ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

MONETARY POLICY AND EXCHANGE RATE SHOCK ON ETHIOPIAN TRADE BALANCE: USING SVAR APPROACH

BY: CHALACHEW ABINET

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A Project Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Applied Economic Modeling and Forecasting (Financial Policy Analysis and Planning)

JUNE, 2014

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This is to certify that the project prepared by Chalachew Abinet, entitled: Monetary Policy and Exchange Rate shock on Ethiopian Trade Balance: using structural VAR and submitted in Partial Fulfillment of the Requirements for the Degree of Master of Arts 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.

Approved by:

Syed Hasan (PHD)	_______________	_______________
Advisor	Signature	Date

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	Confirmed by Advisor
Name: Chalachew Abinet	Name: Syed Hasan (PHD)
Signature: …………………	Signature: ………………
Date: ………………………	Date: …………………………

Abstract

Monetary Policy and Exchange Rate Shock on Ethiopian Trade Balance: Using SVAR Approach

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Addis Ababa University, June 2014

This paper investigates monetary and exchange rate policy shock on Ethiopian trade balance. Trade balance is the most important macroeconomic variable in every country due to its importance for economic growth and it is affected by monetary and exchange rate policy. To accomplish this study the researcher used Structural Vector Autoregressive model. The time series data included for the study was quarterly data starting from quarter on 1997/98 to quarter four 2012/13. The variables included under study was trade balance which is expressed as a ratio of export to import, consumption gap(foreign- domestic), consumer price index gap(foreign- domestic), reserve money and real effective exchange rate. Stationarity of time series data was tested using ADF test. To select the best lag length information criteria BIC and AIC and others were used lag two was selected as the best lag length. Johansen cointegration test was used to test the existence of long run relationship among variables. SVAR restriction approach based on theory was applied to analyze these variables. The impulse response result shows that exchange rate appreciation improves the trade balance in the short run and deteriorates in the long run which supports the J curve effect. But expansionary monetary policy does not support the existence of J curve effect rather it has cyclical pattern and it affects the trade balance through expenditure switching effect. The expansionary monetary policy dominates the exchange rate effect on explaining the Ethiopian trade balance fluctuation.

Acknowledgment

A major research project like this is never the work of anyone alone. The contributions of many different people, in their different ways, have made this possible. I would like to extend my appreciation especially to the following. First and foremost I would like to address my great thanks to the almighty God with his mother St.Mary for the wisdom and perseverance that they have been bestowed upon me during this research project, and indeed throughout my life. My great gratitude also addressed to my advisor Dr. Syed Hasan, for his helpful suggestions and committed follow ups for the success of this project, without him this paper would not be what it is now. My sincere thanks also go to my families and friends for their great contribution starting from the beginning to the end of my success. I want also to thank my senior students for their great contribution for the last one and half year. Last but not least want to thank director and colleagues at National Bank of Ethiopia for their encouragement, tolerance and professionalism while I was studying.

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ACRONYM

ADF- Augmented Dickey Fuller

AIC- Akaike Information Criteria

C-Consumption

CPI-Consumer Price Index

FPE- Final Prediction Error

HQ- Hannan- Quinn information criteria

M0- Reserve money

NBE- National Bank of Ethiopia

REER - Real Effective Exchange Rate

SC- Schwarz Information Criteria

SVAR- Structural Vector Autoregressive

VMA-Vector Moving Average

XM- Export value to Import value ratio

CHAPTER ONE

1.INTRODUCTION

1.1. Background of The Study

Monetary policy affects the trade balance either through contractionary or expansionary policy. Through contractionary monetary policy decrease growth rate of money supply increases interest rate, in turn increase interest rate causes exchange rate appreciation. This leads increase imports and decrease exports which worsens the trade balance on the other hand for the expansionary monetary policy increase growth rate of money supply decreases interest rate and the country's currency weakens, following this the currency will depreciate as compared to foreign currency this improves the trade balance because export goods and services are cheaper for foreigners and they consume more these cheep goods and services.

There are theoretical hypothesis linking monetary policy to both exchange rate and trade balance in open economies Ivrendi and Guloglu (2010). The first hypothesis suggested by Dornbush is that contractionary monetary policy affects the trade balance either through expenditure switching or income channel. In the expenditure switching channel approach contractionary monetary policy shock leads appreciation through capital inflow which worsens the trade balance while the income effect shrinks real income and real import which improves trade balance. These two effects operate simultaneously and if the income effect dominates the expenditure switching channel the trade balance improve and vice versa. Appreciation/depreciation of exchange rate as compared to other currencies deteriorates/improve the trade balance in the long run, but might improve/deteriorate in the short run generating a j curve.

The j curve hypothesis emphasizes on that currency depreciation due to expansionary monetary policy leads an increase export volume (volume effect) and decrease export price and increase the import price (value effect). If the volume effect is weaker than the value effect then the trade balance moves towards a deficit, If the volume effect is stronger than the value effect then the trade balance moves to surplus. The j curve hypothesis emphasizes that the volume effect weaker than the value effect in the short run and stronger in the long run. This implies at least theoretically the effect of contractionary monetary policy on the trade balance gives the impression a J curve that initially causes trade surplus and then leads trade deficit in the long run and the reverse is true for contractionary monetary policy.

J curve effect states that a country's current account worsens after real currency depreciation of domestic currency and improves with some lags this due to the reason that the value effect is stronger than the volume effect in the short run. The theoretical basis of the J curve effect comes in part from Alfred Marshall learner condition states that if initially the balance of trade is zero and supply elasticties are infinite and then the absolute value of export and import demand elasticities have to be at least large enough to add up to unity to have and exchange rate devaluation/depreciation bring about the surplus in trade balance over time.

There are basically three targets in a monetary management frame work. The first is final target in the case of Ethiopia maintains exchange rate and price stability and support sustainable economic growth is the final target. In achieving this objective National Bank of Ethiopia (NBE) uses money supply as an intermediate target but this intermediate target is not controlled by central bank. Therefore, the NBE uses the operational target which is an economic variable that the central bank wants to influence on a day to day basis through monetary policy instruments. The growth of base money/reserve money which is expressed as the sum of currency in circulation and deposit at NBE is being used as an operational target of the NBE. The practice of targeting reserve money is based on the assumption that there is a stable money demand function in the economy. If the money demand is unstable the NBE shift to other workable targeting frame work like interest rate or other multiple indicator approach.

The main cause of current account deficit for Ethiopia is the merchandize trade deficit. This is because there is little significance change on export as compared to import to balance the two. There are two approaches to overcome the trade balance deficit that is the internal and external approach. The internal approach relies on supply side polices such as decreasing tax and alternatively the external approach is devaluation/appreciation of the currency.

The long run and short run response of trade balance on exchange rate shock is important to economic policy makers due to several reasons first it is important to know there is long run relationship between trade balance and exchange rate. If there exist depreciation is important and provides information regarding the immediate and medium term impact of exchange rate on the trade balance.

In this paper I had construct SVAR model which are currently important to see the shocks of one variable on other variable. In this paper I had seen the impact of monetary policy and exchange rate shock effect on Ethiopian trade balance. The analysis was done on small open Ethiopian economy and the concern was how monetary policy shock (expansionary monetary policy) affects the trade balance and how the exchange rate appreciation affects the trade balance.

1.2. Statement of The Problem

Trade balance is the most important macroeconomic variable in every country due to its importance for economic growth. Knowing this the effects of other macroeconomic variables shock on it is more important for development. Therefore, policy makers are interested on trade balance whether the countries trade balance is deficit or surplus and how to improve the deficit since it is one component of measuring economic growth.

Trade balance response to monetary and exchange rate that the contractionary monetary policy/ appreciation of exchange rate improves the trade balance in the short run and deteriorates in the long run and expansionary/depreciation exchange rate deteriorates the trade balance in the short run and followed by improving it in the long run which found evidence of J curve (Koray and Mc Millian (1999)). Based on this the researcher had answer that those questions that is does the monetary and exchange rate policy shock support the J curve effect or not in the case of Ethiopia.

Contractionary monetary policy affects the trade balance either through expenditure switching or income approaches depending which approach controls. Money literatures Ncube Mthuli and Ndou Eliphas (2013), Soyoung Kim (2001) and others found that contractionary monetary policy affects the trade balance through expenditure switching channel rather than income channel.

Therefore, it is also important to know the effect of exchange rate appreciation and contractionary monetary policy shock on Ethiopian trade balance. Even though, this is important there is no research findings which supports how these policy variables affect Ethiopian trade balance. These raises the following questions, does expansionary monetary policy improve or deteriorate the Ethiopian trade balance? Does exchange rate appreciation improve or deteriorate the Ethiopian trade balance? Is there any evidence that support J curve effect on both monetary and exchange rate shock? There is also no evidence that supports whether exchange rate or monetary policy shock highly affects Ethiopian trade balance. These questions are an indication of a research gap that is not filled on the impact of monetary and exchange rate policy shock on Ethiopian trade balance. All this questions and research gaps initiate the researcher to do this paper monetary and exchange rate shock on Ethiopian trade balance to answer all those questions and fill the research gaps by investigating in detail.

