ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

EXCHANGE RATE PASS THROUGH IN ETHIOPIA: A VECTOR ERROR CORRECTION MODEL (VEC)

BY: NEGASI GIDEY

JUNE 2014

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

EXCHANGE RATE PASS THROUGH IN ETHIOPIA: A VECTOR ERROR CORRECTION MODEL (VEC)

BY: NEGESI GIDEY

A project submitted to the School of Graduate Studies of Addis Ababa University in Partial fulfillment of the requirement for the Degree in Masters of Art in Applied Economic Modeling and Forecasting

JUNE 2014

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVESITY

SCHOOL OF GRADUATE STUDIES

EXCHANGE RATE PASS THROUGH IN ETHIOPIA: A VECTOR ERROR CORRECTION MODEL (VEC)

This is to certify that the paper prepared by Negasi Gidey entitled: Exchange Rate Pass Through in Ethiopia: A Vector Error Correction Model (VEC), and submitted in partial fulfillment of the requirement of the Degree of Masters of Art in Applied Economic Modeling and Forecasting complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

BY: NEGASI GIDEY

Approved by **Signature**

Assefa Admassie(PhD) _____

JUNE 2014

ADDIS ABABA, ETHIOPIA

Abstract

Exchange Rate Pass Through in Ethiopia

Negasi Gidey

Addis Ababa University, June 2014

It is recognized in the literature that exchange rate pass through is a very important instrument in the design of monetary policy, particularly in response to exchange rate shocks. This paper has examined the pattern of exchange rate pass-through to consumer price indices in Ethiopia in the sample period beginning from 1998Q1 up to 2013Q4 with 64 observations. Nominal effective exchange rate (NEER) and consumer price index (CPI) was the centre of investigation in the paper. Error correction model accompanied by impulse response function is applied for analyzing the data. The result shows that there is modest exchange rate pass through of 34 % in the long run. However, there is low exchange pass through in the short run in that it is not much difficult burden for the monetary authority.

Acknowledgement

At first, my deep gratitude goes to the Almighty God who helped in all my activities including this research project. Next I would like to my advisor Dr. Assefa Admassie (PhD) for his deep and constructive comments that are very useful even for my next carrier development. I also want to thank for Komah Zeru who encourages me being in my side while I am doing this project.

My final gratitude goes to my father Abba G/Kiross who faced a lot of difficulties so that I reach here. My brother Halefom Gidena and all my sisters also deserves for appreciation for their encouragement in all my activities.

List of Acronyms

CPI- Consumer Price Index

CSA - Central Statistics Agency

ERPT - Exchange Rate Pass-Through

GTP - Growth and Transformation Plan

IRF - Impulse Response Function

M2 - Money Supply

NBE - National Bank of Ethiopia

NEER - Nominal Effective Exchange Rate

WOP - Oil Price Index

PPI - Producers Price Index

PPP - Purchasing Power Parity

VAR - Vector Autoregressive

VECM-vector Error Correction Model

CHAPTER ONE

1. Introduction

1.1. Background of the Study

The Ethiopian economy is stepping with a fast growth since the last two decades. There are huge public investments in both social and physical infrastructures across the rural and urban areas of the country. Now days, the country is undertaking a five year Growth and Transformation Plan focusing in every sector of the economy especially in road and energy infrastructures. This economic activity is not without implication. One of the potential changes of this investment is in relation to the external sector of the economy. The ongoing projects require huge import of capital and intermediate goods from rest of the world. To fulfill the demand for intermediate goods, the country needs much foreign exchange.

However, the export sector, which is believed to be the main source of the required foreign exchange, is not as it had been expected to be in the GTP period. Though the export sector was assumed to grow by 28.5% in the last periods of the GTP, it has shown weak performance that it has declined in the first two years of the GTP period. For instance, the sector declined by 2.5 % in 2011/13 as compared to 2011/12 which contributed for widening the trade deficit by 6.1% (NBE annual report, 2012/13).

This weak performance of export sector and highly increasing import of intermediate goods has an implication to the exchange rate policy of the country. The central bank (NBE) is making a planned and continuous depreciation so as to stimulate the export sector and narrow down the trade deficit. However, putting aside other foreign exchange supplements such as grants and remittances from abroad, the export sector is not enough to narrow down the trade deficit which in turn potentially leads for further exchange rate depreciation. It is also clear that continuous depreciation of currency will have economic

costs such as inflation in which purchasing power of the society depletes from time to time.

For policy makers, there is a policy dilemma concerning to exchange rate issues. On one hand, policy makers want to encourage export sector by increasing competitiveness through depreciation. On the other hand, they need to have low level of inflation so that faire price is provided in domestic markets and the welfare of the society will be improved. But it is difficult to achieve these objectives at the same time. Notwithstanding, East Asian countries experienced low levels of inflation even if they depreciated their exchange rate Stiglitz and Uy (1996). The main reason is that these countries take anti-inflationary actions as soon as they depreciate their currency as they have credible monetary policy. Such immediate policy measures are important for the reduction of exchange rate pass-through to domestic prices. But in most developing countries, it is uncommon to observe exchange rate depreciation free of inflation as they have ineffective monetary policies.

Therefore, for developing countries like Ethiopia, it is difficult to properly manage exchange rate policies. When they depreciate their currency, developing countries are prone to high inflation most of the time. Therefore, empirical study on exchange rate impacts is much important for developing countries so that they will be able to mitigate external costs resulted from depreciation thereby they can achieve sustainable economic growth.

1.2. Statement of the Problem

Since the last decade, Ethiopia is achieving a two digit economic growth which enables the country to be standardized as one of the high growing economies in the world. However, inflation rate did not remain silent in these growth periods though it currently shows a tendency of decline. Food inflation has reached 49% in 2008 that made the poor class of the population more victims Alemayehu (2011). The IMF country report of 2008

also evidenced that recent inflation occurring in Ethiopia is characterized in that it coincides with high level of economic growth.

Different causes of inflation are provided in literature in that exchange rate pass through effect is among them. It is argued that the high inflation rate might be resulted from a large depreciation of the national currency exemplifying that exchange rate has been depreciated by 112% in one decade; from 2002/2003 to 2012/13. In line with this argument, the IMF annual report of 2008 for the Ethiopian economy articulated that depreciation of exchange rate put upward pressure on both imported and domestically produced goods.

Exchange rate pass through is the rate at which a shock in exchange rate is transmitted to domestic prices. Depending on the level of economic integration an economy might have with the rest of the world, the degree of shock transmission is different across countries and through time. It is also different based on the exchange regime the economy under consideration follows. Pass through effect is high (complete) when an economy is more open and the exchange rate regime is floating. However, since there is no free floating and perfectly open economy in the world, exchange rate is incomplete theoretically and empirically.

