.584872
	(0.06768)	(0.16892)	(0.07632)	(0.15001)
	[3.25876]	[3.20914]	[13.0736]	[3.89894]
LINF(-1)	0.064593	0.061178	0.019247	0.760814
	(0.04732)	(0.11811)	(0.05337)	(0.10489)
	[1.36496]	[0.51799]	[0.36066]	[7.25376]
C	-3.804193	-8.881627	-0.207803	-12.58216
	(1.27285)	(3.17677)	(1.43541)	(2.82114)
	[-2.98872]	[-2.79580]	[-0.14477]	[-4.45996]
R-squared	0.999122	0.993315	0.991018	0.985267
Adj. R-squared	0.999016	0.992505	0.989930	0.983481
Sum sq. resids	0.067273	0.419043	0.085554	0.330473
S.E. equation	0.045151	0.112687	0.050917	0.100072
F-statistic	9393.334	1225.878	910.2832	551.7001
Log likelihood	66.47533	31.72034	61.90808	36.23185
Akaike AIC	-3.235544	-1.406334	-2.995162	-1.643782
Schwarz SC	-3.020072	-1.190862	-2.779690	-1.428310
Mean dependent	23.26809	22.97156	25.87385	3.041995
S.D. dependent	1.439441	1.301612	0.507387	0.778601

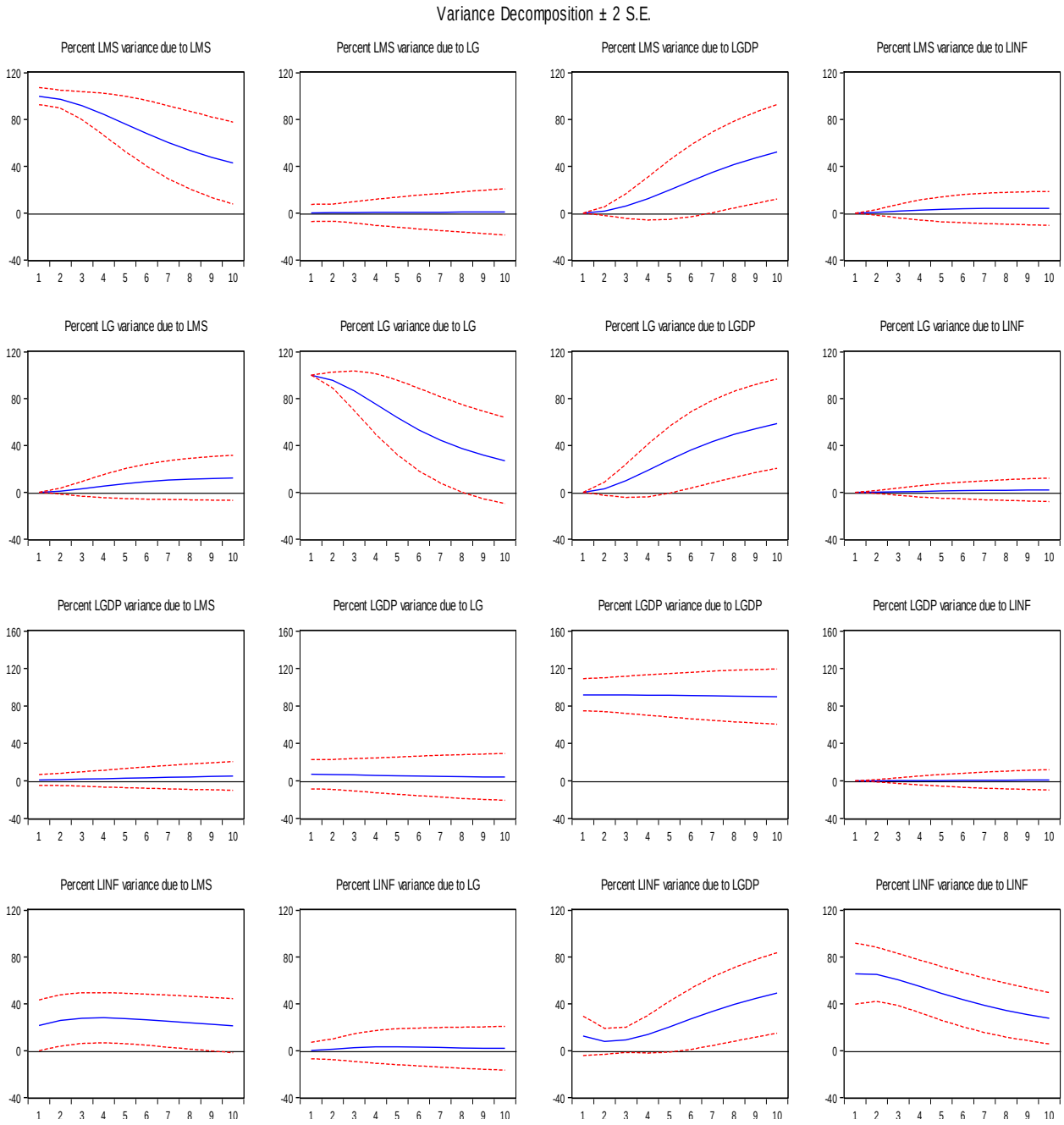
Determinant resid covariance (dof adj.)	4.06E-10
Determinant resid covariance	2.31E-10
Log likelihood	205.9234
Akaike information criterion	-9.785442
Schwarz criterion	-8.923555