1.3. Objective of The Study

The general objective of this study was to identify the effect of monetary policy and exchange rate shock on Ethiopian trade balance, while the specific objectives are:

- To identify the effects of expansionary monetary policy on Ethiopian trade balance whether it is negative or positive?
- To identify the effect of exchange rate shocks (appreciation) on the Ethiopian trade balance.

- To identify whether the monetary policy and exchange rate shock supports the J curve effect or not.
- To identify how monetary policy affects the trade balance whether it is through income effect or expenditure effect.
- To identify whether monetary policy or exchange rate effect highly affects the Ethiopian trade balance.

1.4. Significance of The Study

The main significance of this paper will be used by policy makers to identify whether expansionary monetary policies have negative or positive impact on Ethiopian trade balance if there exist is it through expenditure or income channel and enables them to use expansionary monetary policy if it has positive impact. The study will be used to know that the exchange rate and monetary policy shock effect on Ethiopian trade balance supports the J curve effect or not and allows policy makers cure the J curve effect if there exists in short run when they want to overcome trade balance deficit before taking any of expansionary monetary or exchange rate depreciation policy measures. The study will helps to know that whether the exchange rate shock have negative or positive impact on Ethiopian trade balance. This study helps to identify whether monetary policy or exchange rate policy highly affects the Ethiopian trade balance and finally it will be used by academicians and researchers as a literature for further study on monetary and exchange rate shock on Ethiopian trade balance.

1.5. Organization of The Paper

This paper is organized in a manner that including six sections the first chapters discuss about the introduction part as discussed above. The second section of the paper presents Ethiopian monetary policy, exchange rate and merchandize trade frame work. The third section is about theoretical and empirical literatures that have done by other researchers. The fourth section is about methodology how to conduct the study what procedures the researcher follows to achieve the study. The fifth chapter is all about empirical results which answer all questions raised at the statement of the problem and the objective of the study stated under section one. The final and sixth section was the conclusion and recommendation part which summarizes what we follow and found on the full research paper and provides recommendations for policy makers.

CHAPTER TWO

2. MONETARY POLICY, EXCHANGE RATE AND MERCHANDIZE TRADE

2.1. Ethiopian Monetary Policy Frame Work

The principal objective of National Bank of Ethiopia is to maintain price and exchange rate stability and support sustainable economic growth. Monetary policy strategy of the central bank depends on a number of factors and it is a contextual to the country. A good policy strategy depends on the macroeconomic and institutional structure of the economy. Generally with in a country monetary management frame work there are basically three targets final target, intermediate target and operational target.

The final target of monetary policy in Ethiopia is to maintain price and exchange rate stability and support sustainable economic growth. To achieve this final target the NBE sets money supply as intermediate target which is not directly controlled by the central bank. Money supply is defined as from its narrow and broader sense. Narrow money (M1) is a measure of money stock intended primarily for use in transaction, while Broad money is a measure of domestic money supply that includes M1, quasi money (time and saving deposit), overnight repurchase agreements and personal balance in money market accounts. Basically M2 includes money that can be used for spending limit plus that can be easily converted to M1.NBE takes the broader definition of money or M2 as a money supply and its current target is to ensure that the money supply growth is in line with nominal GDP growth rate.

While the operational target is an economic variable in which the central bank influences on day to day activities through its monetary policy instruments. The operational target of the National Bank of Ethiopia is the growth of base money/reserve money which is defined as the sum of currency in circulation and deposits of commercial banks at the NBE. The practice reserve money is based on the assumption that there will stable money demand function in the economy. If money happens to be unstable over the medium and long term the NBE will target as operational targeting framework other workable frame work like interest rate targeting or multiple indicator approach.

There are a wide range of monetary instruments by central banks engenders competition, efficiency, transparency and broadens financial intermediation in banking system. The use of monetary policy instruments has been extremely limited in Ethiopia due to the underdevelopment of the money market and the virtual non existence of a financial market. The National Bank of Ethiopia uses diversified monetary policy instruments so as to effectively carry out the monetary management function.

Open market operation (saving and purchase of bonds or securities issued by governments) has been used by countries as one of the main instruments for the development of the money markets. Trading in these instruments liquefies the financial system in particular and national economy intermediation among market participants. The National Bank of Ethiopia uses open market operations (sales and purchase of government securities) as one of monetary policy instruments.

A standing central bank of credit facility is another instrument used to enhance the financial capacity of commercial banks and promote financial intermediation and efficiency. The key advantages of such standing credit facility are transparency and predictability of accessing central banks resource to cover short term needs.

2.2. Ethiopian Exchange Rate Policy and Regime

Maintaining exchange rate stability in Ethiopia is considered as the principal objective of National Bank of Ethiopia so as to be competitive in international trade and to use exchange rate intervention as policy tools for monetary policy to affect both foreign reserve and domestic money supply.

The exchange rate regime is the way the country manages its currency in respect to foreign currencies and the foreign exchange market. There are various types of exchange rate regimes practiced by countries the main types are floating, managed floating and fixed exchange rate regimes.

The choice of exchange rate regime is determined by various factors such as the objectives pursued by policy makers, the sources of shocks hitting the economy and the structural characteristics of the economy. Once the choice is made, the authorities are presumed to adjust their macroeconomic policies (especially fiscal and monetary policies) to fit the exchange rate policies considering the underlining economic situation of the country Ethiopia practiced managed floating exchange rate since 1992.

2.3. Ethiopian Trade Balance and Merchandise Trade

The trade balance of a country is defined as the difference between the monetary value of it exports and imports over a certain period of time. A trade balance can be positive or negative. A trade balance can be positive (trade surplus) if the monetary value of a country’s export is greater than its imports and negative (trade deficit) if the monetary value of its imports greater than its exports.

The Ethiopian trade balance is always negative or deficit. This means that Ethiopian imports exceed its exports or unable to cover its import bills. The reasons to such a deficit trade balance are its level of development, policies and strategies in the country.

The Ethiopian merchandise trade deficit was narrowed by 12.1 percent during year 2010/11. This is due to a strong rise in merchandise export by 37.1 percent. There was a slight contraction on total Ethiopian import by 0.2 percent as compared to the year 2009/10. While the Ethiopian merchandise trade during 2011/12 was widened by 42.8 percent which accounts USD 7.9 billion relative to the fiscal year 2010/11 mainly due to high growth rate of total import as compared to the growth rate of total exports this was the reverse that was happened in the 2010/11.

The Ethiopian merchandise trade during the fourth quarter of 2012/13 stood at USD 1.8 billion which narrowed by 0.7 percent compared to the fourth quarter of 2011/12. As compared to the fourth quarter of 2011/12 to the same quarter of 2012/13 the total merchandise export and import went down by 13.9 percent and 5.3 percent respectively.

The merchandise trade deficit in the first quarter of 2013/14 amounted to birr 2.3 billion which was 25.6 percent and 12.9 percent higher than that of quarter four 2012/13 and quarter one 2012/13 respectively. The reason that for widened the trade deficit was due to both an increase in total import a reduction in total export during the period.

CHAPTER THREE

3. LITERATURE REVIEW

The goal of this work is to provide prescription for the monetary and exchange rate shock on Ethiopian trade balance in particular what is the effect of monetary and exchange rate shock on Ethiopian trade balance is it negative or positive. We can measure the exchange rate shock effect on the trade balance by using the direct (by estimating import and export demand elasticity) method or using the indirect method which is by estimating the dynamic reaction of trade balance to real exchange rate depreciation. But for this study the indirect method is used by estimating the dynamic reaction of the trade balance for a shock of real exchange rate depreciation. There are many empirical findings on the impact of exchange rate shock on trade balance, but regarding to the impact hybrid monetary policy and exchange rate shock on trade balance there is gaps and only little literature exists which are presented in section 3.2 after describing theoretical literature in section 3.1.

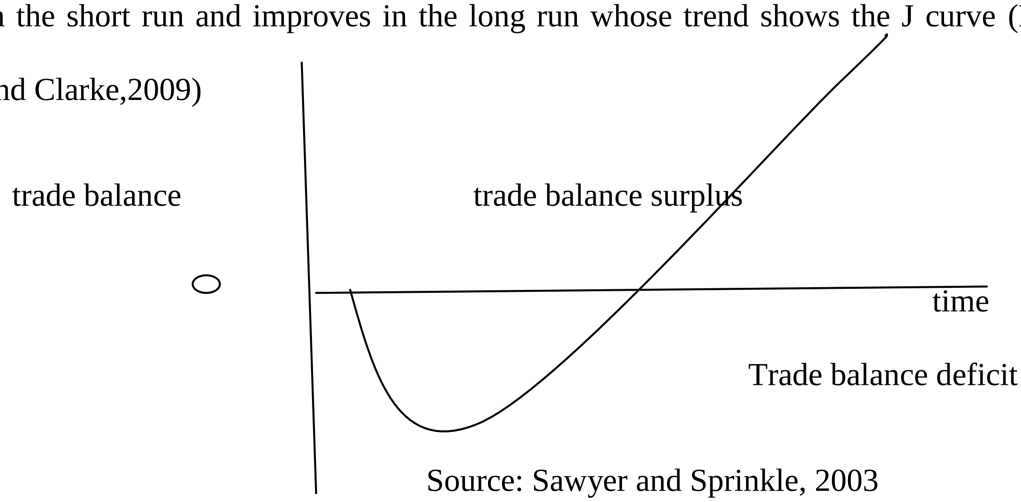
3.1. Theoretical Literature Reviews

When we analyze monetary policy it must be based on the assumption that the central bank influences the economy either by controlling money supply or interest rate. Whatever, the monetary policy instrument is used whether interest rate or money supply both are equally important. But the choice between the money supply or interest rate or the combination of the two as a monetary policy instrument depends on the countries current situation and monetary policy framework. Some countries use interest rate others use money supply and also there are countries which are used the combination of the two based on the countries current situation (Mankiw, 2002).