More attention is given to exchange rate pass through since the breakdown of the Bretton Wood of fixed exchange rate system in 1973. Therefore, though concerning to developed countries, a number of research works have been produced on how exchange rate affects domestic prices. Rawland (2000) and Bodrug (2011) found weak and incomplete effect of exchange rate shock to domestic inflation. But this result is in contrast to that of Leigh and Rossi (2002) who found strong correlation between exchange rate and domestic prices.

Coming to Ethiopia, however, it is hardly possible to dictate that exchange rate pass through to domestic prices is extensively tested empirically. Research works concerning to this issue are very few in number to the access capacity of this research project.

Muhammednur (2012) studied exchange rate pass through using unrestricted VAR model analyzed by impulse response and variance decomposition functions.

This research project is different from this study in that; first, the above study used unrestricted VAR model though he found that all the variables in his model except money supply are integrated of order one. Aliyu eta al (2007), Ca' Zorzi eta al (2007) and pavlo (2010) argued that in cases where the variables are I(1) and co integrated, favoring VAR to VCEM model may lead to misspecification error. Second this study uses quarterly data rather than monthly data as the above study. In developing countries such as Ethiopia, the economy is rigid due to low infrastructures facilities and low degree of economic integration which in turn leads to the delay of exports and imports. Therefore, the economy might not be responsive as soon as movement in monthly exchange rates takes place.

Taking these differences into account, this study will try to analyze the relation between exchange rate and inflation with more focus in long run analysis; long run exchange rate passes through. The main reason why the paper inclines to stick in the long run analysis is because inflation rate is not much serious issue in the current time as it fell to a single digit through tight monetary policy.

1.2. Objective of the Study

- To examine exchange rate pass-through on domestic consumer prices
- To forward conclusions and recommendations from the result

1.4. Organization of the Study

The chapter has four chapters organized in such a way that after discussing the introduction part, theoretical and empirical literatures are reviewed in chapter two. In chapter three the data is estimated using econometric approach. Finally, conclusion and recommendation is forwarded in the fourth chapter.

CHAPTER TWO

2. Literature Review

2.1. Exchange Rate Pass through Theories

In its history, exchange rate has experienced many policy measures resulted in different exchange rate regimes. At a worldly level, the issue of exchange rate determination attracted the attention of many economists after the collapse of Bretton Wood system in 1973 (M. Rusydi and Sardar M.N. Islam, 2007). Since 1960s, as the gold demand is increased, the gold ratio became difficult to sustain which forced the exchange rate to change from fixed to floating in which exchange rate pass through emerged as an issue.

Exchange rate pass through had been studied for many years Lott (2013) but now days gets more and more indispensability as the world becomes more globalized. When high economic integration exists among countries, there is high probability that the positive or negative shock appeared in one country affects the other countries directly or indirectly.

Exchange rate pass thorough can be defined as the transmission of exchange rate shocks to domestic prices Stulz (2007), Winkelried (2011). Exchange rate pass through can have both macro and micro aspects. The macroeconomic aspect of exchange rate pass through is that it is determined by the persistence of exchange rate shocks An & Wang (2011), trade openness of the economy Riga (2005), monetary policy environments and inflation (Pavlo, Bodrug, 2011) and other macro economic variables such as interest rate and the amount of capital flows to or from the economy.

In its micro aspect, exchange rate pass through takes into account some industry specific microeconomic characteristic such as market concentration, degree of competition and number of firms in both domestic and foreign markets Pavlo (2010) and Lott (2013). The micro economic aspect of exchange rate pass through is said to be 'pricing to market' in its technical term. Stulz (2007) also cited that Goldberg and knetter (1997) studied the

incompleteness of exchange rate pass through from an industrial organization perspective.

There are two stages in which exchange rate shocks are transmitted to domestic prices. The first stage is the transmission occurs directly from exchange rate to import prices Chung et al (2011). When exchange rate depreciates, for example, price of imported goods becomes high in domestic markets. The second stage is price changes resulted from high price of imported inputs which in turn increase cost of production.

Exchange pass through might be complete or incomplete. Complete exchange rate pass through means that when a shock changes by a unit of disturbance term, the other endogenous variable will be changed by one unit. On the other hand, incomplete pass through effect means that when the shock in one variable is not fully transmitted to the other variable.

Exchange rate pass through is complete especially to import prices Bodrug (2011). It is because import prices are relatively near to the wave of exchange rate shock. Meaning, when a shock is crated its immediate effect is on the price of imported or exported goods and then it will be transmitted to prices of domestically produced goods and services. A large increase in price of imported goods resulted from an exchange rate depreciation has the capacity to spill over other sectors which leads to high production costs and finally to inflation spiral Razafimahefa (2012).

It may also be incomplete Razafimahefa (2012) and Stulz (2007). However, large share of body of literature suggests that exchange rate pass through is incomplete. In other words, most of pass through effects are expected to be incomplete as market imperfection and different costs like transport cost and transaction costs are available.

A number of theoretical literatures concerning exchange rate pass through have been developed over the past centuries. Historically, exchange rate pass through effect was stemmed from the theory of purchasing power parity which in turn derived from law of one price Dornbush and Fisher (1990). It is also grounded on the intellectual foundations of Weatly and Recardo in eighteen century C.Mark(2000). After centuries, this theory

developed by Recardo and popularized by Caseal that it became as a centerpiece of the exchange rate theories (Krugman, 2003).

Many economists believe that purchasing-power parity describes the forces that determine exchange rates in the long run. At first it is better to elaborate the doctrine from which purchasing power parity theory is derived. The macro economics of open economy (Mankew, 2003) states that if a unit of certain currency buys more of specific good in one country and less in the other, there will be unexploited profit. This means when a given good is sold less domestically than abroad, profit-seeking arbitrageurs buy the good from domestic and sell it abroad. In doing so, the price of that good gets higher and higher in domestic markets and becomes lower in foreign markets till it comes into equality in both markets.

Therefore, purchasing power parity states that a unit of all currencies must have the same real value in every country. It tells us that the nominal exchange rate between the currencies of two countries depends on the price levels in those countries. Thus, if the purchasing power of the dollar is always the same at home and abroad, then the real exchange rate; the relative price of domestic and foreign goods cannot change. Therefore, since real exchange rate is fixed, the change in nominal exchange rate results from price changes.

Though the PPP is derived from the law of one price, there is significant distinction in practice. The law of one price states that price levels of two goods in two countries expressed in the same currency is equal under the assumption of costless transportation system and competitive economic environment (Krugman, 2003). In addition, the law of one price is concerned only about individual commodity. The PPP, however, focuses in the combination of all prices entered in the reference basket.

