ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

THE EFFECT OF REAL EXCHANGE RATE ON THE TRADE BALANCE OF ETHIOPIA: DOES MARSHALL LERNER CONDITION HOLDS? EVIDENCE FROM (VECM) ANALYSIS

BY

DEBELA GELANA

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This is to certify that the thesis prepared by **Debela Gelana**, entitled: The effect of real exchange rate on the trade balance of Ethiopia: Does Marshall Lerner condition holds? and submitted in partial fulfillment of the requirements for the degree of Masters of Science (Economic policy analysis) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Declaration

I, the undersigned, declare that this thesis is my original work and it has never been presented for masters in any other university, and that all source of materials used for the thesis have been properly acknowledged.

The examiners‟ comments have been properly incorporated.

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List of Acronyms and abbreviations

ADF	Augmented Dickey Fuller
AIC	Akaike information criterion
ARDL	Autoregressive Distributed Lag Model
BMR	Bickerdike, Robinson, Metzler,
ETB	Ethiopian Birr
FEVD	Forecast error variance decomposition
FGDP	Foreign gross domestic product
FPE	Final prediction error
GDP	Gross domestic product
HQ	Hannan- Quinn information criteria
IMF	International monetary fund
IRFs	Impulse response function
LDCs	Least developed countries
ODA	Official development assistance
OLS	Ordinary least square
P^N	Price of tradable goods
P^{NT}	Price of non-tradable goods
PPP	Purchasing power parity
REER	Real effective exchange rate
RMS	Real money supply
SAP	Structural adjustment program
SC	Schwarz information criterion
TB	Trade balance
USD	United States Dollar
VAR	Vector autoregressive
VD	Variance decomposition
VECM	Vector error correction model

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Abstract

This paper attempts to investigate the empirical investigation of the effect of real exchange rate on the trade balance of Ethiopia and whether the Marshall Lerner condition holds using vector error correction (VECM) co-integration method using quarterly data from 1995Q1 to 2017Q4. To make appropriate analysis, the study has used the Granger causality test, impulse response function and variance decomposition method in the short run whilst the vector error correction model (VECM) has undertaken to estimate the long run causality whether real exchange rate improves or worsen trade balance. The study included other control variables like domestic and foreign income and real money supply in addition to real exchange rate. The empirical results thus, indicated a long run significant relationship between trade balance and its determinants; real exchange rate, domestic income, foreign income, and real money supply as incorporated in the model specification of the study. The result of the impulse response function as well indicated that there is no evidence of J-curve in Ethiopia. The study concludes with important implications for policymakers because it provides evidence supporting the fact that the real exchange rate has a major impact on trade balance adjustment and that devaluation of real effective exchange rate worsens the trade balance of Ethiopia even in the long run.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

One of the determinants of the strong macroeconomic performance of most open economy countries today is obviously the international trade. As an open economy, the trade balance of Ethiopia is considered as one of the components of GDP. However, the main problem is that this major component may come with the main problem into GDP as the payment to the rest of the world is greater than what it receives from the rest of the world. This leads to a trade deficit which is faced most of the developed and developing economies. Not only Ethiopia the trade balance of the sub-Saharan countries over many years has been experiencing a trade deficit. The main reasons for this trade deficit in these countries are in fact, due to the poor economic strategy and their reliance on a certain specific primary export product and import a lot of manufactured goods. Particularly, the persistence of the trade deficit is due to stagnating export and increasing imports over the last three decades in Ethiopia.

In most cases, the exchange rate is considered as the main determinant of trade balance as it alters the elasticity demand of import and for export within its trading partners. It is one of the factors that play a vital role in the trade balance of the nation's determination. Exchange rate is so considered, as a tool for the regulation of trade balance, which ultimately affects national income and the welfare of a nation. Hence the effect of the exchange rate change is critical constituent for the trade balance and exchange rate policymakers as its movement is the major concern factor which determines the quantum and direction of international trade. Exchange rate affects the trade balance of one country through trade balance components and hence it affects export by affecting international competitiveness. The effectiveness of exchange rate devaluation in improving the current account has long been an issue of considerable interest to many economic analysts and policymakers.

For devaluation to improve trade balance successfully, the domestic supply of output must be responsive to meet the existing demand caused by the currency devaluation. The appreciation of the exchange rate implies that the cost of producing tradable goods increases and hence the country loses its competitiveness in the international market (Wayne, 2000).

It raises the demand for imports and reduces demand for exports and in order to promote export, it is advisable to stabilize the exchange rate when there are small fluctuations in the exchange rate. On the other hand, devaluation also adversely affects intermediate and capital goods imported from abroad thereby affect the domestic production negatively.

The trading activities of Ethiopia up to 2017 were not inspiring as indicated by the export to import ratio of less than unity. Despite the theory of export encouragement by a devaluation of domestic currency in Ethiopia, the trade deficit of the country continued to remain wide and it accelerates the growth of import over the export. This is mainly due to the weak industrial base to boost export and the inability to substitute imports by domestically produced goods in order to narrow the trade deficit. Besides this, the majority of Ethiopian export is agricultural product instead of industrially produced goods and this tells that Ethiopia suffered a negative trade balance for a number of years although its exchange rate has been depreciating. May be there are other factors affecting the trade balance such as world income and domestic income whether or not there is accompanying monetary policy to the devalued currency. Whether there is the accompanying monetary policy of the country or not the money supply is considered as key variable in which monetary policy used to equilibrate the money market.

Following this, the devaluation of August 31, 2010, from 14.55 to 16.46 was undertaken to boost the export of the country and to bring about structural change in the country. Again for the purpose of the same goal, the currency devalued in October 2017 from the official exchange rate of 23.2488 to 26.7: however this itself shortfall to boost the export value of the country in order to improve the trade balance. Its incapability to overcome trade balance problem in turns manifests in a low trade share of GDP.

1.2 Statement of the problem

The role of the exchange rate in improving the trade balance has long been a debatable issue to economists and policymakers. Especially as in 1973, since the breakdown of the Bretton Woods and the beginning of floating exchange rates, there has been reintroduced awareness on the effect of devaluation on the trade balance of both developed and developing countries. The mixed empirical support of the relationship between trade balance and changes in the exchange rate provides the motivation for investigation of trade balance effect of the exchange rate on trade balance.

Developing countries failing to meet their development plan have lurched from one development paradigm to another: from industrialization to import substitution, from import substitution to export promotion, from export promotion to Structural Adjustment Program (Rawlins and Praveen, 1993). In implementing one of the essential components of the SAP, less developed countries (LDCs) facing balance of payment problems due to expansionary financial policies, a deterioration in terms of trade, price distortions, high debt servicing and/or combination of these factors have often resorted to devaluing their currencies (Nashashibi, 1983).

Ethiopia, as one of the LDCs, faced a number of problems which were the main causes of the poor economic performance of the 1970s and 1980s. Even though the causes of poor economic performance were numerous, poor macro-economic policies were the prominent ones. Thus, in doing that comprehensive, compatible, timely, and sequential policy rearrangement was incontestable for reliable and sustained growth and development. Not only this but also for the maintenance of both the external and internal balance of the country. In order to do that, Ethiopia has experienced various policy and structural reforms both at a micro and macro level of the economy in the form of implementing Structural Adjustment Program (SAP), which began in 1992, after the downfall of the Derg regime. As a part of this overall reform program, on October 1, 1992, Ethiopian Birr devalued from its nominal level of 2.07 to 5.00 Birr per US dollar. In this period, due to the devaluation of Birr against USD, the value of Ethiopian birr depreciated by about 142 percent.

The time when the Structural Adjustment Program was introduced in Ethiopia since October 1992, the nominal exchange rate of Birr against the US Dollar had been fixed for nearly three decades, except the revaluation of 1971, 1972, and 1973 with a cumulative nominal revaluation of 17 percent. During the time such a passive exchange rate policy, together with expansive monetary and fiscal policies, led to continuous overvaluation (Alem, 1996). In spite of the fact that the rate was fixed against the dollar for this period, on the other hand, the rate was floating against all other major currencies. Afterward these all, enormous devaluation of 1992, the Ethiopian Birr has consistently been depreciating in nominal terms from year to year but yet the trade balance has been worsening. By the year 2012/13, the average nominal exchange rate raised to18.6518 Birr per US dollar (it depreciated by about 274 percent compared to 1992, 5.0 Birr per USD).