Central banks use money supply as a monetary policy instrument either by using contractionary monetary policy or expansionary monetary policy. Contractionary monetary policy (decreasing growth rate of money supply) increases interest rates which encourages foreign financial investment and strengthen the international value of domestic currency. The effect is increases imports and decrease exports which worsen the trade balance towards deficit while expansionary monetary policy (increasing the growth rate of money supply) decreases interest rate which discourages foreign financial investment in the domestic economy rather encourages towards investment of abroad which weakens the international value of domestic currency. The effect of this is it decreases imports and increases exports which moves the trade balance towards surplus (Sawyer and Sprinkle, 2003)

A reduction in value of nations currency need not immediately improves its balance of trade in intuitive terms. If domestic currency devalue/ depreciate the cost of foreign goods increase relative to the cost of domestic goods. There will a quantity effect because domestic consumers buy less foreign goods (imports) while foreign consumers buy more of domestic goods (exports). The net effect on the trade balance is positive or negative it depends on which the value effect or volume effect dominates. If the volume effect dominates the value effect marshal learner condition is met which states that devaluation/depreciation improves the trade balance marshal and learner statement says that countries currency devaluation/depreciation improves the trade balance and promotes development, if the import and export demand elasticities are greater than unity in absolute value. But the marshal learner condition may not hold in the short run and the long run there may be paradox that is devaluation may worsen the trade balance in short run and improve in the long run because import and export elasticities are less than one (in elastic) in the short run and greater than unity (elastic) in the long run which is called the J[1]-curve effect (Sawyer and Sprinkle, 2003).

The J- curve effect is the term used to describe the impact of currency appreciation or contractionary monetary on a countries trade balance. The theoretical basis of the J curve effect comes in part from Alfred Marshal and Abba learner which marshal learner condition states that if the elasticities of import and export demand is greater than unity exchange rate depreciation improves the trade balance since elasticities are small in the short run does not met M-L condition but in the long run it holds. Applying this theory using simple observation the effect of devaluation over time, economists have developed a J curve hypothesis which states that currency depreciation deteriorates the trade balance in the short run and improves in the long run whose trend shows the J curve (Kulkarni and Clarke,2009)



Source: Sawyer and Sprinkle, 2003

Fig 3.1 J curve

[1] The original work on the J curve is in Stephen Magee, currency contracts, pass through and devaluation ,1973, booking papers on economic activity

The J curve illustrates that the effect of currency depreciation on trade balance which is initially at equilibrium is it moves towards deficit and then it improves after certain periods of time.

3.2. Empirical Literature Review

Fail Koray and W. Douglas McMillin (1999) studied on the response of exchange rate and trade balance on monetary policy innovation in the case of USA by using Vector Autoregressive model. Fail Koray and W. Douglas McMillin uses non borrowed reserve and interest rate as monetary policy variable when studying the impact of monetary policy shock on exchange rate and trade balance. They found that initial improvement in the trade balance due to appreciation of exchange rate by following deterioration of the trade balance supports the J curve hypothesis. Fail Koray and W. Douglas McMillin Also found that contractionary monetary policy causes transitory appreciation of real and nominal exchange rate and these temporary improves the trade balance and then follows deterioration of the trade balance which supports the J curve hypothesis.

Batbayer Buyangerl and Joong Kim(2013) had studies the effect of macroeconomic shocks on exchange rate and trade balance in Korea by using Structural Vector Error Correction model and found that contractionary monetary policy causes the exchange rate appreciate this worsens the trade balance. The reaction of the trade balance on contractionary monetary policy depends on the magnitude of expenditure switching and income channel in their study the expenditure switching channel dominates the income channel these leads contractionary monetary policy shock deteriorates trade balance. Buyangeres and Kim also found little evidence of J curve effect that exchange rate appreciation shock leads to a small improvement in trade balance in short run and deteriorates in the long run.

EL Sayed Mettwally Abd-EL-Kader (2013) analyzed the existence of J curve effect for Egypt economy by using ARDL model. Abd-EL-Kader uses trade balance, Egypt income and foreign income of the trading partner and test the stationarity of those observation some were stationary at I(0) and others were stationary at I(1) by using this data Abd-EL-Kader result was consistent to Marshall Lerner condition, depreciation of exchange rate deteriorates the trade balance in the short run and improves in the long run. This result shows the existence of J curve effect on Egypt economy is that Egypt can use exchange rate policy (depreciation the exchange rate) to increase its competitiveness on the export.

Ivrendi and Yildirim (2013) analyzed the effects of monetary policy shock on fast growing emerging countries (BRICS-T) using a structural VAR. they found contractionary monetary policy shock have negatively significant effects on exports in Russia, China and Brazil consistent with theoretical expectations but have positive and insignificant effect on South Africa, Turkey and India with the exception of china and South Africa (which is negative and insignificant). Contractionary monetary policy has positive and significant in all BRICS-T countries. Ivrendi and Yildirim also found that the inverse J curve effect for five countries out of six countries.

Soyoung Kim (2001) studied the effect of monetary policy shock on the trade balance in small open European countries by using VAR model. Kim found the evidence of the expenditure switching effect that is a monetary expansion leads exchange rate switching effect seems to dominate the income absorption effect. The impulse responses are consistent with the expenditure switching effect that is monetary expansionary monetary leads exchange rate depreciation and improves the trade balance. Kim found that there was little evidence on J curve effect which states expansionary monetary policy leads deterioration of terms of trade in the short run and improves in the long run.

Mthuli Ncube and Eliphas Nudou (2013) studied the monetary and exchange rate shock on South African trade balance by using structural vector autoregressive model specifically using the two recursive and sign restriction SVAR models. To accomplish the study they use interest rate as monetary policy variable other variables. They found that the real effect of exchange rate appreciation and contractionary monetary policy worsens the trade balance as a percentage of GDP in the long run periods. The shock of exchange rate on trade balance was greater than contractionary monetary policy shocks. The contractionary monetary policy operates in the expenditure switching channel rather than income channel in the short run that deteriorates the trade balance.

Pavle Petrovic and Mirjana Gligoric (2010) had studied Exchange Rate shock on trade Balance in Serbia using cointegration and autoregressive distributed lag model, impulse response function and ECM. Petrovic and Gligoric found that the depreciation of the exchange rate deteriorates the Serbian trade balance in the short run and improves in the long run in all methods. Therefore, this short run deterioration of trade balance is the value effect and improving in the long run is the volume effect which supports the J curve hypothesis.

Pham Thi and Yuyet Trinh (2012) studied the long run and short run exchange rate shock on trade balance in Vietnam using autoregressive distributed lag model and Error

Correction Model (ECM) and found that depreciation of domestic currency initially deteriorates the trade balance and after four quarters it improves the trade balance. This finding supports the J curve hypothesis, which states that real exchange rate depreciation deteriorates the trade balance in the short run and improves in the long after four periods lag.

Akonji et al (2013) analyzed the dynamics of the trade balance for exchange rate shock and the existence of J curve on Nigerian economy by using VAR. Akonji found that there exists a J curve effect in the short run but little effect in the long run. Finally they recommend that the policy makers can use currency depreciation to improve Nigerian trade balance by diversified the exports in addition to petroleum increase sources of foreign exchange.

Samson Kwalingana et al (2012) studied the short-run and long-run trade balance response to exchange rate changes in Malawi using the model was estimated using the multivariate cointegration framework proposed by Johansen (1988). Samson Kwalingana et al found that the impact of real exchange rate depreciation in the long run is not significant to change the pattern of trade balance. Rather they found that there was evidence that the exchange rate shock on Malawian trade balance support the J curve in the short run and medium term. They found that instead of the exchange rate depreciation (external shock) domestic income (domestic shock) highly affects the trade balance in the long run.

Tihomir Stucka (2003) studied on The Impact of permanent Exchange Rate Changes on Croatia's trade balance using ARDL and found that the exchange rate depreciation improves the Croatia's trade deficit in the long run but deteriorates in the short run. This effect supports the J curve hypothesis which states exchange rate depreciation deteriorates the trade balance in the short run and improves in the long run. Finally Stucka recommends further study on the impact of permanent exchange rate changes on the merchandise trade balance in Croatia using extension models like VAR and VECM to take in to full account the result.