Appendix three: Impulse Response

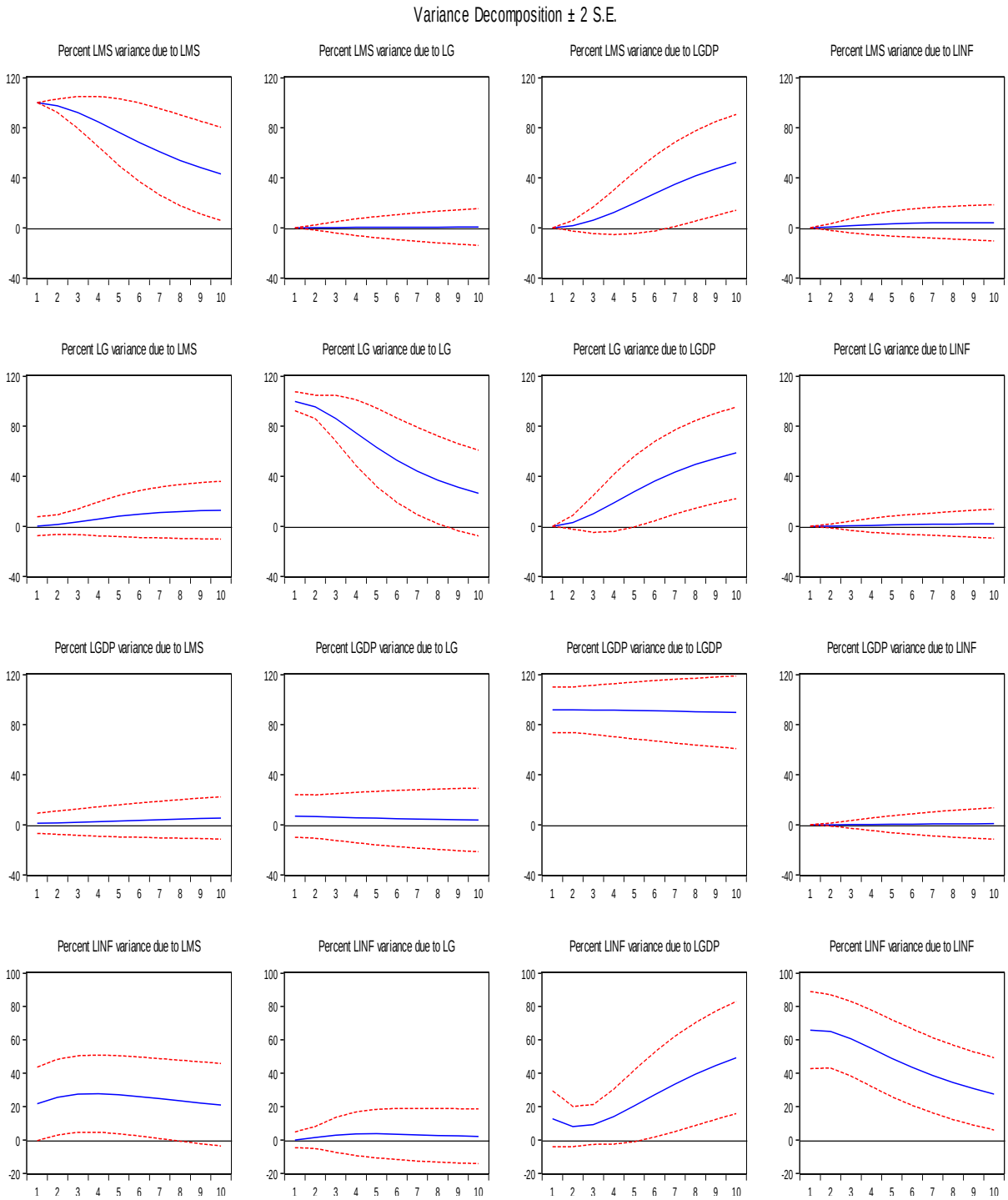


Appendix four: Variance decomposition

Ordering Ms G GDP INF



Ordering G Ms GDP INF



Appendix five: VEC estimation

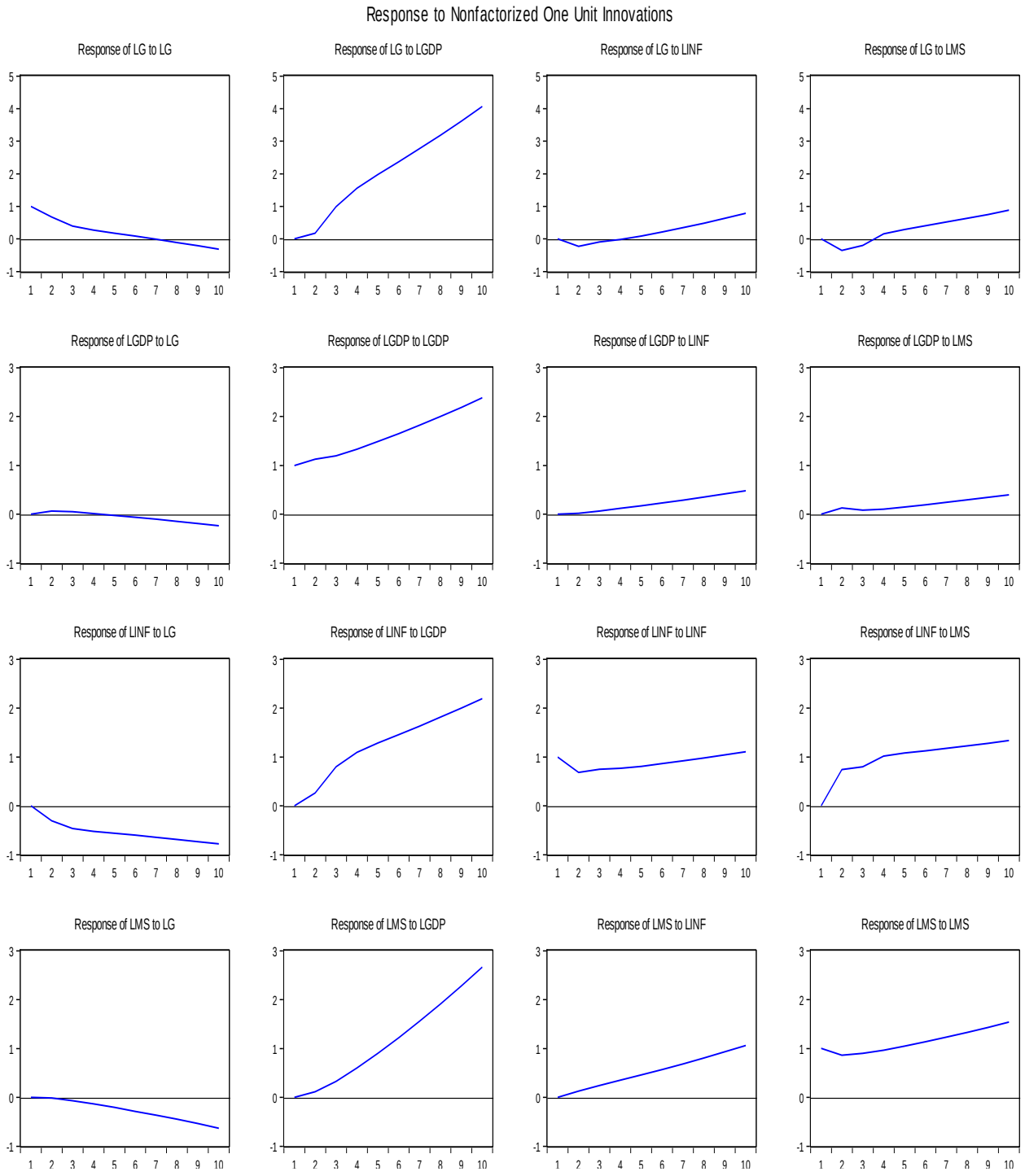
Vector Error Correction Estimates
Date: 04/08/14 Time: 22:56
Sample (adjusted): 1977 2013
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2
LG(-1)	1.000000	0.000000
LGDP(-1)	0.000000	1.000000
LINF(-1)	2.506301	1.274487
	(0.47963)	(0.26960)
	[5.22545]	[4.72726]
LMS(-1)	-1.941473	-0.814915
	(0.24828)	(0.13956)
	[-7.81977]	[-5.83928]
C	14.61900	-10.76187