Unless it is the real devaluation, simply currency devaluation cannot accomplish the external balance adjustment objective. This objective will attain if nominal devaluation translates itself into real devaluation and if trade flows respond to relative prices in a significant and expectable way. This shows that nominal devaluation is not enough in itself to attain the export promotion and adjust external balance.

According to Reinhart (1995), devaluation has often been used by developing countries to reduce large external imbalances, correct perceived "overvaluations" of the real exchange rate, increase international competitiveness, and promote export growth. Unless it is the real devaluation, devaluation cannot accomplish these objectives or if nominal devaluation translates itself into real devaluation and if trade flows respond to relative prices in a significant and expectable way. This shows that nominal devaluation is not enough in itself to attain the export promotion and adjust external balance. Abule and Abdi (2012) found that continuous currency devaluation had no significant effect on the trade balance.

Edwards (1989) however, asserts that in theory and under most common conditions, nominal devaluation will affect an economy in three main ways. First, devaluation has an expenditure reducing effect. To this extent, due to devaluation the domestic price rises, there will be a negative wealth effect that will reduce the real value of all assets, including domestic money denominated in domestic currency. However, to the extent, there are other assets that denominated in foreign currency there may also be a positive wealth effect. If the negative wealth effect dominates positive wealth effect, expenditure on all goods (including tradable) will be reduced. A lower real value of assets will reduce expenditure on all goods. Secondly, a nominal devaluation of domestic currency may tend to have an expenditure switching effect. In this extent, it changes the relative prices of tradable goods to non-tradable goods, and in this way, it involves shifts in the pattern of domestic demand from tradable towards non-tradable goods, and the pattern of domestic production from non-tradable to tradable. The combined effect of expenditure reducing and expenditure switching the effect will, of course, improve the external situation of the country. Third, devaluation will increase the domestic price of imported intermediate goods and imported finished goods. This will increase the cost of production and results in a contraction of real output or aggregate supply, including non-tradable.

Even though economic theory suggests that devaluation of a country's currency will likely improve the trade balance, there are conflicting theories about the effect of devaluation on the trade balance. Empirical findings of Rose (1990, and Dhakal D. (1997) both suggested mixed results in certain developing countries. The nonstructural technique of the analysis revealed that the depreciation of the real exchange rate is not strongly associated with a significant improvement in the trade balance in most developing countries. The key findings empirical of BigBen O. (2010) showed that there is some limited evidence of an insignificant pass-through of exchange rate devaluation to trade balance.

Ethiopia has experienced devaluation for a long time of period in order to improve its trade balance, but instead of improving its trade balance, the export to import ratio held remain less than unity and the trade balance has worsened. Specifically, between 1985 and 2010 exchange rate was falling in value but trade balance remained to be less than unity. It is this phenomenon that motivates me to investigate the behavior of exchange rate change and trade balance in the Ethiopian economy. This study thus would intended to answer the research question and tried to achieve the objective the study by including the real money that equilibrates the money market bringing the demand for money and the supply of money that makes different from the former investigating in Ethiopia and most developing countries.

1.3 Objective of the study

1.3.1 General Objective of the Study

The general objective of the study was to examine the effect of exchange rate on trade balance and to check whether marshal learner condition holds.

1.3.2 Specific objectives of the study

To examine the relationship between exchange rate and trade balance and total values of export and import of the country

To evaluate the passing through effect of exchange rate devaluation on export and import and in turn trade balance.

To examine the trade balance response for exchange rate shock.

Whether or not real money supply matters the trade balance in Ethiopia

1.4 Research question

How the exchange rate is related to the trade balance and total values of import and export in Ethiopia?

How much exchange rate passes through to import and export via trade balance of the country?

How much trade balance responds to the exchange rate shocks of Ethiopia?

Does the real money supply matters the trade balance in Ethiopia?

Hypothesis testing of the study

Null hypothesis: There is no relationship between trade balance and the real exchange rate of Ethiopia**. Ho**: $\beta 1 = 0$. Alternative hypothesis: There is a significant relationship between the Exchange rate and Trade balance of Ethiopia. $\mathbf{H_1}$: $\beta 1 \neq 0$

1.5 Significance of the study

Quantifying the short-run and long-run responsiveness of the merchandise trade balance to exchange rate changes is important to economic policy for a number of reasons. It determines whether there is a stable long-run relationship between the exchange rate and the merchandise trade balance. If there is no such long-run relationship, then depreciating the exchange rate does not improve the country's competitiveness on the long-term. If a long-run relationship does exist, it is vital to see whether depreciation leads to the improvement of the country's trade balance.

Measuring the extent to which trade balance improvement would be desirable to weigh the trade balance benefits against costs of permanent depreciation. The estimate of the short-run dynamics provides information regarding the immediate and medium impact of exchange rate changes on the balance. The results presented may contribute to further insights into the international transmission of changes in economic activity and prices.

1.6 Scope of the study

This study has been limited only to specific country Ethiopia, and taking exchange rate and trade balance, for Ethiopia using a quarterly data set from 1995/96Q1-2017/18Q4. The study also relies on the current account part of the balance of payment through its theoretical part based on the elasticity approach, absorption approach and monetary approaches of the balance of payment.

1.7 Limitation of the study

The study has a number of limitations related to the period, availability of the data and methodology. Regarding periodicity, the study limited to quarterly data ranging from 1995/96Q1 to 2017/18Q4 because of the non-availability export and import data in the quarterly series. From the availability of data concern, a gross domestic product of Ethiopia is no found in quarter form and the study used after generating by interpolating annual data by the aid of EVIEWS10. Regards to the methodology of the investigation, the study used VECM to use the long run relationship among the real exchange rate and trade balance of Ethiopia as there is co-integration among them.

1.8 Organization of the Study

In order to investigate the impact of the real exchange rate on the trade balance of Ethiopia, the rest of the study categorized into six chapters: Having the first chapter as discussed above, the second chapter gives an overview of both the theoretical and empirical of the related literature review. The third chapter presents a brief look at the structure of and trends in exports and imports. Chapter four describes the methodology and data sources of the study. The fifth chapter presents and discusses the empirical results of this study. Finally, the sixth chapter provides concluding remarks and policy implications based on empirical findings of this study.

CHAPTER TWO

REVIEW OF THE LITERATURE

2.1 THEORETICAL REVIEW

The term trade balance is defined as the difference between the value of exports and the value of imports (Colander, 2004). It shows how a country is favored in advantage by trading in relation to other countries. The country's trade balance is said to trade surplus when the value of the export product exceeds import value; the opposite scenario is termed as trade deficit when the export value is less than import value.

2.1.1 Types and measurements of exchange rate

Exchange rate can be defined as the cost of a currency in relation to other currencies of other countries (Colander, 2004). It is defined also as the country's currency expressed in terms of another country's currency (Krugman, 2008). Exchange rate as a macroeconomic indicator plays a vital role in international trade to compare the value of products produced in various countries. Countries follow different exchange rate policy based on its own economic performance across the world. The choice of the exchange rate as said depends on the economic condition of the specific country monetary policy history, its trade openness, a major trading partner of the country and a political situation of that country (Wolf, 2002). It is the cost of a unit of foreign currency in terms of the domestic currency. There are majorly two types of exchange rate based on its theory; nominal exchange rate and real exchange rate.

Nominal exchange rate

The nominal exchange rate is a monetary concept that measures the relative price of two monies (Edwards, 1987). Others defined nominal exchange rate as the price of one currency in terms of other currency. Since two currencies are involved in the concept of the nominal exchange rate, there are two different ways of giving the quotation (Gandolfo, 2002; Keith, 2006). One is called the price quotation system and defines the exchange rate as the number of units of domestic currency per unit of foreign currency. The other one is called the volume quotation system and defines the exchange rate as the number of units of foreign currency per unit of domestic currency and is, obviously, the reciprocal of the previous one with this definition the exchange rate is the price of domestic currency in terms of foreign currency.