Elif Akbostanci (2002) had studied the dynamics of trade balance using Vector Error Correction model and general impulse response. Akbostanci had used general impulse response to solve the problem of ordering of cholesky decomposition in which the order of variables are critical for good investigation based on theory. Akbostanci found on his study by using general impulse response that for one standard deviation real exchange rate shock improves the trade balance which shows a cyclical pattern (S shape) rather than J curve by using quarterly data. Akbostanci also found by using vector error correction model the same result which shows a cyclical pattern the depreciation of real exchange rate improves the trade balance, which worsens the trade balance (by appreciating the exchange rate) and then improves the trade balance by depreciating the real exchange rate which does not support the J curve effect hypothesis rather it shows a cyclical pattern like S shape.

Ng Yuen Ling et al (2008) studied on the relationship between real effective exchange rate and trade balance on Malaysia using VECM and an impulse response function analysis. They found that by using VECM the relationship between real exchange rate and trade balance support marshal learner condition which states that depreciation improves the trade balance(when the sum of import and export elasticities greater than unity). However, VECM analysis does not find the J curve effect which states that depreciations worsens the trade balance and improves in the long run. They also find the same result by using impulse response analysis.

Ericben Kamoto (2006) had studied the J curve effect on the trade balance to shocks in exchange rate on Malawi and South Africa by using Vector Error Correction Model and general impulse response. Based on the VECM the finding that was obtained was suggesting the existence of long run equilibrium relationship among the exchange rate and trade balance on Malawi and South Africa. These positive relationships between the trade balance and real effective exchange rate indicating that real effective exchange rate depreciation will improve the trade balance in the long run. The study found an evidence of J curve in South Africa trade balance however, the Malawi trade balance does not have significant J curve effect. Kamoto's finding on the non existence of J curve effect was supported by Kwalingana et al on their study.

Rehmat Ullah Awan et al (2012) had studied the existence of J curve effect on the Pakistan by using ARDL methodology. For their study they used quarterly data and try to explore the existence of stable relationship between changes in the real exchange rate and trade balance. The main finding of the study was the existence of long run relationship between the real exchange rate and trade balance, statistically significant negative elasticity show that depreciation will lead to deteriorate the trade balance under the managed floating exchange rate. Their finding shows one standard deviation shock on the real exchange rate deteriorates response on trade balance from four time horizons and continues to twenty time horizons which suggest there is no J curve effect on the Pakistan. Finally they concluded that depreciation of exchange rate does not improve the trade balance rather it deteriorates, so in order to improve the trade balance it is better to take in to other policy measures other than depreciation.

Olugbenga Onafowora (2003) studied on the existence of J curve effect due to the effect of exchange rate shock on East Asia by using Vector Error Correction Model and generalized impulse response functions for the three Asian countries Malaysia, Thailand and Indonesia in the their bilateral trade with US and Japan. Onafowora uses quarterly data and dummy variables for the analysis of the existence of J curve effect on the response of trade balance to exchange rate shock. The cointegration analysis for the three countries shows long run relationship between trade balance and exchange rate. Onafowora found that for Indonesia and Malaysia in their bilateral trade with Japan and US and Thailand in its bilateral trade to US the existence of J curve effect which depreciation worsens the trade balance and after four quarter it improves the trade balance. But for Thailand bilateral trade with Japan has an opposite movement that depreciation initially improves the Thailand's trade balance then deteriorates and again it improves which shows cyclical nature and supports S curve rather than J curve.

Colin A.Carter and Daniel H. Pick (1989) had studied on the J curve effect on the U.S. agricultural trade balance by using OLS and quarterly data. They found that depreciation of USA dollar against other currencies deteriorates U.S agricultural trade balance in the short run because the export increase after three quarter for change in currency value (depreciation) while import responds before export, this result deteriorates the trade balance in the short run and improves in the long run, which results a J curve effect on USA agricultural trade balance.

Paul Krugman and Richard E. Baldwin (1987) found that real exchange rate appreciation is not the only cause for persistence trade balance deficit rather the effect of domestic demand and foreign demand has its own effect on trade balance deficit. If the domestic demand is higher it widened the trade balance deficit and if it is low reduces trade balance deficit. But in the case of foreign demand as the demand foreigners increase the trade balance improves and when their demand decrease the trade balance deteriorates in addition the effects of depreciation/appreciation exchange rate.

CHAPTER FOUR

4. DATA AND METHODOLOGY

4.1. Data Source and Variables

The time series data used for this study was quarterly data which are collected starting from 1997/8 quarter one up to 2012/13 quarter four. The sources of these data were National Bank of Ethiopia and Federal Reserve Bank of ST.LOUIS.

The variables that were included in the study were expressed as a vector **Y** where **Y**=(C*-C,CPI*-CPI,M0,REER,XM) the Ethiopian variables are private consumption(C), consumer price index(CPI), real effective exchange rate(REER), which are the same as Mthuli Ncube and Eliphas Ndou (2013), reserve money(M0) which is the same to that of Fail Koray and W. Douglas McMillin (1999) and trade balance which is expressed as a ratio of export to import, which is the same as Ivrendi(2010). M0 was used as monetary policy variable in Ethiopia instead of interest rate by assuming money demand is stable. Whereas other variables used are United States private consumption (C*) which used as a proxy for world consumption expenditure, United States consumer price index (CPI*) which was also used as a proxy for world inflation. The reason that i have control the USA variables is by using Ncube and Ndou (2013) as a bench mark that first the global economy has remained uncertain following the onset of USA 2007 financial crisis and the subsequent global recession in 2008. Secondly an expected decline in US consumption due to recession reduces for foreign goods distorting the foreign trade balance and an expected currency changes. For simplicity I had represent C*-C by cgap and CPI*-CPI by cpigap.

The monetary policy variable which was be used is reserve money which affects broad money through money multiplier which is used as a monetary policy variable by National Bank of Ethiopia by assuming that money demand is stable. If this assumption is failed it is expected to consider other monetary variables like interest and other.

4.2.Methodology

4.2.1. Structural VAR Model

The structural vector autoregressive model originally propounded by Sim (1986) and Bernanke (1986) was used to study the effect of monetary policy and exchange rate shock on Ethiopian trade balance. The general SVAR model for p order is written as follows:

$$C_0 Y_t = B_0 + C_1 Y_{t-1} + C_2 Y_{t-2} + ... + C_p Y_{t-p} + \varepsilon_t$$

Where, B_0 is k×1 of constants and C_i is k×k matrix of coefficients (i=0,1…p) and Y_t is k×1 vector of variables and ε_t is k×1 vector of innovations which are uncorrelated each other, have constant variance and zero mean. But the parameter estimation of the SVAR using OLS may yield inconsistent estimate therefore, to overcome this problem the researcher write the SVAR model to a reduced VAR model form. To obtain the reduced form we multiply both sides by C_0^{-1} we get the following VAR model.

$$Y_t = B_0^* + C_1^* Y_{t-1} + C_2^* Y_{t-2} + ... + C_p^* Y_{t-p} + v_t$$

Where, $B_0^* = B_0 C_0^{-1}$, $C_i^* = C_i C_0^{-1}$ and $v_t = C_0^{-1} \varepsilon_t$

A parametric restriction SVAR model among those many other SVAR models like sign restrictions and others was used. To analyze the SVAR for n endogenous variables we need $\frac{n^2 - n}{2}$.

4.2.2. Unit Root Test

The first thing in analyzing time series data is testing the stationarity of the series whether it is stationary or not that means whether it is time dependent or not. Because In order to generalize for all periods even, for those periods that had not included under study the mean and variance covariance of time series data must be independent of time. Unless the time series data is stationary we can generalize only for those time period those are included in the study but.

There are different methods of testing unit roots for those variables included under study. This study considered Dickey fuller test, Augmented Dickey fuller test among those different test of stationarity.

Dickey Fuller (DF) test is used when the error term is identically and independently distributed. But if there is serial correlation we use Augmented Dickey Fuller (ADF) test which adjusts it by including additional lags.

The hypothesis used to test unit root for all the above tests was stated as follows

H_0= there is unit root (non stationary)

H_1= there is no unit root (stationary)

If the time series data is not stationary at level we make it stationary by differencing up to second order, But if it is not stationary up to second order the time series data is not economically reasonable it is better revise the data. But if the non stationarity is due the existence of trend we make it stationary by detrending (including time period) the time series data (Gujarati, 2004).

4.2.3. Lag Length Selection Criteria

Prior to cointegration test the maximum lag length k was chosen for the VAR model, since choosing appropriate lag length is very important because to small value of K invalidate the tests and to large reduce the power of the test. To select the lag length we use information criteria Akaike information Criterion (AIC), Schwarz criterion (SIC), sequential modified LR test statistic (LR), Hannan-Quinn information criterion (HQ) and Final Prediction Error (FPE).