Though the theory of ppp serves as a foundation of exchange rate theory, it has both proponents and opponents as any economic theory. From the side of opponents, it is challenged because all goods are not tradable and they are not perfect substitutes.

Moreover, it is criticized due to the less power it has in predicting long run relationship among variables.

2.2. Inflation, Money supply and Exchange rate

In this project the main motive for using VAR -based analysis is due to the nature of variables in question. In one way or another, money supply may affect both inflation and exchange rate. Similarly, exchange rate fluctuation has an effect in money supply and inflation in what is called exchange rate pass through. Therefore, the interaction among these main macroeconomic variables is reviewed based on the existing body of literature.

Economists since Hume (1752) have observed that the prolonged price is resulted from the increase in quantity of money. Most of the time, inflation and money supply are positively related. When central banks inject money to the economy high inflation in goods and services is inevitable. This is aggravated when the economy is at full employment that domestic production remains stagnant or increases slowly bellow the growth rate in money supply.

How money supply affects inflation is also based on the famous quantity theory of money. The quantity theory of money, according to Mankew (2003), states that the ultimate objective of central banks to increase/decrease money supply is to control over the rate of inflation. Directly or indirectly, money supply is the main determinant of inflation (Romer, 1996). The relationship between inflation and money growth is based on the demand for and supply of money Gerald *et al* (1999).

In African case, in addition, most studies indicate that the main determinant of inflation is monetary growth (Alemayehu, 2011). The traditional macro economic theory also suggests that monetary growth has co movement with price. However, it is not conclusive that the relationship between money supply and inflation is always positive.

With regard to the linkage between inflation and exchange rate, it is extensively available in economic literature. But before investigating their relation it is better to give a glance insight how exchange rate can be defined. Exchange rate can be categorized into nominal and real exchange rate. Nominal exchange rate is defined as the relative price of two currencies in two economies while real exchange rate is the relative price of two goods in the countries.

As prices of goods and services are indexed to reflect the changes in average prices, exchange rates are also indexed being called as nominal effective exchange rate so that they signify average appreciation or depreciation in relation to the currency of main trading partners of an economy. Economists use indexed exchange rate to measure price changes in the international market as they use indexed prices such as consumer price index, producer price index to measure price changes in the domestic market. Inflation, on the other hand, can be defined as a persistent increase in the general price of goods and services over periods of time.

Exchange rate can influence inflation through traded final goods, imported intermediate inputs and inflation expectations. The fundamental theory of exchange rate and price starts from the Keynesian IS-LM model of closed economy and the Mundel-Fleming model of open economy Bodrug(2011). The open macroeconomic theory explains that there is strong and positive relationship between inflation and nominal exchange rate. The influence of exchange rate towards inflation depends on the choice of exchange rate regime in the country whether it is fixed or floating R. Ghosh *eta al* (1996). It is also related to the trade opens of the given economy.

Understanding the impact of exchange rate movements on prices or vice versa is critical from a policy perspective. Policy makers and central bankers are eager to follow exchange rate movements and price changes in order to design appropriate monetary policy so that stable macroeconomic environment will prevail in the economy. Moreover, policy makers desire to minimize the tradeoff between exchange rate and inflation by designing appropriate monetary policy. Their positive relation has both

positive and negative impacts on the economy. As it was explained above, economic theory (Mankew, 2003) shows that inflation and nominal exchange rate go to the same direction; that is when a given country depreciates its national currency so as to boost its export earning, it is inevitable that it will be prone to high inflation unless credible and anti-inflationary monetary policy is adopted.

There are different stages in which exchange rate passes through to domestic prices. In a direct way, exchange rate pass through comes from the increase in prices of imported goods. It also passes indirectly through the increment of production costs resulted from imported inputs.

2.3. Review of exchange rate in Ethiopia

Exchange rate concepts are not newly arising issues in the world. In history, the world entertained different exchange rate regimes like fixed, pegged or managed floating exchange rate regimes. The application of exchange rate as one of monetary policy instruments is widely used by almost all central banks in the world. The principal monetary objective of all central banks is to achieve sustainable economic growth though credible monetary policy. Likewise, the objective of the National Bank of Ethiopia (NBE) is to maintain price stability and support sustainable economic growth in Ethiopia. Exchange rate policy is one of the important policy aspects of which its inappropriate movement might be accompanied by adverse macroeconomic instabilities. For instance, if exchange rate policy is poor, no doubt that it will have adverse effect which leads to currency crisis which in turn results in high level of inflation.

In the history of Ethiopia, it is obvious that exchange rate during the past two governments was fixed throughout its history. During the Durg regime, macroeconomic policies were highly centralized and participation of private sector in any economic activity was very minimal. Inherited from the monetary policy conservatism of the two regimes, the exchange rate was fixed at a rate of 2.07 birr per USD. Therefore, exchange rate policy was not a big macroeconomic issue that needs deep empirical studies and

policy measures during these regimes. Exchange rate management becomes difficult when the exchange regime is floating as the exchange rate becomes highly volatile in nature.

But when the current government came to power, many policy reforms with a tendency to approach towards the market economy were introduced. One of the policy reforms taken place by the current government was the devaluation of the national currency (the Birr) from its fixed values. For instance, the introduction of 'auction based exchange rate' determination scheme was introduced Alemayehu (2011) in the foreign exchange market. In line with this, the national currency devalued by 140 percent from 2.07 birr per USD to 5 birr per USD. From then onwards, exchange rate became one of the objectives of monetary policy which needs great attention. The mandate to follow exchange rate movement was given to the National Bank of Ethiopia.

As the world becomes more globalized, economic integration of developing countries like Ethiopia to the rest of the world increases from time to time. Consequently, the shock created in trading partners will possibly be transmitted to the domestic economy which adversely affects the domestic economy through inflation. Due to this reason, exchange rate policy is in a position to be one of the macroeconomic issues in which researchers and policy makers are attracted even in developing countries. Especially those countries with large share of imported goods for consumption purpose are under the threat of adverse exchange rate pass through.

2.4. Empirical Literatures of Exchange Rate Pass Through

Even if it is not much in the case of Ethiopia, the exchange rate pass through concept is well studied in both developed and developing nations. The main difference between literatures in both developed and developing countries is that there is small but with longer speed pass through effect in developed countries than in developing countries Pavlo (2010). This is similar with the argument forwarded by McCauley (2003). As it is defined in the past sections, exchange rate pass through is a concept which shows how

the domestic prices are sensitive to exchange rate fluctuations. Some studies apply differenced vector auto regression model when variables are I(1) but not co integrated Riga (2005), Pavlo (2010). Also there are a number of studies use error correction models accompanied by impulse responses function and variance decomposition function when variables are I(1) and co integrated.