Real exchange rate

The other type of exchange rate is the real exchange rate which measures the relative price of foreign goods to domestic goods. It gives a measure of competitiveness, and it is a useful variable for explaining trade balance for explaining trade behavior and national income (Barry, 2004). Edwards (1987) defined the real exchange rate as the relative price of tradable to non-tradable. $\mathbf{RER} = \frac{\textbf{price of tradable goods}}{\textbf{price of nontradable goods}} = \frac{\mathbf{P^N}}{\mathbf{P^{NT}}}$

The rationale of this definition is that, in a two-sector (tradable -non-tradable) model, the balance of trade depends on $pT = pNT$ because this relative price measures the opportunity cost of domestically produced tradable goods, and the ex-ante balance of trade depends on the ex-ante excess supply of tradable. The long run PPP holds only for traded goods and the real exchange rate in the long run is a function of the relative productivity of traded to non-traded goods in the home and foreign countries (Balassa, 1964). Definition that arise is an appreciation, a convention often adopted in the field of real exchange rate (contrary to what happens with the price quotation system normally used for nominal exchange rate). A widely held opinion is that the real exchange rate should give a measure of the external competitiveness of a country's goods (if non-traded goods are also present, only tradable should be considered), but even if we so restrict the definition, it is by no means obvious which index should be taken.

2.1.2 Exchange rate Regimes

Fixed exchange rate regime

Under a fixed exchange rate regime, a country pegs its currency to a major currency commonly the US dollar. The central bank of the country has a responsibility to manage and announce the exchange rate policy. After monetary authority announces the fixed exchange rate regime it allows trading with an unlimited country at that fixed rate (Obstfeld & Rogoff, 1995). A fixed exchange rate has a number of advantages: first, it ensures stability in the economy by avoiding inflationary effects due to the variation of the exchange rate. Thereby the government can maintain a low inflation rate and in the long run, it lowers interest rate to promote investment and trade (Ghosh et al. 2002). Second, fixing at a low level will help to restrain from pressures of domestic inflation such as government budget deficit, wage, and price fluctuation.

These will inspire confidence in the strength of local currency for investors and other business organizations (Obstfeld &Rogoff, 1995). Third, a stable exchange rate will become a cause for international trade and flows of foreign direct investment since a fixed exchange rate removes exchange rate risk for traders and investors. However, a fixed exchange rate regime also has disadvantages: first, a fixed exchange rate regime marked with output volatility due to exchange rate misalignment and lack of efficient resource allocations (Ghosh et al., 1997). Second, to implement a fixed exchange rate regime a government needs to build a huge amount of foreign currency reserves. Third, the fixed exchange rate system does not solve the problem of the current account deficit.

The floating exchange rate regime

Under a floating exchange rate regime, the exchange rate is determined by the demand and supply situations in the market for foreign exchange. It is the type of exchange rate regime favored by most economists. In this type of exchange rate regime, appreciation and depreciation of domestic currency bring the balance of payment to equilibrium. Many developing countries adopted market-determined exchange rates (Huh et al., 1987). The adoption of flexible exchange rate may be due to pressure from the IMF and the World Bank. The flexible exchange rate has also advantage and disadvantage. The disadvantages of the floating exchange rate regime are the impulses from the international market causing inflation in the domestic market. Therefore, for developing countries internally inflation and the variability exchange rate harm the investment and business.

Furthermore, floating exchange rate regime affects the export earnings and cost of the import result in the trade deficit since the transaction of export and import invoiced in the currencies which moves against each other in unacceptable ways. The changes in the exchange rate can change the relative price of imports and exports. For instance, if the exchange rate is to appreciate (the value of domestic currency increase) then the price of exports will increase compared to their previous position in foreign currency, so causing a contraction in demand. In contrast, the price of imports would be relatively cheaper; this will cause extension in demand. The overall effect would be that the trade balance (exports minus imports) would deteriorate. In brief, it can be concluded that appreciation of the exchange rate causes deterioration in the trade balance whereby depreciation of the exchange rate causes improvement in the trade balance.

There are several theories and arguments to explain the impact of exchange rate changes on the trade balances here we explain few of them. In spite of the existence of a plethora of theoretical and empirical studies that have examined the relationship between exchange rate devaluation and trade balance, there are still heated debates over the impact of devaluation on trade balance both in the case of developed and developing countries (Ahmad, J. & Yang, J. 2004). One of the vital significance of this study stated above lies in understanding how the exchange rate change rate can affect the trade balance in short run and long run, in order ensure this, we need to consider the relationship among different approaches. In general, ever since the failure of the presumption of automatic adjustment of the balance of payments, three approaches have been developed to investigate the impact of exchange rate changes on the balance of payments. These are discussed one by one as follows.

2.1.3 Theories of trade Balance approach

2.1.3.1 The elasticity Approach

The elasticity approach was put forwarded by Robinson (1947) and Metzler (1948) and popularized by Krueger (1983), it says that transaction under completed contract during the devaluation may affect trade balance negatively in the short run but after a while export and import quantities to adjust. As a result, the foreign price of the devaluing country's export will reduce and it reduces the demand for import which in turn improves the trade balance in the long run. According to this theory, the effect of devaluation depends on the elasticity of exports and imports. This approach has come to known as the BRM model which is driven from the hypothesis of (Bickerdike, 1920; Robinson, 1947; Metzler, 1948). The hypothesis has put that devaluation can improve the trade balance, in the long run, has been based on the particular solution of BRM condition, known as the Marshall-Lerner condition (Marshall, 1923; Lerner,1944). The condition states that devaluation would positively affect trade balance if the absolute value sum of export and import elasticity exceeds unity.

The model has been made based on some simplifying assumptions; these are stated as follows: First, the model assumes partial equilibrium analysis – in that everything else affects the supply of and demand for foreign or domestic currency hold constant, except the change in the relative price of foreign and domestic goods results from exchange rate altering.

Next, this approach assumes that domestic and foreign prices are fixed so that changes in relative prices are caused by changes in the nominal exchange rate. The domestic price of exports, the foreign price of imports and prices of import and export substitutes are constant. With these assumptions, the condition for a devaluation to improve the trade balance which directly contributes to the improvement of the balance of payments is known as the Marshall-Lerner condition. This approach addresses one crucial question: What is the effect of a change in exchange rate on the current account? There are two direct effects of devaluation on trade balance: Either improving or worsening. According to Marshall-Lerner condition all else equal, a real exchange rate depreciation improves the current account if export and import are sufficiently elastic with respect to the real exchange rate (Krugman, P., 2006, p.p. 444).

In general, it states that the devaluation of domestic real exchange rate will improve the balance of payments on the trade balance, if the sum of the foreign price elasticity of demand for exports (η_x) and the domestic price elasticity of demand for imports (η_m) exceeds unity, in absolute value. I.e. if: $|\eta_x + \eta_m| > 1$ ----------2.1

Mathematically, it can be expressed as $B = PxX - EPmM$ ----------2.2

Where E –nominal exchange rate, Px – the domestic price of export good Pm – the foreign price of import good, X – export volume, m- import volume and B –balance of payment.