4.2.4. Cointegration Test

If the time series data is not stationary at level but stationary after first difference which is integrated order one I(1) then there may exist a linear combination of those non stationary variables that became stationary that is integrated of order zero(Engle and Granger (1987) and Johansen(1991, 1995)). To test the cointegration or long run relationship between non stationary variables Johansen cointegration test was used. Before using Johansen first the time series data must be the same order otherwise it is not possible to use Johansen test. Let consider p dimensional vector time series Y_t involving k lags of Y_t

$$Y_{t=}\mu + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} ....+ \beta_k Y_{t-k} + e_t$$

The hypothesis stated here is that

H_0= there is no cointegration (there is no long run relationship)

H_1= there is cointegration (there is long run relationship)

If there are cointegration the researcher proceed to analyze the impact of exchange rate and monetary innovations on Ethiopian trade balance by using SVAR which enable us to interpret the effect of monetary and exchange rate innovations on Ethiopian trade balance to investigate the response employed.

4.2.5. Model Specification

Based on the general SVAR model discussed above the SVAR model for this paper was specified as follows.

The $AY_t = B(L)Y_t + e_t$..................................1

above structural VAR can be written in matrix form as follows.

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} & a_{15} \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} \end{bmatrix} \begin{bmatrix} \mathrm{M0} \\ \mathrm{cgap} \\ \mathrm{cpigap} \\ REER \\ xm \end{bmatrix} = \begin{bmatrix} b_{11}(L) & b_{12}(L) & b_{13}(L) & b_{14}(L) & b_{15}(L) \\ b_{21}(L) & b_{22}(L) & b_{23}(L) & b_{24}(L) & b_{25}(L) \\ b_{31}(L) & b_{32}(L) & b_{33}(L) & b_{34}(L) & b_{35}(L) \\ b_{41}(L) & b_{42}(L) & b_{43}(L) & b_{44}(L) & b_{45}(L) \\ b_{51}(L) & b_{52}(L) & b_{53}(L) & b_{54}(L) & b_{55}(L) \end{bmatrix} \begin{bmatrix} \mathrm{M0} \\ \mathrm{cgap} \\ \mathrm{cpigap} \\ REER \\ xm \end{bmatrix} + \begin{bmatrix} \mathrm{e}^{\mathrm{M0}} \\ e^{\mathrm{cgap}} \\ e^{\mathrm{cpigap}} \\ eREER \\ e^{xm} \end{bmatrix}$$

The structural innovations are 'primitive ' exogenous forces which are not directly observed by econometricians which buffet the system and cause oscillations. They do not have common causes and it is natural to treat SVAR innovations as uncorrelated and the variance-covariance matrix has off diagonals Bernanke (1986). In order to make it convenient and study the response of endogenous variable for a unit change in the structural innovation we normalize variance-covariance matrix of $\sum_e$ to identity matrix by making the $Y_t = C_0 + B(L)^* Y_t + V_t$..................................2

diagonal elements one and the covariance zero. The first task in using SVAR model is that to reduce it in to VAR model. By including intercept C_0 we found the following VAR model for the above SVAR model.

Where $B(L)^* = A^{-1}B(L), V_t = A^{-1}e_t$, $V_t \sim [0, \Sigma_V]$

4.2.6. SVAR Restriction

In order to say the above model was identified the number of unknown parameters must be less than or equal to known parameters.

$e_t = AV_t$, $\sum_e = \mathbf{A}\sum_v \mathbf{A'}$, $\sum_e = \mathbf{A}^{-1}\sum_v \mathbf{A}^{-1}$ Where $\sum_v = \begin{bmatrix} \sigma_{11}^2 & \sigma_{12} & \sigma_{13} & \sigma_{14} & \sigma_{15} \\ \sigma_{21} & \sigma_{22}^2 & \sigma_{23} & \sigma_{24} & \sigma_{25} \\ \sigma_{31} & \sigma_{32} & \sigma_{33}^2 & \sigma_{34} & \sigma_{35} \\ \sigma_{41} & \sigma_{42} & \sigma_{43} & \sigma_{44}^2 & \sigma_{45} \\ \sigma_{51} & \sigma_{52} & \sigma_{53} & \sigma_{54} & \sigma_{55}^2 \end{bmatrix}$

We have $\frac{n(n-1)}{2} + n = \frac{n^2 + n}{2}$ unknown parameters from elements of A diagonal elements are known and equal to one. So unknown parameters in A are while for the structural shocks covariance's are known and equal to zero since variables are uncorrelated to each other. Therefore, the unknown parameters are n.

$e_t \sim [0, \sum_e]$, $E(ee') = \sum_e = \begin{bmatrix} \sigma_{M0}^2 & 0 & 0 & 0 & 0 \\ 0 & \sigma_{cgap}^2 & 0 & 0 & 0 \\ 0 & 0 & \sigma_{cpigap}^2 & 0 & 0 \\ 0 & 0 & 0 & \sigma_{REER}^2 & 0 \\ 0 & 0 & 0 & 0 & \sigma_{xm}^2 \end{bmatrix}$

The total numbers of unknowns are $n^2 - n + n = n^2$. In order to identify the system of we need $n^2 - \frac{n^2 + n}{2} = \frac{n^2 - n}{2}$ restrictions. For this paper we have five variables. Therefore, the number of restrictions required to just identify the system is $\frac{5^2 - 5}{2}$ equals ten restrictions required. If the number of restrictions are greater than ten the model is over identified. The following restrictions are made by using theoretical evidence for the above specified model.

The SVAR short run restrictions all variables have restricted no short run effect on reserve money, while i have restricted that reserve money and trade balance have no short run effect on consumption but the inflation and real effective exchange rate have left unrestricted to the model. Trade balance have restricted that have no short run effect on inflation gap while consumption gap, reserve money and real effective exchange rate left unrestricted to the model. The consumption gap, inflation gap and trade balance have restricted to zero that have no effect on real effective exchange rate while reserve money have effect on exchange rate it is left to the model. Reserve money, consumption gap, inflation gap and real effective exchange rate all have effect on trade balance and left to the model unrestricted.

The restrictions can be written in matrix form or text form. I have written the matrix form representation of SVAR restrictions which summarizes the above theoretical restriction.

$$Av_t = Be_t \quad \Longrightarrow \quad \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & a_{23} & a_{24} & 0 \\ a_{31} & a_{32} & 1 & a_{34} & 0 \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} v_t^{M0} \\ v_t^{cgap} \\ v_t^{cpigap} \\ v_t^{REER} \\ v_t^{xm} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e^{M0} \\ e^{cgap} \\ e^{cpigap} \\ e^{REER} \\ e^{xm} \end{bmatrix}$$

4.2.7. Diagnostics Checking and Stability

After identifying the SVAR model and its restrictions the researcher had used diagnostics tests like Autocorrelation LM Test and portmanteau autocorrelation test which tests whether there is autocorrelation or not on the residuals. Both portmanteau autocorrelation test and Autocorrelation LM test states at null hypothesis that there is no autocorrelation up to lag chosen and there is autocorrelation at the alternative hypothesis to check whether the model will perform well or not. In order to say the model was correctly specified the null hypothesis must be accepted which states that there is no serial correlation.

4.2.8. Impulse Response

A shock on the i^th^ variable not only affects the i^th^ variable rather it affects all endogenous variables through the dynamic (Lag) structure of the VAR. An impulse response traces the effect of one variable shock or innovation on itself and other endogenous variables. In analyzing the impulse response the SVAR model must be first represented by reduced form VAR and then representing the VAR model by Vector Moving Average which is an essential feature of Sims'(1980) methodology. That is the current value of endogenous variables is a function of past and present value of the innovations. The impulse response function derived from VMA traces the path of the response for the i^th^ variable over time following an innovation from the j^th^ variable, while holding all other reduced form innovations constant(Enders,1995).

The VMA representation of the above reduced form of VAR model is written as follows by first writing it in lag operator form:

Equation 3 can be expressed in terms of MA (∞)

$$(I - B(L))Y_t = C_0 + V_t \qquad \text{.......3}$$

$$Y_t = \mu + \theta(L)V_t \qquad \text{.......4}$$

Where $\theta(L) = (I - B(L))^{-1} = \sum_{k=0}^{\infty} \theta_k L^k \qquad \mu = (I - B(L))^{-1} C_0$

From the reduced VAR moving average representation we can write Structural Moving Average (SMA (∞)) by substituting $V_t = A^{-1}e_t$

$$Y_t = \mu + \theta(L)A^{-1}e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5$$

Equation five can be written by assigning as

$$Y_t = \mu + \phi(L)e_t = \mu + e_t + \phi_1 e_{t-1} + \phi_2 e_{t-2} + \ldots\ldots\ldots\ldots\ldots\ldots 6$$

$$\phi(L) = \theta(L)A^{-1} = \sum_{k=0}^{\infty} \phi_k L^k$$

By redating the time t by t+s the above equation six can be written as follows:

$$Y_{t+s} = \mu + e_{t+s} + \phi_1 e_{t+s-1} + \phi_2 e_{t+s-2} + \ldots + \phi_s e_t + \phi_{s+1} e_{t-1} \ldots\ldots\ldots 7$$

4.2.9. Covariance Decomposition

Covariance decomposition is used to aid the interpretation of a SVAR model once it has been fitted. Covariance decomposition indicates that the amount of information each variable explains the fluctuations to itself and other variables in the SVAR. It determines how much forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. In the case of this paper covariance decomposition examines the variability between monetary policy, exchange rate and other shocks in explaining trade balance fluctuations.