Riga (2005) investigated exchange rate pass through taking 13 East European countries and using VAR model during the period 1993-2003. He found that exchange rate pass through is incomplete but with positive and statistically significant relation with the average inflation. Moreover, he concluded that exchange rate pass through is strongly related to import structure and trade openness. Jombo et al (2014) also found that modest pass through effect of exchange rate to domestic prices in Malwi using Philip curve and autoregressive analysis.

Pavlo (2010) put much effort in studying exchange rate pass through in Ukraine. This study is peculiar to other research works in that it used CPI and PPI included in a detailed disaggregated forms. Components of both CPI and PPI are handled independently so that the degree of pass through will be compared and the vulnerable sector for imported shock will be identified. This way of handling the data of consumer price index gives sense in that the data of this index comprises both tradable and tradable goods even services which are largely non tradable. Taking as it is may not reflect the exact relation between exchange rate shock and domestic prices as the exchange rate pass through is strongly related with tradable goods not non tradable ones. In line with this, Bodrug (2011) studied the exchange rate pass through in disaggregated domestic prices and finally he identified those countries with undeveloped financial market and with higher import shares of the specific good in the study are relatively vulnerable to external shocks resulted from exchange rate shocks.

Similarly, Akinbobola (2012) studied the same topic and concluded that money supply and exchange rate have significant inverse effect on inflationary pressure while real output and foreign price have positive effect. This result is most probably in contrast to

the studies of Adyemi and Samuel (2013). Theoretically and empirically the long run relation between inflation and money supply and exchange rate is positive. Rawland (2010) using both unrestricted recursive VAR and Johanson co integration analysis found incomplete pass through for import and consumer prices. According to this study import prices responds quickly relative to producer and consumer prices. Lewis (2011) reached more or less similar conclusion in that imported manufactured goods respond quickly to exchange rate shocks in foreign countries.

IMF working papers such as that of Razafimahefa (2012) investigated exchange pass through and its determinants in Sub-Saharan African countries. According to this study exchange rate pass through is high in countries with more flexible exchange rate regimes and large income. It reasoned out that the low exchange rate pass through effect is resulted from the presence of more prudent monetary policy and sustainable fiscal policy. This result seem contradicting to the studies arguing exchange rate pass through is high in economies with more floating exchange rate regime. This shows that exchange rate pass though might not be a threat under the availability of credible monetary and fiscal policies.

CHAPTER THREE

3. Model Specifications and Data Analysis

3.1. Data Sources and Variable Definitions

The variables considered as the center of investigation in this paper are nominal effective exchange rate (NEER) and consumer price index (CPI). Producer price index (PPI) and Import price index are removed from the model though they are important to show the channel of shock transmission based on literature. Regarding to import data, there is no indexed import price which is empirically reasonable to be included in the model. The data of PPI collected from CSA is also very short and inconsistent in time with other variables in the model. The NEER and broad money supply (m2) were collected from the National Bank of Ethiopia External Economic analysis while CPI was collected from CSA. International oil price is collected from the World Bank data base system. Quarterly data for GDP is also derived disaggregating the annual GDP data using the method of interpolation.

The data for all variables in the model consists of quarterly observations from 1998 quarter one to 2013 quarter four with 64 observations. Data availability and consistency is the reason for using this year as sample period.

Before specifying the model, it is advisable to elaborate how the variables under consideration are economically related to each other. Theoretically, NEER and domestic inflation are related in that when exchange rate of a given economy depreciates, foreigners find the goods of that economy cheaper and domestic consumers find imported goods more expensive (Krugman, 2003). When the imported goods are relatively more expensive, adding tariffs and transportation costs, importers are forced to sell the imported items in the domestic market with high price. Particularly, when the imported items are of intermediate type, the increase in price doesn't cease in these goods only. Rather it transmits to other domestically produced goods in such a way that cost of

production increases for producers and the producers load price burden upon the shoulder of final consumers.

The converse is also true when a currency of a certain economy appreciates. Generally, when exchange rate fluctuates it affects domestic inflation Winkelried (2011). This indicates that domestic price and nominal effective exchange rate are directly related given that an increase in NEER is defined as appreciation and its decrement as depreciation. In this case, it is possible to hypothesize that CPI increases when a currency depreciates.

There are also some other macro economic variables included in the model so as to relatively fully capture the modeling framework. Almayehu (2011) stated that money supply is the prime source of inflation in African countries. In line with this argument, Asayegn (2010) stated that the main determinants of inflation in Ethiopia are depreciation and increase in broad money supply. The inclusion of money supply into the model, therefore, is to reflect how the monetary policy reacts to price changes. Traditionally, money supply is defined from its narrow and broad sense. Narrow money (M1) comprises money held by the public and other checkable deposits which are used for transaction purpose. Broad money (M2) on the other hand is a measure of domestic money supply which includes m1 and quasi money (saving and time deposits).

While modeling exchange rate pass through, many researchers such as Ca' Zorzi *eta al* (2007) included short term interest rate to represent monetary policy. However, in the case of Ethiopia, it seems implausible to include interest rate instead of money supply into the model. This is because the central bank uses money supply as a stabilizing instrument as the economy is not much responsive to interest rate (IMF country report; 2008). GDP data is also included in the model to represent the supply side of the economy. Supply side constraints are also significant sources of inflation especially in developing countries. Therefore, if supply is more, inflation may decline other things remain constant. Precisely, the variables with their respective hypothesized sign are framed in the following equation.

$$cpi_t = (gdp_t^{\pm}, neer_t^{+}, wop_t^{+}, m2_t^{+}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Each variable and how it was measured is as explained above. Handling GDP in such a model is ambiguous as it can represent both supply and demand. Earlier studies consider it as economic activity (demand side) in which it is expected to have positive relation with domestic prices. On the other hand, when it is assumed to represent supply of the economy (as in this case), it is theoretically reasonable to hypothesize negative relation with domestic prices. Other variables are signed by the argument proposed above.

3.2. Model Specification and Research Methodology

Regarding the model specification of exchange rate pass through, extensive literature is available. But the starting point of all models of exchange rate determination goes back to 1920 Riga (2005) in which the concept of purchasing power parity has come to the application of macroeconomic variables. In the previous section, it has been explained that PPP also had been derived from the low of one price. Mathematically, the low of one price can be expressed as

$$p_{it} = Ep^*_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This is following the specification method in studies of Bondrug (2011) and (Krugman, 2003). Here, p_{it} is the price of a good or service in local currency, E is exchange rate expressed in domestic currency per foreign currency and P*it is foreign price. Rearranging equation 2 and writing as $E = P_{it} / P^*_{it}$, the equation of ppp is derived. The equation reveals intuitively that when p_{it} increases E increases (depreciates) and vice versa. The main difference between the two twin theories is regarding the nature of the prices they assume; law of one price assumes the price of a single commodity while PPP the general price of goods in the basket.