Proof: $\frac{\partial B}{\partial E} = \frac{\partial PxX}{\partial E} - \frac{\partial PEmM}{\partial E} = 0$ balance of payment is in equilibrium …….2.3

$\frac{P_x \partial X}{\partial E} - \frac{PmM \partial E}{\partial E} - \frac{\epsilon Pm \partial M}{\partial E} = 0$ ……..optimization condition……...2.4

$\frac{P_x \partial X}{\partial E} - PmM - \frac{EPm \partial M}{\partial E} = 0$

$\frac{Px \partial X}{\partial E} \frac{1}{PmM} - \frac{PmM}{PmM} - \frac{EPm \partial M}{\partial E} \frac{1}{PmM} = 0$ ……dividing both sides by P_mM ……..2.5

$\frac{PX \partial X}{\partial E} \frac{E}{EX} \frac{X}{PmM} - 1 - \frac{\partial ME}{\partial E} \frac{1}{M} = 0$

$(\frac{\partial X}{\partial E} \frac{E}{X}) \frac{XPx}{EPmM} - 1 - \frac{\partial M}{\partial EM} \frac{E}{M} = 0$ Rearranging the equation to their respective elasticity

$\eta x \frac{XPx}{EPmM} + \eta m - 1 = 0$ Since the elasticity of import is negative by theory it becomes:

$\eta x + \eta m - 1 = 0$ Hence $\frac{XP_x}{EPmM} = 1$ by applying the law of one price and hence at equilibrium

$XP_X = EP_mM \Longrightarrow XP_X = EP_mM$ …….2.6

Therefore Marshall Lerner condition may hold when the sum of the elasticity exceeds unity. Algebraically, when $\eta x + \eta m > 1$, the devaluation of the domestic currency will improve the trade balance of the devaluing country. The core message of this approach is that there are two direct effects of devaluation on trade balance one which it works to reduce and the other one works to worsen (Pugel and Lindert 2000). These are price effect and volume effect. The price effect evidently contributes to worsening of trade balance because when domestic currency devalues, exports become cheaper in foreign currency and imports would expensive in the home currency. Contradictory to this, the volume effect obviously contributes to improve the trade balance. This is due to the fact that exports become cheaper would help to increase the volume of exports and imports become expensive would lead to a decrease in the volume of imports. The net effect depends upon whether volume or price effect dominates. There is a general consensus by most economists that elasticity is lower in the short- run than in the long -run, in that case, Marshall Lerner condition may only hold in the medium to long- run. However, the Marshall Lerner condition is also indicative of stability. If the sum of the import and export demand elasticity does not exceed unity, the equilibrium is unstable and an economic model with an unstable equilibrium could be inefficient for measuring the outcome of exchange rate devaluation on trade balance.

Almost three decades after the generalization of the Marshall Lerner condition, the J-curve effect theory came into existence as it first illustrated by Magee (1973) the J- curve phenomenon reflects how a devaluation of a country's exchange rate affects its trade balance over time. Thus, it is considered as the dynamics of the Marshall Lerner condition. In the short run instantly after currency devaluation, domestic importers face inflated import prices as paid in domestic currency and hence the net export declines. Thus, the exchange rate impacts the trade balance on the time path is commonly known as "the exchange rate pass-through period." The time path through which the trade balance follows generates a phenomenon of a J-curve. The J-curve effect underlies that, in the short term export volumes and import volumes do not necessarily change with respect to a price change so that the country receives less export revenue and spends more on imports leading to deterioration in the current account balance (Solderstein, 1995). Three of the most important reasons why trade balance deteriorates in the short run are time lag both in producers and consumers response and imperfect competition. One explanation for the J-curve phenomenon is that the prices of import rise soon after real depreciation but quantities take time

to adjust downward because current imports and exports are based on orders placed some time back (Yarbough and Yarbrough, 2002). On the other hand, domestic exporters become more attractive to foreign markets but quantities do not adjust immediately for the same reason. An increase in the value of the imports against a constant or a small change in the value of exports results in a trade deficit in the short run. As time passes, importers have enough time to adjust their import quantities with respect to the rise in prices while quantity demand for exports increases and this result in an improvement in the trade balance (Kamoto, 2006). Driskell and Robert A. (1981), made a modification of the elasticity approach by incorporating income effects into the analysis. According to this study, if autonomous money expenditure remains constant, allowing for income effects does not alter the Marshall-Lerner condition for a successful devaluation, but the magnitude of the effect on the balance of payments is altered. With this effect equation (2.2) becomes; dTB = X (ηx + ηm − 1)dE ---------- (2.7)
where **s** is the propensity to save and m is the propensity to import. Since $s/(s + m)$ is a fraction, the change in the balance of payments is smaller with income effects than without income effect (becomes less stringent).

According to the same source, a seemingly contrary result was given by Harberger (1983). His models hold real expenditure constant; implying a rise in autonomous expenditure in money terms, which suggests that the income effects of devaluation alter the Marshall-Lerner condition, making it more severe. According to these models the condition for trade balance improvement becomes: $\left| \eta_m + \eta_x \right| > 1 + m_1 + m_2$ ---------- (2.8)
where m_1 is the marginal propensity to import of the devaluing country and m_2 is the marginal propensity to import of the trade partner country. Which model specification should be preferred depends on whether a successful devaluation is interpreted to mean one which improves the balance of payments with real income falling or without real income falling.

Mariana (2006) argued that besides the limitations of the partial equilibrium framework adopted by the elasticity approach, supply elasticity matter both in themselves and as a determinant of the terms of trade. What happens to expenditure (or absorption), as the terms of trade change also matter. It can be shown, for example, that if the supply elasticity of export product and import product exceeds the demand elasticity, the terms of trade will decline, and if the expenditure does not fall by as much as real income, the balance of payments will worsen.

In general, there is a highly held view that this approach made a very simplistic assumption and it is by no means certain that in practice the elasticity condition is satisfied, or that, by the time they are satisfied the competitive advantage gained by depreciation has not been eroded by the induced price rise.

2.1.3.2 The Absorption Approach

Elasticity approach is mainly criticized for being a partial equilibrium approach which it does not account for the macroeconomic effects arising from the price change leads to production fluctuation in response to currency devaluation. In fact, it only accounts for the value and volume response to price changes. Williamson (1983) criticized this approach by arguing that high import prices that caused by devaluation could stimulate domestic prices of non-tradable goods. This situation leads to a rise in inflation and potentially reduces the advantage of devaluation as a manifestation in the trade balance. Laffer (1997) and Himarious (1989) opined a similar argument that the elasticity approach is difficult to hold in real life situation. Absorption approach proposed by Alexander (1952) and Johnsen (1967) and popularized by Miles (1979) was developed to overcome some of the shortcomings of the elasticity approach discussed above. The major purpose of the absorption approach is to integrate the balance of payments with the functioning of the total economy in a general equilibrium framework, in which balance of payments disequilibrium on current account side is viewed as the outcome of the difference between production and expenditure, and/or saving and investment decision. This approach starts with the assumption that a nation's expenditures fall into four categories: consumption (C), investment (I), government expenditure (G), and net exports$(X - M)$.

Taking the national income identity: $Y = C + I + G + X - M$ ---------- (2.9) whereas C denotes consumption; I is investment, G is government expenditure, X is exports and M is imports and defining domestic absorption as $A = C + I + G$ and trade balance as $TB = X - M$ equation (2.9) can be rearranging as: $TB = Y - A$ ---------- (2.10) That is, the trade balance is the difference between income (gross domestic product) and domestic absorption (A). Alternatively, since $Y - C - G$ is savings (S); equation (2.10) can be rewritten as:$TB = S - I$ ---------- (2.11) similarly, the absorption approach can be investigated using the leakage -injection terminology (Hall wood and Macdonald, 2000).

Thus, $S + T + M = I + X + G$ and after rearrangement $(S - I) + (T - G) = X - M$, where T is tax and the other variables are as defined above. That is net national saving equals with trade balance. Within this framework, the effect of devaluation can be evaluated in terms of whether it raises income (Y) relative to the domestic absorption (A), or saving (S) relative to investment (I). Generally for the understanding of how devaluation affects the trade balance is based on the degree to which it affects national income and absorption. Policies to raise Y are termed as expenditure switching policy, and include tariffs, import quotas, export subsidies (trade barriers), and devaluation.

Policies to reduce A are termed as expenditure reducing policies and include higher taxes, lower government expenditure, higher interest rates (Hallwood and Macdonald, 2000 and Thirlwall, 2004). Taking the difference of equation (2.10) we have: $dTB = dY - dA$ ---------- (2.12) Devaluation will have direct effects on income (dY), direct effects on absorption (dA), and indirect effects on absorption working through changes in income whose magnitude depends on marginal propensity to absorb, α (determined by the propensity to consume and invest) (α dY). Thus, the change in total absorption dA is given by: $dA = \alpha\, dY + d\bar{A}$ ---------- (2.13) Where α- the marginal propensity of absorption, Ā- autonomous domestic absorption Substituting and rearranging: $dTB = dY - (\alpha\, dY + d\bar{A}) = dY(1 - \alpha) - d\bar{A}$ ----- (2.14) Since Ā is constant and $d\bar{A} = 0$, so equation (2.14) become: $dTB = dY(1 - \alpha)$ -------- (2.15)

Three factors have to be considered in the analysis of the impact of devaluation by the absorption approach revealed by Equation (2.14). These are the following factors:

(i) How does devaluation affect income?