Forecast error variance decomposition for this study determine the proportion of the variability of the errors in forecasting M0,cgap,cpigap,REER and xm at time t + s based on information available at time t that is due to variability in the structural shocks e^{M0},e^{cgap},e^{cpigap}, e^{REER} and e^{xm} between times t and t + s.

To derive the forecast error variance decomposition, commence with impulse response representation of the reduced form VAR model for Y_{t+s}.

$$Y_{t+s} = \mu + V_{t+s+} + \theta_1 V_{t+s-1} + ... + \theta_{s-1} V_{t+1} + \theta_s V_t + \theta_{s+1} V_{t-1} ....$$

The best linear forecast of Y_{t+s} based on information available at time t is

$Y_{t+s/t} = \mu + \theta_s V_t + \theta_{s+1} V_{t-1}$.........And the forecast error is written as follows:

$$Y_{t+s} - Y_{t+s/t} = V_{t+s} + \theta_1 V_{t+s-1} + ... + \theta_{s-1} V_{t+1}$$

The forecast error in terms of structural shock is representing by substituting

$$\phi(L) = \theta(L) A^{-1}, \mathrm{V_t} = A^{-1} e_t$$

$$Y_{t+s} - Y_{t+s/t} = \phi_0 e_{t+s} + \phi_1 e_{t+s-1} + ... + \phi_{s-1} e_{t+1}$$

CHAPTER FIVE

5.RESULTS AND DISCUSSION

5.1. Descriptive Statistics

In this section the results of the monetary and exchange rate shock had displayed. The standard deviation used for the shock was one standard deviation. The descriptive statistics for the variables under study presented as follows.

Table 5.1 descriptive statistics

	LREER	LCPIGAP	LCGAP1	LM0	LXM
Mean	4.357076	5.001582	15.96967	7.702317	-1.326230
Median	4.502376	5.024823	16.01872	7.873803	-1.345239
Maximum	4.704994	5.127228	16.26933	8.487636	-0.433582
Minimum	3.738480	4.740090	15.56377	6.554279	-1.996395
Std. Dev.	0.320580	0.102208	0.204412	0.584774	0.312558
Skewness	-0.974968	-1.079709	-0.358489	-0.258172	0.224093
Kurtosis	2.418717	3.615317	1.899408	1.490620	3.175957
Jarque-Bera	11.04038	13.44453	4.600961	6.786233	0.618219
Probability	0.004005	0.001204	0.100211	0.033604	0.734100
Sum	278.8529	320.1013	1022.059	492.9483	-84.87874
Sum Sq. Dev.	6.474623	0.658127	2.632400	21.54355	6.154631
Observations	64	64	64	64	64

Table 5.1 shows that the standard deviation of logarithm real effective exchange rate and reserve money was high as compared to logarithm of consumption gap (foreign-domestic), and logarithm of consumer price index gap (foreign- domestic) and logarithm of trade balance. Trade balance was expressed as a ratio of export to import. The logarithms of all observations except trade balance are negatively skewed.

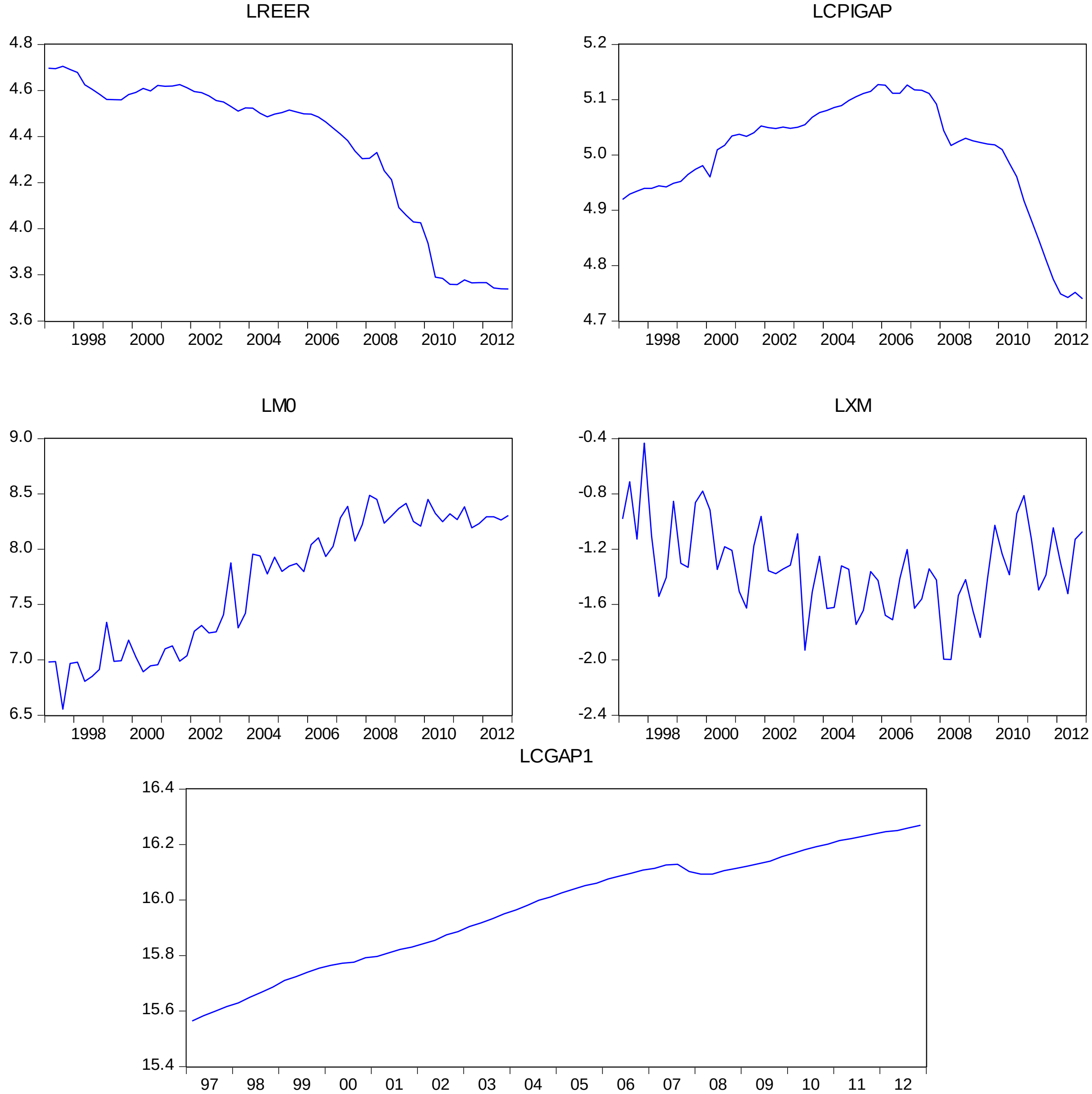


Fig 5.1 trends of logarithmic time series data.

The logarithmic data of real effective exchange rate and consumption gap (foreign-domestic) relatively have similar trend. Trade balance (expressed as a ratio of export to import) and reserve money relatively follows the same trend as compared to other variables. But the consumption gap follows an increasing trend except decline 2008 due to United States recession.

5.2. Stationarity Testing

Stationarity of the time series data are examined at logarithm level with intercept by using ADF and the following result are obtained:

Table 5.2 Unit root test

Variable		ADF statistics	Probability
Lxm	Level	-2.61999	0.0945
	Difference	-11.607	0.0000
Lreer	Level	0.6650	0.9904
	Difference	-5.5034	0.0000
Lm0	Level	-1.3411	0.6050
	Difference	-12.6133	0.0000
Lcpigap	Level	0.2214	0.9719
	Difference	-4.0486	0.0023
Lcgap	Level	-1.9717	0.2983
	Difference	-4.1152	0.0018

The above table 5.2 shows that the time series data for all variables were non stationary at logarithm level with intercept. But it became stationary after first difference of the logarithm level with intercept.

5.3. Lag length selection

As table 5.3 shows the lag length was selected based on lag length selection criteria. Based on Akaike information Criterion (AIC) and Hannan-Quinn information criterion (HQ), sequential modified LR test statistic (LR) and Final prediction error(FPE) lag two was selected but Schwarz criterion (SIC) is better and based on SIC lag one was selected but there was serial correlation at lag one so to beat this problem adding lag length is the best mechanism. It is removed by adding one lag and lag two was the selected which was also supported by AIC and HQ.