To measure exchange rate pass through from the law of one price or ppp, Lott (2013) used the following non linear equation;

$$p_i = \gamma E^{\alpha} p_i{}^{*\beta} \quad \text{.....(3)}$$

Taking natural logarithm in both sides of equation 2 above and including a stochastic error term, it gives the linear econometric model provided below.

$$\ln p_{it} = \gamma + \alpha \ln E + \ln \beta p_{it}{}^{*} + \varepsilon_t \quad \text{.....(4)}$$

Where p_{it}, E and P_{it}* are as defined above in equation 2, γ is constant, α and β are the elasticity of domestic price to exchange rate and foreign price respectively and ε_t is an error term.

To econometrically estimate pass through effect to domestic prices, some researchers have used single equation model while some others applied VAR model. For instance, Stulz (2007) employed single equation methods. In contrast to this, Jin (2012), Riga (2005), Shaari *et al* (2012) used VAR model to estimate exchange rate pass through effect.

It is hardly possible a given econometric model is free of critics. Both single equation model and VAR model have their respective drawbacks in modeling economic variables. For instance, single equation method shows the effect from explanatory variables to the explained one but not the other way round.

> *"If we consider an equation where one or more of the explanatory variables are jointly determined with the left-hand side variable, the OLS estimator will typically provide inconsistent estimators.'' (Vebeek, 2004).*

It is common to have explanatory variables in a model that can be explained by the dependent variables they determine. In this case, simultaneous equation method is applied which again needs to identify which variables are endogenous and which are exogenous. However, the identification process is not only highly complicated but also highly criticized by Sims (1980). To ease this complication, Sims advocated that VAR based estimation is relatively good because to worry about which variable is endogenous or exogenous is not a precondition for specifying the model.

The rationale for employing VAR model discriminating to single equation and simultaneous equation methods is, therefore, to accommodate all variables as endogenous. In our case, specifically, it is appropriate to use a model which handles both exchange rate and domestic prices as endogenous variables. This is because domestic macroeconomic variables such as inflation are also likely to affect the exchange rate especially in the floating exchange rate regime (Mankew, 2003,). Therefore, a vector autoregressive (VAR) approach is useful to allow for endogenous interactions between the exchange rate and other macroeconomic variables particularly domestic prices.

Following the econometric specification method adopted by Ca' Zorzi (2007) and Lian An (2006), the very general VAR model of exchange rate pass through can be specified as;

$$Y_t = c + \sum_{i=1}^{p} \Phi_i Y_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Where Y_t is vector of endogenous variables, Φ_i is matrices of coefficients, ε_t is vector of white noise error term and c is vector of constants.

In literature, there are three types of VAR models; reduced form, recursive VAR and structural VAR models differing each other by the assumption they take to estimate the data.

Though all VAR types have their respective drawbacks, the reduced VAR is better in many aspects. In one hand the reduced model is simple and fitting to the data. On the other hand, all variables are treated equally. Since the reduced form of VAR may also be restricted or unrestricted, the nature of the data plays a great role which one to use for estimation.

If variables are non stationary or I(1) but co integrating, discriminating VAR specification from Error Correction Model leads to misspecification problem Aliyu eta al (2007), Ca' Zorzi eta al (2007). Therefore, VECM model is adopted here since the variables are non stationary but co integrated. The general VECM framework is specified in this way.

$$\Delta cpi_t = \sum_{i=0}^{p} \beta_{1i}\Delta neer_{t-i} + \sum_{i=0}^{p} \beta_{2i}\Delta m2_{t-i} + \sum_{i=0}^{p} \beta_{3i} wop_{t-i} + \sum_{i=0}^{p} \beta_{4i} rgdp_{t-i} + \beta_5 \varepsilon_{t-i} + \nu_t \quad .....(7)$$

All the variables are in natural logarithm. $\beta_i's$ are parameters to be estimated, p represents maximum lag length, Δ is the difference operator and ν_t are independent and identically distributed error terms. β_{10} is the current exchange rate pass- through. If the shocks in exchange rate are less proportional i.e if $\sum_{i=0}^{p} \beta_{1i} < 1$, exchange rate pass -through is incomplete.

3.3. Unit Root Tests

Any time series data provided for regression should pass the required statistical tests so that decision drawn from the result about these variables will be reliable and more

informative about the future economic phenomenon. Unit root test is one of the known statistical methods which are helpful for data screening.

In time series analysis, the first pre estimation task is to check whether the series are stationary or not. By stationary variables it means that the first moment of the variables is time independent. By non stationary variables, on the other hand, means variables which are not mean reverting or with persistent response after a shock is introduced to them. If variables are not stationary, the result from the standard OLS regression leads to incorrect decision. Econometrically speaking, the regression is spurious if the time series data is non stationary. However, most of macroeconomic time series are trended and therefore in most cases they are non stationary Binh (2013).

There are many statistical methods for checking unit roots such as Philip perron and KPSS unit root tests. However, since the last few decades the most widely applied method of test is the Augmented Dickey Fuller (ADF) test (Gujirati, 2003). ADF test have more acceptance in practical application though it is weak in its power of test. If the ADF test fails to reject the null hypothesis of unit root, we can say that the variable is non stationary otherwise it is stationary.

Coming to the variables in question, as it is depicted in table 1 below, all the variables are non stationary at level and stationary at their first difference; that is they are integrated of order one. This is indicated by the fact that the ADF statistical values are much greater than two. The default or automatic lag length selection is used in the unit root testing process based on the SIC. CPI, GDP, WOP and NEER are modeled with an intercept only while M2 is tested with intercept and trend. It is clear that the null hypothesis in the ADF stationary test is the presence of a unit root and the alternative is otherwise.

Table 1. ADF –Tests of Unit root tests

Variables	At level	At first difference
Lcpi	1.43	-6.83**
Lrgdp	0.52	-12.73**
Lm2	-0.83	-9.46**
Lneer	-0.25	-5.48**
Lwop	-1.36	-6.34**

** indicates significance at 1%

3.4. Selection of Lag Length

The determination of optimal lag length is the first step in the environment of VAR model and co integration analysis. Once the optimum lag is determined through statistical tests, it is devoted to undertake co integration test and to estimate the VAR or VEC models. The main objective of using lags in a model is so that the model will be free of serial & auto correlation and the error term will fulfill the classical linear regression assumptions. Moreover, relatively efficient lag length brings into balance the tradeoffs between loss of degrees of freedom and small sample problems.