(ii) What is the value of α, the propensity to absorb, and

(iii) How does devaluation affect absorption directly?

The Effects of devaluation on national income: There are two direct effects of devaluation on income. The first is an idle resource (less than full employment) effect and the second is a term of trade effect.

Employment effect: If there are idle resources and the providing Marshall-Lerner condition is fulfilled, income will increase depending on the degree to which the rest of the world absorbs more exports and the value of the income multiplier.

It is noteworthy, however, that even if income increases, the trade balance will only improve if the marginal propensity to absorb is less than unity i.e., $\alpha < 1$. On the other hand, if marshal learner condition is not fulfilled, then net exports would fall implying that national income falls.

The terms of trade effect (TOT): The term of trade is the ratio of the price of exports to the price of imports. Algebraically it can be expressed as Price of exports/ Price of imports=P/EP*, whereas P- is the price of export in domestic currency, P*- price of import goods in foreign currency and E- is the nominal exchange rate. Deterioration in terms of trade follows devaluation because devaluation tends to make imports more expensive in domestic currency term which is not matched by the corresponding rise in export prices. This deterioration in terms of trade lowers national income, because deterioration in terms of trade means a loss of real national income, as more units of exports have to be given to obtaining a unit of import.

However, Laursen and Metzler (undated) noted that the deterioration in terms of trade following devaluation will have two effects on absorption: the substitution effect and the income effect. While the deterioration in terms of trade lowers national income and thereby income related absorption, it also makes domestically produced goods relatively cheaper compared to foreign-produced goods, which implies a substitution effect in favor of increased consumption of domestically produced goods. If the positive substitution effect outweighs the negative income effect, Laursen –Metzler (un-dated) noted that a devaluation which results in a deterioration of terms of trade could actually lead to a rise in absorption. According to the elasticity approach, a worsening of the terms of trade will improve the trade balance if the Marshall-Lerner condition is satisfied. In the absorption approach, it depends on the magnitude of the marginal propensity of absorption (α). If $\alpha < 1$, a worsening of the terms of trade which reduces income will worsen the trade balance.

Generally, the effect of devaluation on the income of the devaluing country is ambiguous and depends on the net effects of employment effect and terms of trade effect. If there is full employment ($\Delta Y = 0$) and/or if $\alpha > 1$ and income expand, devaluation cannot be successful in improving the balance of payments unless there is a direct fall in absorption ($\Delta A < 0$).

The real income effect: Given an unchanged money stock, i.e. the case where the authorities do not alter the level of the money supply to the change in money demand, devaluation tends to raise the overall price index. This rise in price likely reduces the real value of people's money holdings. If economic agents try to restore their real money holdings, this will force economic agents to cut down direct absorption. If, however, the authorities try to respond to the increased money demand by increasing the money supply, the effects of devaluation on direct absorption will be sterilized.

The income redistribution effect: A rise in general price index resulting from devaluation is likely to have many effects on income redistribution: from fixed income groups to the rest of the economy; from wages to profits; from imported input reliant firms to exporting firms; from taxpayers to government. All these effects are plainly exposited in Pilbeam (1998) and Thriwall (2004). If devaluation /depreciation effects lead to the redistribution of income from those with the low marginal propensity to absorb to those with the high marginal propensity to absorb, this will increase direct absorption. The reverse effect lowers direct absorption.

Money illusion: It may likewise reduce real consumption, although perhaps only temporarily until agents realize that they are spending less in real terms. Finally, as discussed above the effects of devaluation are many, often conflicting, and indeterminate. It should also be noted that equations (2.14) and (2.15), which depicts the balance of payments as the difference between income and expenditure and/or savings and investment, are derived from the national income identities, and causation must never be inferred from these identities (Thriwall,2004).

2.1.3.3 The Monetary Approach

The monetary approach to devaluation analysis was pioneered by Whitman, K.Frekel, and Johnson and Carbaugh (1995). The fundamental basis of the monetary approach to the balance of payments is that the balance of payments is a monetary phenomenon and not a real phenomenon. It is argued that any disequilibrium in the balance of payments is a reflection of disequilibrium in money markets. There are three key assumptions that underlie the monetary model. These are a stable money demand function, a vertical aggregate supply schedule and purchasing power parity (Pilbeam, 1998).

The money supply of the domestic economy is made up of two components. $M_S = D + R$ where D- domestic component of the monetary base and R- the reserves held in the form of the foreign currency denominated assets. This implies that the change in money supply comes from two sources: ΔD and ΔR. $\Delta M_S = \Delta D + \Delta R$ and the money demand function is denoted as $M^D = F(Y, E)$, where M^D- money demands M^S-money supply, E-nominal exchange rate. However at equilibrium real money supply and real money demand are equal, to leave the balance of payment unchanged. A Balance of payment deficit is solely a monetary phenomenon mainly caused by excessive money supply. Currency devaluation has an impact on the balance of payment only through its effect on the real money supply. Devaluation increases the balance of payment by increasing domestic prices and thereby reducing the real money supply. Devaluation fails if they are followed by further increases in the nominal money supply that reestablish the nominal disequilibrium. The long-run effect on the trade balance is thus ambiguous. When a country devaluates currency, the real value of the money supply decreases due to the fact that the prices of traded goods and services increases in the domestic currency.

Mathematically, this can be denoted as: $\frac{MS}{P} = MD(Y, E)$ where M^S - money supply, P –price level, M^D - money demand, Y- income (output) and E – nominal exchange rate. Based on this equation devaluation in E leads to an increase in the prices of traded goods and services and decreases the real value of cash balance. The reduction in real cash balance eventually leads to a reduction in the expenditure in order to restore its holding of real money value. From this, the decline in consumptions of goods ultimately leads to a reduction in domestic absorption and hence trade balance improvement.

The elasticity and absorption approach analysis to the current account of the balance of payment did not incorporate the capital movements. Thus, the central message of the monetary approach to the balance of payment is that it takes the balance of payments as a whole (the current and capital account) and assumes that changes in international reserves are a function of disequilibrium between the supply of, and demand for, money. An excess supply of money leads to a loss of international reserves (a deficit), and an excess demand for money leads to a gain in international reserves (a surplus); and changes in the level of reserves are the mechanism by which the balance between the supply of and demand for money is restored and the balance of payment is equilibrated.

The monetary approach argues that currency depreciation can only be successful if it increases the nominal demand for money relative to the supply, with the proportion of the price level rises, or by reducing the real supply of money in relation to the real demand (Thirlwall, 2004). Quoting the same author "Johnson (1977) once asserted 'all balance of payments disequilibria are monetary in essence. So-called "structural" deficits or surpluses simply cannot exist'. The IMF, which is heavily 'monetarist' in its thinking, rationalizes devaluation not only in terms of its encouragement to supply more traded goods but also within this monetary approach, by devaluation reducing the real value of the money supply."

The theme of the monetary approach is that exchange rate changes are viewed as incapable of bringing about a dynamic change in the balance of payments. The monetary approach emphasizes that devaluation will have only a transitory beneficial effect on the balance of payments, so as long as the authorities do not simultaneously engage in expansionary open market operation. As already stated above, exchange rate change operates strictly by causing disequilibrium in the money market, causing a deficit or surplus in the balance of payments which continues only until equilibrium is restored in the money market via reserve changes.

According to Thirlwall (2004), why the monetary approach to the balance of payments has died a slow death are two reasons. First, strictly speaking, the model assumes fixed exchange rates with changes in the excess supply/demand for money affecting the level of reserves, whereas since 1972 the world has been on floating exchange rates under which the balance of payments is supposed to look after itself (at least if the floating is 'clean') so that there is no need for reserves. The supply and demand for money determine the exchange rate and not the balance of payments. Second**,** this is the very important, reason concerns the assumptions on which the monetary approach is based, which have come to be seen as totally unreal in the changing and volatile conditions of the world economy over the past few years. The first major assumption is that deficits can only arise if there is disequilibrium in the money market. This assumption, as in the absorption approach, is also derived from an identity. In this case, the identity is Walras law that in the model of only two assets, money and goods, an excess demand for goods (i.e. a balance of payments deficit) must mean an excess supply of money.