Table 5.3 lag length selection results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	158.8768	NA	3.73e-09	-5.216161	-5.040099	-5.147434
1	565.6447	730.8033	8.98e-15	-18.15745	-17.10107*	-17.74508
2	606.9706	67.24217*	5.26e-15*	-18.71087*	-16.77418	-17.95486*
3	626.1752	27.99325	6.72e-15	-18.51442	-15.69742	-17.41477
4	648.3753	28.59665	8.11e-15	-18.41950	-14.72219	-16.97622
5	669.8950	24.07290	1.07e-14	-18.30153	-13.72390	-16.51461

5.4. Cointegration test result

Since the time series data is stationary at the same order integrated of order one the researcher uses Johnson (1991, 1995) cointegration test to test long run relationship. Based on Johansen cointegration test on table 5.4 below we can reject the null hypothesis that there is no cointagration among variables by using both Max-Eigen statistics as well as Trace Statistics. The existence of this cointegration implies there is long run relationship among variables.

Table 5.4 Johansson cointegration test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.395999	63.62778	60.06141	0.0243
At most 1	0.219595	32.87280	40.17493	0.2231
At most 2	0.168550	17.74830	24.27596	0.2658
At most 3	0.087636	6.488673	12.32090	0.3790
At most 4	0.014548	0.893964	4.129906	0.3983

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.395999	30.75498	30.43961	0.0457
At most 1	0.219595	15.12450	24.15921	0.4976
At most 2	0.168550	11.25963	17.79730	0.3619
At most 3	0.087636	5.594709	11.22480	0.3981
At most 4	0.014548	0.893964	4.129906	0.3983

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

5.5. SVAR restrictions

The structural vector autoregressive results are presented on appendix D shows the signs of coefficients are consistent to theoretical relationship among variables. The result also shows that the model is just identified with ten restrictions.

5.6. Diagnostics checking and stability

At selected one lag using SIC there was serial correlation so to overcome this problem one additional lag was added. At lag two both portmanteau autocorrelation test and LM autocorrelation test shows that there is no serial correlation for the VAR model. The other thing is that the VAR model is stable which is measured by using auto regressive roots. The result shows that the roots and modulus lies inside the unit circle which is an indication of stability of the VAR model. Since model is stable and have no serial correlation (see Appendix E) we can analyses impulse response and covariance decomposion to see the effect of monetary and exchange rate shock on Ethiopian trade balance.

5.7. Impulse response result

The column represents one standard deviation shocks and the row shows responses to one standard deviation shock on the column. By using the two lag length the researcher examine the response of Ethiopian trade balance to monetary policy and exchange rate policy shock and other variables included under study.

Fig 5.2 shows that how trade balance responses to the monetary policy, exchange rate shock the full variables shock are presented on appendix F. The most relevant shocks are the real effective exchange rate shock (exchange rate appreciation) and reserve money shock (expansionary monetary policy shock) on Ethiopian trade

The real effective exchange rate shock that is an appreciation of the exchange rate initially up to second quarter improves the trade balance and starting from third quarter it worsens the trade balance which supports the finding of Mthuli Ncube and Eliphas Nudou (2013). The exchange rate appreciation shock shows that cpigap (foreign-domestic) increases which is an indication of decreasing inflation on the domestic economy. Consumption gap (foreign- domestic) also decreases due to exchange rate appreciation which indicates consumption in the domestic economy increase by importing cheap goods abroad. The trade balance improvement in the short run and deterioration in the long run due to exchange rate appreciation is an indication of the existence of J curve effect which is the same result that of Fail Koray and W. Douglas McMillin (1999).

When we see the effect of monetary policy shock or expansionary monetary policy worsens the trade balance up to second quarter and improves from quarter three to four and again it decreases the trade balance and then improves which represents cyclical effect on trade balance. This effect does not support the existence of J curve effect for expansionary monetary policy shock on trade balance. The expansionary monetary policy causes the exchange rate to depreciate in the short run that means expansionary monetary policy depreciates the exchange rate. The dynamic effect of this exchange rate depreciation is that it improves the trade balance.

One standard deviation shock on consumption gap (foreign- domestic) improves the trade balance up to quarter three but have no significance effect after quarter three. The increase of consumption gap increases cpigap which is an indication of inflation in the domestic economy and have no significant effect after quarter three.

The expenditure-switching evidence implies that monetary policy can persuade the shift in the composition of domestic output between domestic goods and imported goods over the identified period. The significant depreciation real effective exchange rate due to expansionary monetary policy implies that trade balance improves which is an indication of expenditure switching effect dominates the income effect. This result supports the result found by Soyoung Kim (2001) that the expansionary monetary policy improves the trade balance through exchange rate depreciation.

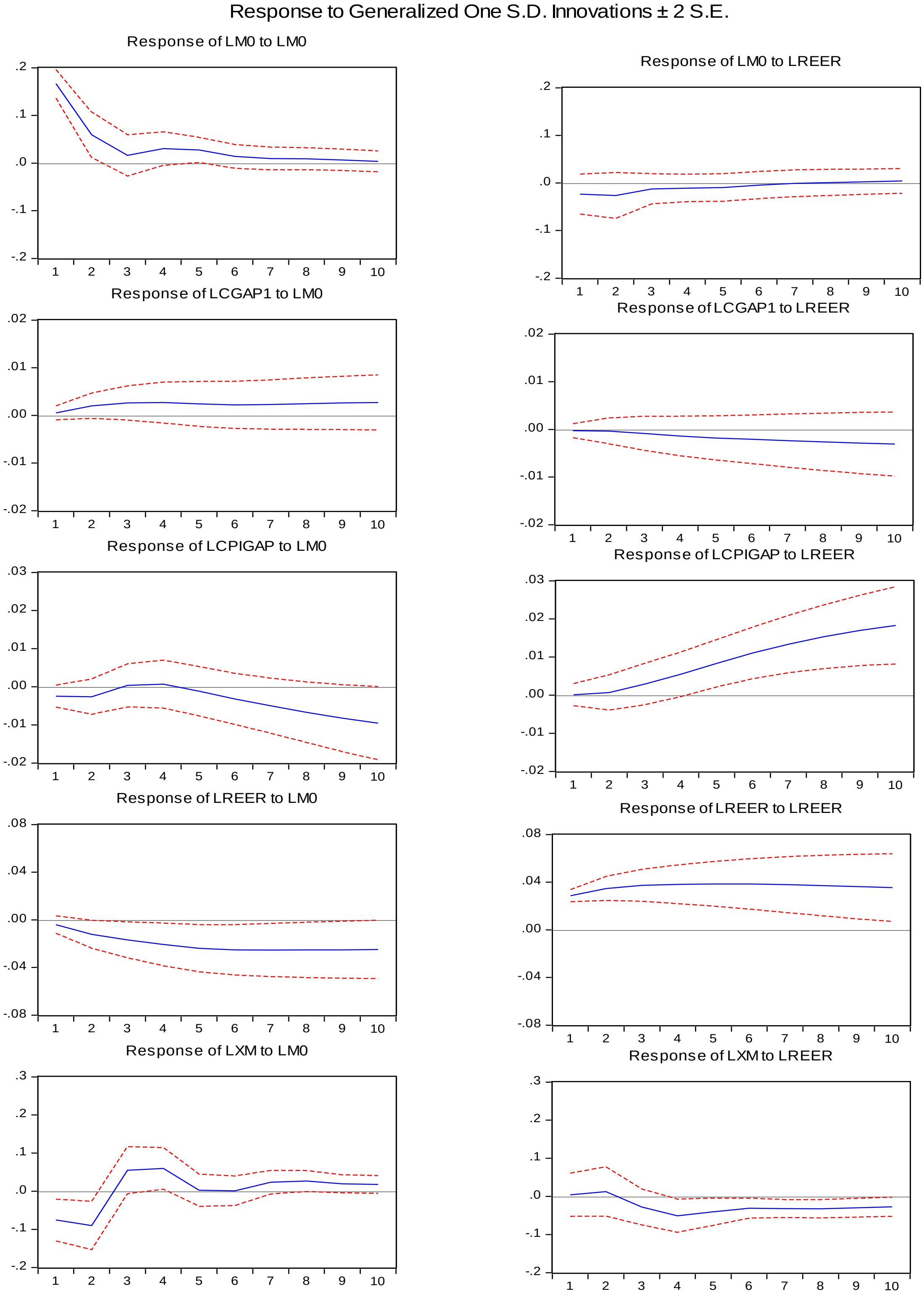


Fig 5.2 trade balance impulse response of one standard deviation shock

5.8. Variance covariance decomposition

Table 5.8 variance covariance decomposition

Variance Decomposition of LXM in percentage:						
Period	**S.E.**	**LM0**	**LCGAP1**	**LCPIGAP**	**LREER**	**LXM**
1	**0.22257**	**11.58293**	**0.21019**	**0.595328**	**0.086118**	**87.52543**
2	**0.244824**	**23.1041**	**2.824013**	**0.516736**	**0.071177**	**73.48398**
3	**0.263751**	**24.26173**	**3.076317**	**0.462685**	**0.654941**	**71.54433**
4	**0.274598**	**27.14961**	**3.069075**	**0.584476**	**3.030718**	**66.16612**
5	**0.279963**	**26.12594**	**3.179386**	**0.891739**	**5.007664**	**64.79527**
6	**0.282378**	**25.6824**	**3.127354**	**1.148013**	**6.147064**	**63.89517**
7	**0.28509**	**25.88432**	**3.068628**	**1.297607**	**7.064058**	**62.68539**
8	**0.28811**	**26.1867**	**3.035223**	**1.41458**	**7.949421**	**61.41408**
9	**0.290485**	**26.20683**	**3.027665**	**1.530612**	**8.720646**	**60.51425**
10	**0.292403**	**26.22434**	**3.014862**	**1.631191**	**9.342994**	**59.78661**
average	**0.272417**	**24.24089**	**2.763271**	**1.007297**	**4.80748**	**67.18106**

Table 5.3 examines the variability of real effective exchange rate, inflation gap, and consumption gap and reserve money explaining trade balance fluctuation. The variability of explaining trade balance fluctuation increases over time for all variables shock except its own effect starting with small value from initial period to higher value as time period increases. The exchange rate shock and monetary policy shock explains more than inflation and consumption gap but less than its own effect. As compared between the two exchange rate shocks and reserve money (expansionary monetary policy) shock on explaining trade balance fluctuation the reserve money shock explains more of Ethiopian trade balance fluctuations.