Sharp (2006) cited that the choice of the lag order in the VAR is important in the sense that too low order lags could lead to the problems of serial correlation and too high lag order could potentially lead to small sample problems. Many model selection criterions have been used extensively for the determination of lag length in a regression framework. In the following sub topic, statistical tests based on which the optimum lag length is selected are provided.

Table 2. Lag selection Statistics

Lag	LogL	LR	FPE	AIC	SC	HQ
0	68.7	NA	0	-2.1	-2.0	-2.1
1	415.7	624.5	0	-12.9	-11.8*	-12.4
2	453.1	61.1	0	-13.3	-11.3	-12.5
3	492.9	58.4	0	-13.8	-11	-12.7*
4	522.1	38.0*	0.00*	-13.9*	-10.2	-12.5

* Indicates lag order selected by the criterion

Where LR: LR test statistic (at 5% level) **FPE**: Final prediction error

AIC: Akaike information criterion **SC**: Schwarz information criterion

HQ: Hannan-Quinn information criterion

For a given model, the optimum lag length may be different based on different selection methods. The smallest values of each selection criteria signified by the asterisks is taken as optimum lag length based on each model. As it is depicted in the above table, Final Prediction error (FPE), Likelihood Ratio test (LR) and AIC recommend lag 4, SC lag 1 and HQ alone suggest lag 3 as optimum lag length for the model. In this case it is advisable to discriminate one model from the other based on the following lag exclusion test so that of significant lag length is selected.

Table 3 Lag Exclusion Test

Number of lags	1	2	3	4
Joint χ^2 test statistics [P-values]	198.70 [0.000]	37.28 [0.057]	57.58 [0.000]	44.96 [0.008]

It is obvious that every lag selection criteria possesses their own weakness and strength. But in application, when most of selection methods support a specific lag length, it is recommended that this lag length could be selected as optimal lag length. But lag exclusion test uses to identify which lag lengths are appropriate. The zero probabilities in

parenthesis indicate that the selected lags are statistically accepted. Usually, we can discriminate one model from the other based on the above test statistics. But now it is difficult to discriminate one model from the other for all lags are significant. To ease this ambiguity, subjective decision is taken leaving the two extreme lags and taking the middle one. Therefore, lag three is taken as optimum lag for the model based on the HQ test statistics. This is because estimating the VEC using lag 3, gives residuals free from autocorrelation, serial correlation and heteroschedasticity problems though the error term failed to pass normality tests.

3.5. Cointegration Analysis

Two non stationary time series might be co integrated if they tend to move together through time. As a precondition for carrying out co integration tests, the variables should be integrated of orders one. The above result of unit root test is in line with this idea. When two or more economic variables are co integrated, it means that there is long run relationship among the variables. In other words, the variables have a tendency to come to their equilibrium position after they deviate from it by some exogenous external shocks.

The two common methods of co integration test are Johanson (1988) co integration test and Engle –Granger (1987) procedure of unit root test. But here, Johanson co integration method is applied because it is mostly recommended in multivariate co integration analysis Binh (2013). The optimum lag selected above is used to test Johanson co integration test too.

Taking lags 1 up to 3 and choosing a model with intercept and no trend (most recommended) in the co integrating equation, the result from Johanson co integration tests are provided below in table 4. The null hypothesis is different for the two statistics. In the first (trace) statistics the null is that there are cointegration equations at most r=k-1 against the alternative r=k. where r is the rank of the co integrating coefficient matrix and k is number of explanatory variables in the model. The second (max eigen value) statistics assumes the null hypothesis of r=0 against r=k+1 co integration equations.

Table 4. Johanson Co integration Test

Trace (λ trace)

No. of CE(s)	None *	At most 1 *	At most 2	At most 3	At most 4
Eigen value	0.63	0.35	0.23	0.10	0.04
λ Statistic	109.45	50.32	24.50	8.62	2.27
Critical Value	69.82	47.86	29.80	15.49	3.84

Trace test indicates 2 co integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Maximum Eigen Value (λ Max)

No. of CE(s)	None *	At most 1	At most 2	At most 3	At most 4
Eigen value	0.63	0.35	0.23	0.10	0.0
Max-Eigen Stat	59.13	25.82	15.87	6.35	2.27
Critical Value	33.88	27.58	21.13	14.26	3.84

Trace test indicates 2 co integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Normalized Co integration Equation

LCPI	LM2	LNEER	LNWOP	LGDP
1.00	0.72	0.34	0.59	-4.20
t.stat	2.18	1.17	7.37	7.37

In the above table, Johanson co integration test statistics including the normalized co integrating equation are provided. The trace and Eigen value statistics are greater than their respective critical values in the second row and first two columns for trace statistics and second row and first column for max-Eigen value statistics. Trace statistics indicates that there are two co integrating equations and maximum Eigen value statistics suggests that there is only one. Subjectively, by the reason that the one suggested by the two statistics might be better model and based on the argument forwarded by Banerjee *et al* 1993 as cited by Hussain (2008) that maximum Eigen value is powerful relative to trace statistics, only the first co integration equation is taken for analysis.

In order to determine the responsiveness of consumer price to exchange rate changes in the long run, we can use Johanson approach or VEC approach or both. Consumer price index is normalized to one so that it is considered as dependent variable and the other coefficients could be analyzed in relation to it. The co integrating equation derived from the Johanson procedure is much useful to provide an insight about the long run relation of the variables under consideration. In the normalized co integration equation, all the co integrating coefficients except that of nominal effective exchange rate are statistically significant.

Depending on the co integration method of analysis, LM2 and LNWOP affect LCPI by 0.72% and 0.59% respectively in the long run. The response of domestic prices to one percent fluctuation in nominal effective exchange rate fluctuation is 0.34% in the long run. GDP also affects negatively domestic prices by 4.2 percent. Assuming that RGDP represents the amount of output supplied within the economy, its sign is as expected though its magnitude is subject to suspicion because RGDP is not the sole determinant of domestic prices.

3.6. Estimation of VECM and Discussion of Results

As explained in model specification section 3.2, VAR model is useful for estimation due to its simplicity and fewer requirements it imposes for the identification of variables which are exogenous and which are endogenous. Moreover, VAR model is good in

forecasting the nature of variables in the long run though is not much established on real economic theory (Gujirati, 2003). If variables are integrated with the same order (non stationary) but co integrated, the special model evolves from VAR model is the vector error correction model basically the restricted form of VAR. The quality of this model relative to OLS or simple VAR model is that it simultaneously shows not only the long run but also the short run relationship of the variables.