Apart from the confusion between planned expenditure and actual expenditure, the limitations of the model are obvious when it is prolonged to many assets, with disequilibrium in the capital market or any other market as the source of disequilibrium, combined with ex-ante equilibrium in the money market. Another weak assumption is that there is no sterilization of reserve movements by the monetary authorities through open market operations so that the money supply always falls as reserves fall, and rises as reserves rise. This assumption simply states that the volume of the money supply is positively related and is the function of the reserve. If there is sterilization of reserve movements, there cannot be a one-to-one relationship between the money supply and reserve movements.

2.2. Empirical literature of the related review

Many researches, both cross-country panel regressions and econometric models applied to specific countries, have been conducted to show how exchange rate changes affect the trade balance of both developing and developed countries. In spite the facts, the evidence of both theoretical and empirical into the effect of exchange rate on the trade balance, there is still considerable disagreement concerning the relationships between them and the effectiveness of currency devaluation as a tool for increasing a country's balance of trade (Onafowora, 2003). Existing empirical analyses show mixed results of how exchange rate change affects the trade balance. The following empirical works clearly show these facts as presented in Sugman (2005) and it states that “Amongst 30 countries studied.

Baharumshah (2001) has employed an unrestricted VAR model for bilateral trade of Thailand and Malaysia with USA and Japan for the period of 1980to 1996 and he found the existence of a stable and positive long-run relationship between trade balance and exchange rate.

Similarly, the empirical study by Agbola (2004), by using the Johansen multivariate cointegration procedure and the Stock-Watson dynamic Ordinary Least Square model (DOLS), revealed that devaluation did not improve the trade balance of Ghana.

Contrary to this, Sugman's (2005) investigated the effects of real exchange rate on the trade balance of Indonesia which exposes depreciation of currency improvement in trade.

The study by Rawlins and Praveen (2000), examined the impact of devaluation on trade balance of a sample of 19 countries in Sub-Saharan Africa by specifying and estimating an Almon Distributed lag process of trade balance using annual data. Their finding showed in no case did real exchange rates revert to their pre-devaluation levels and real exchange rate depreciation did improve a country's trade balance in the year of the devaluation.

Rincon (1998) used both the absorption and monetary approach to analyze the short run and long run relationship of the exchange rate and balance of trade in Columbia. Applying the Johansen co-integration and Vector Error Correction Model (VECM) as econometric techniques, the study revealed that, effects of exchange rate on Columbia's trade balance was insignificant in both short run and long run periods.

A study by Shao (2007), on the Exchange Rate Changes and Trade Balance: An Empirical Study of the Case of Japan by Johansen co-integration using quarterly data from 1980Q1 to 2006Q4. According to this finding, the final effect of the exchange rate changes on the trade balance is undetermined in the long run while it induces trade surplus in the short term.

Ogundipe, et al (2013) have worked on estimating the long run effects of exchange rate devaluation on the trade balance of Nigeria, using the Johansen cointegration and variance decomposition analyses from 1970-2010. The empirical results indicate that there exists a long-run stationary relationship between trade balance and exchange rate. His finding insists that devaluation of the exchange rate worsens the trade balance of Nigeria in the long run.

Akpansung and Babalola (2013), examined the effects of real exchange rate on trade balance in Nigeria using a vector error correction model (VECM) and the model has two co-integrating equations. They hypothesized that trade balance is negatively related to the real exchange rate but insignificant relationship between trade balance and real exchange rate.

Mai (2014) examined the impact of the real exchange rate to trade balance of Vietnam by using monthly data from Jan 2008 to Jan 2012. His finding indicates that there is no evidence of a relationship among real effective exchange rate, trade balance, and domestic output. The J-curve pattern is invalid for the case of Vietnam and the depreciation of real exchange rate in Vietnam impacts negatively on the trade balance and the real exchange rate does not comprise significantly in determining the variations of the trade balance.

Musawa (2014) has investigated the relationship between Zambia's exchange rates and the trade balance. The hypothesis for the research was that there is no evidence of the long run and short run relationship between Real Exchange Rates and the Trade Balance in Zambia.

Alhannom (2016), determinants of trade balance in Jordan by bound cointegration test using autoregressive distributive lag model (ARDL). The empirical investigation, using the ARDL bounds test shows that real exchange rate is an insignificant determinant of trade balance in either the short or long run.

Selena and Sead (2018) have worked on the adverse effect of real effective exchange rate change on trade balance in European transition countries by using fixed effect model for static and generalised method of moments for dynamic estimation. Their finding reveals that there is an adverse effect of the REER on trade balance in European transition countries over the period 2000-2015. Namely, depreciation of REER deteriorates trade balance in European transition countries, which could be explained by high import dependence and low export capacity.

According to Reinhart (1995), devaluation has often been used by developing countries to reduce large external imbalances, correct perceived "overvaluations" of the real exchange rate, increase international competitiveness, and promote export growth.

2.2.1 Reviews of empirical evidence in Ethiopia

Many empirical investigations have been conducted in Ethiopia focused on the nexus between trade balance and exchange rate. Most of these studies concluded that the currency y devaluation has an adverse effect on the trade balance, while in some case others found that devaluation has positive affect the trade balance. Still, there is a debate on whether currency devaluation improves or worsens the current account of the country in the long run.

However, Haile (2018) worked on the impact of devaluation on the trade balance of Ethiopia using annual data ranging from 1980 to 2003. In his analysis, the demand for export and demand for imports are estimated using the ordinary least square (OLS) and instrumental variable respectively. He also employed a co-integration approach and error correction model and finally concluded that the devaluation of currency worsens trade balance of Ethiopia.

Lulit (2011) examined the impact of exchange rate on the trade balance of Ethiopia using two approaches. First, using the original elasticity model and second, employing a modified version by incorporating other sources of income such as Official Developmental Assistance (ODA) and remittances. The Ordinary Least Squares (OLS) econometric procedure is used for data analysis. The main conclusion of this study is that currency devaluation does not have an impact on improving the Ethiopian trade balance. This is due to other means of income inflows, such as ODA and Remittances; counteract the intended positive effect of devaluation.

Samuel and Tarekegn (2011) investigated on how to narrow the widening trade deficit of Ethiopia. The study did not apply econometric technique rather desk and field research methods are used to analyze the data. Their finding points out options to narrow the trade deficit, like a transformation of the export of primary commodities into export of high value-added manufactured products through the development of proper upgrading strategies and introduction of new import substituting commodities and increasing the production volume and the competitiveness of existing domestic manufacturing industries.

Kebede (2011) investigated the role of the real exchange rate in the aggregate exports of Ethiopia and examined the extent to which the real exchange rate shapes the commodity-specific exports of the country. He employed a Gravity model and from his analysis, he found out that the export of Ethiopia is highly dependent on the economic growth of Ethiopia and the GDP of countries who import Ethiopian products. From the Gravity model, the effect of the exchange rate was found to be statistically insignificant. Which means the change in exchange rate either it can be devaluation or revaluation in Ethiopia has nothing to do on Ethiopia's export.

Similarly, Endale (2012) conducted research on the impact of exchange rate devaluation on the trade balance using annual data from 1976-2012 in Ethiopia and his finding showed that Ethiopian export has a low response for exchange rate rise when compared with import, the increase in domestic currency is not sufficient to improve the trade balance.

A Study took place by Fikreyesus and Menasbo (2012), conducted research on the effect of Birr devaluation on the trade balance of Ethiopia using 30 years of time series data. Descriptive analysis and econometrics regression were employed as analytical tools. Based on OLS estimates they found that real GDP and Real Effective Exchange Rate Index were positively correlated with Ethiopia's trade balance while currency devaluation (dummy) was negatively correlated

with trade balance. In Their finding is that currency devaluation may not improve trade balance so they recommended a need to introduce import substitutions and export-oriented strategy of industrialization scheme so as to improve the country's competitiveness on the external world and to correct trade balance deficit.

Lencho, (2013) conducted his work, on the effect of exchange rate movement on the trade balance in Ethiopia. Accordingly, he found that, in the long run, depreciation of currency succeeds in improving the trade balance deficit of Ethiopia. Similarly, the short run dynamic error correction model indicated that changes in the trade balance in the short run is explained by changes in Real Effective Exchange rate and by two years lagged changes in the same variable.