CHAPTER SIX

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusions

In this paper I had used quarterly data to analyze the effect of monetary and exchange rate policy shock on Ethiopian trade balance. The variables included are consumption gap (foreign-domestic), inflation gap (foreign-domestic), real effective exchange rate, and trade balance and reserve money by applying the SVAR approach with one standard deviation shock. The exchange rate appreciation affects the trade balance of Ethiopia by improving in the short run (up to quarter two) and deteriorates after quarter two. While the effect of expansionary monetary policy is cyclical it deteriorates up to quarter two then improves from three to quarter four and then deteriorates. The expansionary monetary policy explains the Ethiopian trade balance fluctuation highly over long periods as compared to exchange rate shock effect. The exchange rate shock effect evidence supports the existence of J curve effect on Ethiopian trade balance. But the evidence of expansionary monetary policy shock does not support the existence of J curve effect on Ethiopian trade balance rather it shows cyclical pattern (S shape). Since expansionary monetary policy shock affects the exchange rate to depreciate it improves trade balance which indication of monetary affects the trade balance through an expenditure effect which dominates the income effect.

6.2. Policy implication

Based on this research finding the researcher recommends the following which are relevant for policy makers:

Since the exchange rate depreciation improves the trade balance the policy makers are recommended to depreciate further to improve the Ethiopian trade balance by considering its impact on inflation since it increases inflation.

Policy makers can also improve the trade balance by expansionary monetary policy but its effect is not consistent since it has cyclical effect.

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APPENDICES

Appendix A: Lag length selection

VAR Lag Order Selection Criteria

Endogenous variables: LM0 LCGAP1 LCPIGAP LREER

LXM

Exogenous variables: C

Date: 04/09/14   Time: 17:38

Sample: 1997Q1 2012Q4

Included observations: 58

Lag	LogL	LR	FPE	AIC	SC	HQ
0	158.3860	NA	3.47e-09	-5.289173	-5.111549	-5.219985
1	556.5206	713.8965	9.00e-15	-18.15588	-17.09014*	-17.74075
2	598.8858	68.66085*	5.04e-15*	-18.75468*	-16.80081	-17.99361*
3	618.9440	29.04976	6.29e-15	-18.58428	-15.74228	-17.47726
4	647.3547	36.24812	6.17e-15	-18.70189	-14.97177	-17.24893
5	669.5882	24.53350	8.05e-15	-18.60649	-13.98825	-16.80759
6	692.2112	21.06285	1.15e-14	-18.52452	-13.01817	-16.37969

* 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

Appendix B: Stability test

Roots of Characteristic Polynomial

Endogenous variables: LM0 LCGAP1 LCPIGAP LREER LXM

Exogenous variables: C

Lag specification: 1 2

Date: 04/09/14   Time: 17:37

Root	Modulus
0.989368	0.989368
0.936808	0.936808
0.878501	0.878501
0.679827	0.679827
-0.005094 - 0.560739i	0.560763
-0.005094 + 0.560739i	0.560763
0.476536	0.476536
0.205362 - 0.386028i	0.437255
0.205362 + 0.386028i	0.437255
-0.079337	0.079337

No root lies outside the unit circle.

VAR satisfies the stability condition.

Appendix C: Cointegration test

Date: 04/09/14   Time: 17:36
Sample (adjusted): 1997Q4 2012Q4
Included observations: 61 after adjustments
Trend assumption: No deterministic trend
Series: LM0 LCGAP1 LCPIGAP LREER LXM
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.395999	63.62778	60.06141	0.0243
At most 1	0.219595	32.87280	40.17493	0.2231
At most 2	0.168550	17.74830	24.27596	0.2658
At most 3	0.087636	6.488673	12.32090	0.3790
At most 4	0.014548	0.893964	4.129906	0.3983

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.395999	30.75498	30.43961	0.0457
At most 1	0.219595	15.12450	24.15921	0.4976
At most 2	0.168550	11.25963	17.79730	0.3619
At most 3	0.087636	5.594709	11.22480	0.3981
At most 4	0.014548	0.893964	4.129906	0.3983

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Appendix D: SVAR restriction

Structural VAR Estimates
Date: 04/09/14 Time: 17:33
Sample (adjusted): 1997Q3 2012Q4
Included observations: 62 after adjustments
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 9 iterations
Structural VAR is just-identified

Model: Ae = Bu where E[uu']=If
Restriction Type: short-run pattern matrix
A =

1	0	0	0	0
0	1	C(6)	C(8)	0
C(1)	C(4)	1	C(9)	0
C(2)	0	0	1	0
C(3)	C(5)	C(7)	C(10)	1

B =

C(11)	0	0	0	0
0	C(12)	0	0	0
0	0	C(13)	0	0
0	0	0	C(14)	0
0	0	0	0	C(15)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.018477	0.009499	1.945074	0.0518
C(2)	0.024292	0.021623	1.123465	0.2612
C(3)	0.487874	0.165867	2.941353	0.0033
C(4)	-1.136344	1.066346	-1.065642	0.2866
C(5)	-3.213456	4.734567	-0.678722	0.4973
C(6)	0.204511	0.343163	0.595957	0.5512
C(7)	1.170847	2.423464	0.483130	0.6290
C(8)	0.009124	0.029646	0.307768	0.7583
C(9)	-6.65E-05	0.052458	-0.001268	0.9990
C(10)	0.216327	0.933399	0.231762	0.8167
C(11)	0.166528	0.014955	11.13553	0.0000
C(12)	0.006679	0.002197	3.040304	0.0024
C(13)	0.011577	0.002297	5.039347	0.0000
C(14)	0.028353	0.002546	11.13553	0.0000
C(15)	0.208226	0.018699	11.13553	0.0000

Log likelihood 589.4080

Estimated A matrix:

1.000000	0.000000	0.000000	0.000000	0.000000
0.000000	1.000000	0.204511	0.009124	0.000000
0.018477	-1.136344	1.000000	-6.65E-05	0.000000
0.024292	0.000000	0.000000	1.000000	0.000000
0.487874	-3.213456	1.170847	0.216327	1.000000

Estimated B matrix:

0.166528	0.000000	0.000000	0.000000	0.000000
0.000000	0.006679	0.000000	0.000000	0.000000
0.000000	0.000000	0.011577	0.000000	0.000000
0.000000	0.000000	0.000000	0.028353	0.000000
0.000000	0.000000	0.000000	0.000000	0.208226

Appendix E: Portmanteau tests for autocorrelations and Lm auto correlation test

Appendix E1: Portmanteau tests for autocorrelations

VAR Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Date: 06/03/14 Time: 13:12
Sample: 1997Q1 2012Q4
Included observations: 62

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	6.765935	NA*	6.876852	NA*	NA*
2	28.32803	NA*	29.15768	NA*	NA*
3	49.61931	0.3311	51.53157	0.2663	46
4	69.21675	0.5378	72.48056	0.4289	71
5	93.62935	0.5495	99.03461	0.3956	96
6	117.5682	0.5713	125.5383	0.3704	121
7	142.1072	0.5756	153.2005	0.3251	146
8	159.7026	0.7219	173.4026	0.4343	171
9	181.2803	0.7670	198.6444	0.4338	196
10	229.2503	0.3375	255.8395	0.0539	221

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

Appendix E2: Lm auto correlation test

VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 06/03/14 Time: 13:11

Sample: 1997Q1 2012Q4

Included observations: 62

Lags	LM-Stat	Prob
1	25.95694	0.4099
2	27.29887	0.3411
3	23.27561	0.5615
4	19.84980	0.7547
5	23.09105	0.5722
6	24.34581	0.4995
7	25.61225	0.4285
8	17.96106	0.8440

Probs from chi-square with 25 df.

Appendix F: Impulse response of one standard deviation