In addition, it gives an insight about how the long run and short run behavior are related through the ECM term. The ECM term in the error correction model serves as a bridge to connect the short run dynamics with the long run or static path of the variables. It also shows how the short run equation is adjusted to its long run values once it deviates from its equilibrium due to shock. Moreover, in the analysis of VAR models, the advantage of the VECM model is of great importance in that it shows both short run and long run causality among the variables. The long run causality is identified by the statistically significant ECM term. If the ECM term is negative and significant, it is a good indicator that the variables in the model cause each other in the long run. The problem is, however, the ECM term does not clearly show which variable causes which one.

The result of VECM is provided in table 6 and 7 below. It has two parts; the long run equation shown under the column cointeq1 and short run equation shown in the error correction part. With regard to the long run analysis, the long run part in this model and the normalized co integration equation reviewed in the co integration analysis section are more or less similar. Since the data is transformed into natural logarithm, all the coefficients assume elasticity interpretations.

It is important to recall that domestic price and exchange rate depreciation are positively related in that depreciation of exchange rate indicates that importing of foreign goods becomes expensive and as result domestic prices will increase assuming CPI baskets include high share of tradable goods. If the goods are not tradable, the effect of exchange rate fluctuation may not influence domestic prices as the channel for shock transmission is international trade.

The data for NEER is constructed as currency of main trading partners per birr. Therefore, its increment implies appreciation and its decrement depreciation. Though literatures use its inverse (1/NEER) to capture the exchange rate data, this paper has used as it is because the inverted data worsens the result of the model. Taking this theoretical relationship into account, 1 percent depreciation in LNEER makes LCPI to increase by 0.34% in the long run. In both methods of analysis, exchange rate pass through effect is with the same magnitude but insignificant.

Krugman (2003) proposed that money supply and exchange rate positively related both in the long and short run time paths. The relationship between CPI and WOP is also straight forward. When oil price increases in the international market, cost of transportation becomes higher thereby domestic prices gets higher in turn. In line with this theoretical explanation, a one percent increase in LM2 and LWOP, results in 0.72% and 0.59% increase in LCPI respectively in the long run. This result importantly matches with existing theory about the relationship between domestic prices and both oil price & money supply.

The increase in GDP by one percent, in the same way, leads to a 4.2 percent decrement in inflation. The sign and magnitude of GDP coefficient seem to fall in the usual and inconclusive relation between GDP and inflation. Both long run and short run relation between output and inflation are not without dispute. In the course of time, there had been different views regarding the relationship between these two variables.

> *"…in sum, the view from the 1960s on inflation and growth was surprisingly ambiguous. Theory presumed that the short run relationship was definitely positive. Whereas the long run relationship was either way. Empirical results usually found nothing!''* Bruno and Easterly (1996)

Therefore, the above result is also inconclusive in line with this view. If GDP is considered in the supply side, this result seems reasonable as supply increases price

declines based on the common theory of economics. However, if GDP is considered in the demand side or economic activities, the above result contradicts the theory.

Table 5. Long run Estimate of VECM

1.CE.	LCPI(-1)	C	LM2(-1)	LNEER(-1)	LNWOP(-1)	LRGDP(-1)
	1.0	89.9	0.72	0.34	0.59	-4.20
		t-stat	[2.21]	[1.18]	[7.11]	[-7.40]

Table 6. Adjustment coefficients (ECM terms) of VECM

2. Error Correction:	D(LCPI)	D(LM2)	D(LNEER)	D(LWOP)	D(LRGDP)
CointEq1	-0.18	-0.09	0.08	-0.04	0.10
t-stat	[-3.72]	[-4.72]	[2.06]	[-0.31]	[1.18]

The error correction terms or adjustment coefficients constitute the other wing of investigation. Here, only the ECM term is reported for the sake of space saving. The ECM term has the implication that by how much the model adjusts to its equilibrium position once it deviates due to some shocks. As it is depicted in table 7 above, the ECM term of the D(LCPI), D(LM2) and D(LNEER) are statistically significant and with expected sign except that of D(LNEER). The error correction term of D(LWOP) and D(LRGDP) are insignificant but with the to be sign. However, the ECM term of the focus model i.e D(LCPI) is significant and correctly signed which suggests once the long run value of D(LCPI) deviates from its equilibrium position, it adjusts to its normal position at a rate of 18 percent each quarter.

3.7. Diagnostic Tests for the Model

To forward reliable conclusion from any regression results of a model, the model should be stable at first. If a given model is not stable, variable coefficients and statistical values

become misleading and inferences drawn from the model might not be much convincing. Therefore, a given model should pass certain diagnostic tests before it is devoted for forecasting or policy purposes. Some of the tests are to check whether the error term from the model is subject to serial correlation, autocorrelation or hetroschedasticity problems. In addition to these tests, the model should also pass stability tests and the error term should fulfill the classical linear regression assumptions.

The most common test statistics used to identify a better model are Portmateau autocorrelation tests, Lagrgian multiplier (LM) test of serial correlation and normality test. The first test statistics is used to check whether the residual from the given model is free of autocorrelation problem or not. Similarly, the second test is used to identify if the residual derived from the model is serially correlated or not.

With regard to the model in question, though it is good in most of the tests, it is not perfect in all. It is free of serial and autocorrelation problems using the above tests. It also passed the stability analysis using CUSUM of squares. However, the error term is not normally distributed as expected.

The failure of a model in normality assumption is not much critical in OLS estimation technique as the OLS estimates remain unbiased (Gujirati, 2003). So since each equation in VAR model is OLS by construction, non normality of the error term might not be serious issue in this model. The short run coefficients of the VECM in the equation of D(LCPI) are also tested using Wald test. Over all, the short run coefficients are statistically significant which implies the lagged dependent variables cause CPI in the short run. The statistical results for diagnostic tests are provided in Appendix 3.

3.8. Impulse Response Function

In the VECM or generally VAR model, the short run coefficients are somewhat difficult to interpret individually. Therefore, practitioners use impulse response and variance

decomposition functions for further analysis of VECM. The main advantage of impulse response function is to examine how external shocks are propagated to domestic prices. It is because impulse response function is more helpful to quantify the degree of pass through induced by exchange rate movements. While showing the degree of pass through, the order in which the variables are put one prior to another has significant impact on the results.