Abebe (2014) investigated on the trade balance and exchange rate relationship in Ethiopia using VAR and VECM methodology and he suggests that the trade balance of Ethiopia after real depreciation of currency follows a J-curve pattern. The study found that real depreciation deteriorates trade balance in the first three years ("short run") and later on it improves the balance of trade. The forecast error variance decomposition for each variable reveals the proposition of the movement due to its own shock and shocks of other variables. The variance decomposition of trade balance exhibit that a change in its shock is the predominant source of variation in the logarithm of the trade balance.

A study conducted by Zelalem (2014) analyzed the relationship between exchange rate and trade balance of Ethiopia using co-integration technique and annual data from 1974/75 to 2011/12. The study conducted Zivot-Andrews and Perron unit root test with structural break and Gregory-Hansen structural break co-integration test besides the conventional unit root and cointegration tests. The co-integration tests revealed that there is a long-run relationship among variables; however, estimation results indicated that the sign of real effective exchange rate is positive and it is insignificant which confirms against Marshal-Learner condition.

Alemayehu (2014), write on Why is the World Bank Bothering the Government of Ethiopia on Devaluation?, and argued that Ethiopian imposts are what can be described as strategic imports which are not amenable for reduction because they will be expensive in local currency following the advised devaluation. The breakdown of our imports shows that about 70% of our imports are capital & intermediate goods.

The long-run trade balance equation regression results were estimated by using OLS estimation method and empirical results indicate that, in the long run, there is a positive relationship between the real exchange rate depreciation and trade balance.

The study by Kassie (2015), Assessment on Real Effective Exchange Rate and External Sector Development of Ethiopia and the paper tried to assess the movement of real effective exchange rate and external sector development such as export, import & trade balance of Ethiopia using descriptive analysis to incorporate the two major devaluation period from the year 1985/86 to 2012/13. The result revealed that the depreciation of the real effective exchange rate improves the export performance however it doesn't discourage our import. A result even if there is a higher growth of export after depreciation of the real effective exchange rate since the growth rate of imports outweighs, there is no improvement in the trade balance account.

Yigermal (2018) investigated the devaluation, balance of payment and output dynamics in developing countries a case of Ethiopia the channels through which the exchange rate to other macro variables. He employed both structural VAR and vector error correction (VECM) models. In his analysis, he found that devaluation deteriorates the balance of payment of Ethiopia.

Based on the above-related literature both theoretical and empirical, most findings of the empirical evidence on the relationship between exchange rate and trade balance reveals that devaluation of ETB has worsened the trade balance of the country instead of improving it. This scenario motivates me to conduct research by including the real money balance which is based on the monetary approach of the balance of payment says the disequilibrium in the balance of payment is due to the disequilibrium in the money market. Thus, the researcher employed, the vector error correction model (VECM) to show the long-run effect of real effective exchange rate on the trade balance. Therefore, in this study, the inclusion of real money balance makes different from other researchers and the recent devaluation of 2017/18 has been included in this study.

CHAPTER THREE

OVERVIEWS, STRUCTURES AND TRENDS OF EXPORT AND IMPORT

3.1 Snapshot of exchange rate regimes and development in Ethiopia

Different countries use various exchange rate regimes and experienced with different types of exchange rate arrangements within which since the emergence of the international Gold Standard in 1987 to the emergence of the floating exchange rate in 1973. The success or the failure of different exchange rate regimes depends historically on the severity of the shocks with which those systems have had a couple (Pugel and Linbert, 2000).

When we come to the Ethiopian exchange rate regime the country experienced only two major exchange rate regimes. These are before 1992 during the fixed exchange rate regimes where Ethiopian Birr was pegged into USD and after 1992 in floating exchange rate regimes. After the issuance of Ethiopian legal currency, as one of the founding member, dedicated itself to the IMF agreement article under which each currency assigned a central parity against USD and allowed to fluctuate by plus or minus 1percent of that parity. Along with this parity, countries were allowed to revalue or devalue their currency only if there is a case of 'fundamental disequilibria' (Felleke, 1994).

The country's currency legal tender was issued on 23 July 1945, defining its monetary unit as Ethiopian dollar (E$) by a value of 5.52 grains which is equivalent to 0.355745 grams of fine gold and replaced the Maria Theresa which had been circulating as legal tender. The fine gold was linked accord with the monetary system established by the Bretton Woods agreement of 1944. This arrangement automatically creates the exchange rate between the national currency and the other country's currency with the same arrangement. Accordingly, the Ethiopian currency official exchange rate established with the US dollar with the official exchange rate of 2.48 Birr per USD dollar on July 23, 1945. After about two decades in January 1964, the Ethiopian Birr was slightly devalued to 2.5 Birr per US dollar.

In 1971, following the down break of the Bretton Woods System and the establishment of floating of dollar and ceasing of its convertibility to gold, the Birr was revalued to 2.30 Birr per US dollar (i.e. by 8.75%) on 21 December 1971.

The subsequent 10% devaluation of the US dollar had temporarily brought about the undervaluation of the Birr. To realign the Ethiopian Birr, it was again revalued to 2.07 Birr per US dollar in February 1973. This fixed official exchange rate was left unchanged for two decades despite the floating of the major world currencies including the US dollar (Befekadu, 1991; Derrese, 2001).

According to Haile Kibret (1994), Asmerom Kidane (1994), Equar Dasta (2001), Alem Abraha (1996)), consequently, due to the fixation of this exchange rate, ETB became over-valued in terms of the US dollar and other foreign currencies. This overvaluation of Birr had an adverse effect on national economic performance such as allocation of resources, international competitiveness, and development of a parallel market for foreign exchange and cross border trade. Knowing these facts from the above empiricism, the great devaluation of 1992 took place. As a consequence of this devaluation in striving to liberalize the foreign exchange market, the national bank has taken numerous initiatives. Accordingly, for foreign exchange, the fortnightly auction market was introduced on May 1, 1993, with two rates, the Dutch auction system (official rate) and marginal pricing auction system (marginal rate). These rates were unified in July 1995.

Fortnightly auction market was changed to weekly to accommodate the growing demand for the foreign exchange rate in August 1996. As a result commercial banks were also allowed to establish foreign exchange rate Bureaus. The retail auction system was replaced by a wholesale system in September 1998. Again by this year, the interbank foreign exchange market was introduced started work alongside with the auction system until October 25, 2001, when the daily interbank has fully replaced wholesale auction system (Deresse, 2001). Now a day, the official exchange rate is made in the daily inter-bank foreign exchange market as the weighted average exchange rate predominant on the .prior day.

During the fourth quarter of the 2017/18, the REER of Birr depreciated by 5.9 percent on annual basis mainly due to the 15 percent devaluation of the Birr in October 2017 (National bank of Ethiopia,vol 34). On quarterly basis however, REER reach a 6.2 percent appreciation as the effect of devaluation died out. The appreciation of on REER on quarterly basis was ascribed to the rising of domestic inflation relative to that of Ethiopia’s major trading partners.

The end period exchange rate of the Birr was 27.2493/USD, indicating the weakening of Birr against USD by 18 percent on account of NBE's decision to devalue the Birr by 15 percent on October 11, 2017.