Error Correction:	D(LG)	D(LGDP)	D(LINF)	D(LMS)
CointEq1	-0.475245	0.006410	-0.366172	-0.027178
	(0.12396)	(0.06271)	(0.11945)	(0.04903)
	[-3.83381]	[0.10222]	[-3.06545]	[-0.55428]
CointEq2	0.958988	0.024842	0.556917	0.184278
	(0.22107)	(0.11184)	(0.21303)	(0.08745)
	[4.33792]	[0.22211]	[2.61429]	[2.10735]
D(LG(-1))	0.145717	0.058263	0.060051	0.012799
	(0.17054)	(0.08628)	(0.16434)	(0.06746)
	[0.85443]	[0.67527]	[0.36541]	[0.18973]
D(LGDP(-1))	-0.789012	0.099238	-0.295002	-0.071167
	(0.47084)	(0.23821)	(0.45371)	(0.18624)
	[-1.67574]	[0.41660]	[-0.65020]	[-0.38212]
D(LINF(-1))	-0.264319	-0.030503	-0.111014	-0.036652
	(0.20767)	(0.10506)	(0.20011)	(0.08214)
	[-1.27278]	[-0.29033]	[-0.55475]	[-0.44618]
D(LMS(-1))	-0.489555	0.159152	0.486609	-0.042816
	(0.46466)	(0.23508)	(0.44775)	(0.18380)
	[-1.05358]	[0.67701]	[1.08678]	[-0.23295]
C	0.238652	0.015476	0.030988	0.148726
	(0.06885)	(0.03483)	(0.06635)	(0.02724)
	[3.46601]	[0.44428]	[0.46703]	[5.46067]
R-squared	0.418001	0.202532	0.327007	0.572436
Adj. R-squared	0.301601	0.043038	0.192409	0.486923
Sum sq. resids	0.368294	0.094265	0.341981	0.057624
S.E. equation	0.110799	0.056055	0.106768	0.043827
F-statistic	3.591074	1.269841	2.429503	6.694161
Log likelihood	32.78044	57.99161	34.15178	67.09677
Akaike AIC	-1.393537	-2.756303	-1.467664	-3.248474
Schwarz SC	-1.088769	-2.451535	-1.162895	-2.943706
Mean dependent	0.131584	0.046707	0.082967	0.138081
S.D. dependent	0.132582	0.057302	0.118808	0.061186

Determinant resid covariance (dof adj.)	3.85E-10
Determinant resid covariance	1.66E-10
Log likelihood	206.5715
Akaike information criterion	-9.220083
Schwarz criterion	-7.652703

Appendix six: Impulse Response from VEC



DECLARATION

I, the undersigned, declare that this is my original work and has not been presented for a degree in any other university and that all sources of materials used for the project have been duly acknowledged.

Declared by

Name: ……

Signature: …….

Date: ……..

Confirmed by Advisor

Name: ……

Signature: …….

Date: ……..