Therefore, following the ordering argument of Rowland (2010) and Muhammednur (2012), the variables are ordered in such a way that the variable firstly ordered is assumed not to be affected by the other variables while it affects variables ordered next to it. On the one hand, it is considered as the most exogenous variable comes first followed by the most endogenous one. The target variable is usually ordered at the end according to Hussain (2008). Based on this, the variables are put in the following order; $WOP \rightarrow LNEER \rightarrow LM2 \rightarrow LGDP \rightarrow LCPI$

This ordering implies that there is contemporaneous effect from WOP or NEER to the other variables but not vice versa. The whole graph of impulse response function is provided in Appendix 4 but in table it is depicted in the following. Actually, both the graph and the table convey the same message but with different dimensions. Eight quarters or two years are taken as periods of analysis to show how the domestic prices responses to the shock in exchange rate.

Table 7. Effects on CPI to one standard deviation of exchange rate shock

	After 2 quarter	After 4 quarter	After 6 quarter	After 8 quarter
Consumer price index	0.017	0.006	0.009	0.006

Generally, short run exchange rate pass through is very low in Ethiopia according to this result. It is obvious that the pass through effect oscillates from one quarter to another. For instance, after the first and fourth quarters, the shock occurred in exchange rate is transmitted by 1.7 percent and 0.6 percent respectively for one standard deviation of

LNEER which is in a declining trend. But, it is transmitted by 0.9 percent after six quarters and again by 0.6 percent in the following eight quarters in that it declined again as compared to the previous six quarters. This may be due to relatively less economic integration the Ethiopian economy has with the rest of the world in the current time. Past experiences and literatures argue that the degree of exchange rate pass is determined by the degree of trade openness and level of integration the economy will have. During the financial crisis of 2008, for example, developing countries including Ethiopia had been relatively less vulnerable due to the low economic integration. Osakwe (2010) also articulated that the financial crisis was resulted in serous consequence in countries with floating exchange rate and with less impact in countries with managed floating exchange rate regime among which Ethiopia is categorized.

References

Akinbobola, T.O.(2012): "The dynamics of money supply, exchange rate and inflation in Nigeria'', Journal of Applied Finance & Banking, vol.2, no.4, 2012, 117-141

Alemayehu Geda (2011): "Reading the Ethiopian Economy'', Addis Ababa University, Addis
Ababa, Ethiopia

Bandura and Pavlo (2010): "A study of Exchange Rate -Pass Through in Ukraine'' Working paper: Kyiv School of Economics

Bruno, M. and Easterly, W.(1996): "Inflation and Growth: In Search of a Stable Relationship'', Reserve Bank of Luis

Cheikh, N.B. and Louhichia, W. (2014): "The Exchange Rate Pass-Through in a Co integrated VAR Model'', ESSCA School of Management, PRES UNAM, 1 Rue Lakanal, 49000 Angers, France

Chung, E., Kohler,M. and Lewis C. (2011): "The Exchange Rate and Consumer Prices'', Reserve Bank of Australia Quarterly Bulltin Paper

Corrinne Ho and Robert N. McCauley (2003): "Living with flexible exchange rates: issues and recent Experience in inflation targeting emerging market economies'', BIS Working Papers

Dorosh, p., Robinson, S. and Ahmed, H. (2009): "Economic Implications of Foreign Exchange Rationing in Ethiopia'': EDRI, Discussion Paper No. ESSP2 009, ADDIs Ababa, Ethiopia

Dwyer, G. and Hafer, A. (1999): "Are Money Growth and Inflation Still Related?'', Federal Reserve Bank of Atlanta Economic Rview

Fekadu, D. (2012): "Relationship between Inflation and Economic Growth in Ethiopia: An Empirical Analysis'' University of Oslo

Ho, M. and McCauley, M.(2003): "Living with flexible exchange rates: issues and recent experience in inflation targeting emerging market economies'', BIS Working Papers

Honda, J. , Zhan, Z. and Thomas ,A.(2008): "The Federal Democratic Republic of Ethiopia; Selected Issues'' IMF Country Report No. 08/259, Washington, D.C.

Jombo, W., Simwaka,K. and Chiumia, A. (2014): " Exchange Rate Pass-Through in Malawi: Evidence from Augmented Phillips Curve and Vector Autoregressive Approaches'', reserve Bank of Malawi

Jonas Stulz (2007): "Exchange Rate Pass-through in Swizerland: Evidence from Auto regressions", Swiss National Bank Economic Studies No.4

Josef L. Loening, Dick Durevall and Yohannes A. Birru(2009): "Inflation Dynamics and Food Prices in and Agricultural Economy: The case of Ethiopia'', Policy Research Working paper 4969, The world Bank African Region

Krugman, R. and Maurice Obstfeld (2003): "International Economics: Theory and Policy, Six Edition'' University of California, Berkley

Michael Bruno and William Easterly (1996): "Inflation and Growth: In Search of a Stable Relationship", NW, Washington, DC 20433

Michele Ca' Zorzi, Elke Hahn and Marcelo Sánchez (2007): "Exchange Rate Pass-Through in Emerging Markets'', Working Paper Series No 739/March 2007

Milton Friedman (1976): "Adam Smith's Relevance'' Selected Papers No. 5 0

Mohammednur Behru(2012): “Exchange Rate Pass-Through in Ethiopia’’ Addis Ababa University, Addis Ababa, Ethiopia

Natalia Bodrug (2011): “Estimating Exchange Rate Pass-Through in Republic of Moldovia’’ Working Paper: Kyiv School of Economics No 130

Ozawkie, N.P. (2010): “Africa and the Global Financial and Economic Crisis: Impacts, Responses and Opportunities’’, United Nations New York and Geneva, December 2010

Razafimahefa,F.I.(2012): “Exchange Rate Pass-Through in Sub-Saharan African Economies and its Determinants’’, IMF WP/12/141

Razafimahefa,I. (2012): “Exchange Rate Pass-Through in Sub-Saharan African Economies and its Determinants’’,IMF Working Paper, African Department

Riga (2005): “Pass Through of Exchange rates to Domestic prices in East European Countries and the Role of Economic Environment’’ Working Paper 4/2004

Stiglitz, E. and Marilou Uy (1996): “Financial Markets, Public Policy and the East Asian Miracle’’, The world Bank Research Observer, Vol.11

Stulz, J. (2007): “Exchange rate pass-through in Switzerland: Evidence from vector auto regressions’’, Swiss National Bank Economic Studies No. 4

Winkelried, D. (2011): “Exchange Rate Pass Through and Inflation Targeting in Peru’’, Central Reserve Bank of Peru.

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: Negasi Gidey

Signature : _____

Date: 19/06/2014

Confirmed by Advisor

Name : Assefa Admassie(PhD)

Signature : _____

Date: 19/06/2014