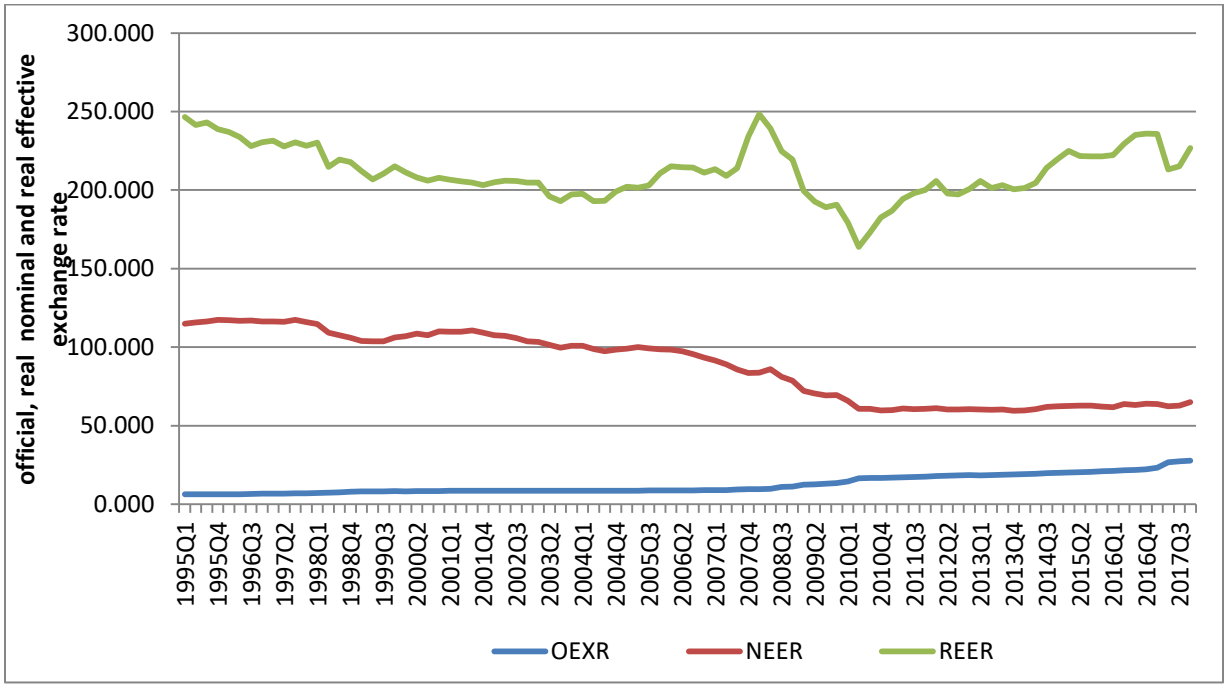
3.2 Trends and structure of exchange rate and devaluation in Ethiopia

Economic theories hypothesis that if nominal devaluation translated itself into real devaluation, the trade balance of a nation is likely improved through import and export effects. This hypothesis implies that the real exchange rate is considered as the measure of international trade competitiveness. It follows according to this argument that a reduction in the real value of one country's currency improves international trade competitiveness by making relatively the value of export cheaper. It is also believed that due to the gain international competitiveness the volume of production shifts from non-tradable to tradable and shifts trade from illegal to legal. As a consequence import becomes expensive and the combined effect of these things leads to the improvement of trade competitiveness and discourage import is expected to improve the trade balance. By doing so, in this study I have seen whether Ethiopia's trade experiences this postulate.

To grasp the applicability of this notion it is very important to examine the impact of the changes in the real exchange rate with Ethiopia's trade partners on export and import and in turn on the trade balance. According to its general definition, an increase in real effective exchange rate implies depreciation and it likely enhances the international trade competitiveness of a country, setting the relative price kept constant.

In a restricted or rationed market for foreign exchange, however changes in the (real) exchange rate need not result in a reduction in imports Dorosh et al (2009). This is because, in a ration regime, the demand for foreign exchange for imports at the official exchange rate exceeds total supply of foreign exchange equal to export (and current account transfer) earnings plus the available foreign exchange from capital inflows and reserve decrease results in an unmet demand for foreign exchange at the official exchange rate. The real effective exchange rate trend with other indicators is plotted in the following figure 3.1 below. The figure shows the official exchange rate, nominal effective exchange rate (NEER) and real effective exchange rate (REER) indices as plotted below.

Figure 3.1 *Movements in the official, Real and Nominal Effective Exchange*



Source: national bank of Ethiopia and own computation using EVIEWS 10

Figure 3.1 shows the official exchange rate is strictly increasing (the home currency per foreign currency devalued) regularly. While it increases from 1995/6Q1 to 2010/11Q1 slowly, it increases by a large amount from 2010/11Q1 to 2017/18Q4. On the other side, the nominal effective exchange rate remains the same from 1995/6Q1 to 1997/98Q4 and increases slowly from 1997/98Q4 to 2000/1Q4. From 2008/9Q1 to 2010Q2, the nominal effective exchange rate declines by a large amount. Finally, the real effective exchange rate remains the same relatively from 1995/6Q1 to 2007/8Q2. It increases strictly from 2007/8Q3 to 2008/9Q1. Starting from 2008/9Q1 to 2010/11Q2 it declined strictly and finally, it increases and increases by a relatively small amount. In 2016/17 the real effective exchange rate declines quickly while in 2017/18Q2 it increases slowly. The real effective exchange rate trends move up and down due to the price movement due to the devaluation of the currency. This is because the real effective exchange rate is a measure of the value of a domestic currency against a weighted average of several foreign currencies divided by a price deflator or index of costs.

3.3 The Structure and Trends of Exports and Imports of Ethiopia

The major components of Ethiopian export and import and their performance would be discussed as mentioned below over the period of 1995Q1 to 2017Q4. The performance of export and import of the country would be assessed on the basis of their average values for the periods of 1995 to 2005 and the last ten years from 2007 to 2017. It is evident that Ethiopia's trade is characterized by highly dependent on the agricultural commodity and almost a single commodity (coffee) dependent no commodity diversification on export side whilst import items are highly based on capital and consumer goods and also highly related to geographical concentration, there is no market diversification to and from a particular destination (Lencho, 2011). From this fact, there has been a widely held view that it is obviously such commodity and geographical concentration which causes the export earning in fewer developing countries like our country Ethiopia.

Such problem leads to the country's economic performance to external shocks and any shocks affect one or two of these commodities which cause a huge fluctuate in export volumes, values or both. This fluctuation is emanated from factors like bad weather conditions, production or marketing problems, international price shock. This situation unquestionably urges that the commodities and markets diversification encourage export earnings. It is the known fact Ethiopia's export is dominated by only certain agricultural commodities such as coffee, leather products, chat, pulses, live animals, and oilseed.

In the 2000s eleven items (coffee, petroleum products, oil seeds, leather products, pulses, meat products, fruit and vegetables, live animals, chat, gold and flower) accounts about1.96% of total gross domestic product. For a long time, there has been a heavy reliance of export performance on coffee which accounts 46.01 %, 37.67%, 32.00%, 26.57% on average over last fifteen years in 2000/1, 2005/6, 2010/11, 2015/16 respectively as shown in table 3.1 below. In 2017 the percentage of coffee from the total export held about 32.09 after some shocks in 2015 when coffee export has been fallen from 32.00 to 26.57%. In this analysis, the table revealed that the share of these major export items in GDP is 8.99% and 3.74% in 2015 and in 2017 respectively.

Table 3.1 *Average values of export earnings by major commodities (in millions of Birr) annually*

Period	2000	%share	2005	%share	2010	%share	2015	%share	2017	%share
Coffee	116.93	46.01	236.65	37.67	1047.53	32.00	1174.40	26.57	1684.1	32.09
Oil seeds	20.73	8.16	141.17	22.47	406.38	12.41	775.13	17.54	860.68	16.40
Lather products	48.75	19.19	50.10	7.97	130.01	3.97	186.46	4.22	265.83	5.07
Pulse	5.6	2.20	24.68	3.93	171.74	5.24	375.92	8.50	548.02	10.4
Mat products	1.10	0.43	12.37	1.97	78.82	2.40	155.88	3.53	204.76	3.90
Fruits and vegetables	3.51	1.38	8.81	1.40	39.43	1.20	86.77	1.96	123.35	2.35
Gold	18.07	7.11	43.24	6.88	580.04	17.72	470.24	10.64	200.44	3.82
Live animals	0.11	0.046	18.40	2.93	183.63	5.61	237.73	5.38	118.39	2.26
Chat	39.27	15.45	59.50	9.46	295.09	9.01	423.99	9.60	529.40	10.08
Cotton	Na	Na	4.57	0.72	0.66	0.02	0.01	2.01	10.80	0.21
Textile products	Na	Na	7.31	1.16	76.93	2.35	125.69	2.84	207.33	3.95
Follower	Na	Na	14.54	2.31	218.90	6.68	364.45	8.24	460.16	8.77
Other	Na	Na	6.86	1.09	43.63	1.33	43.55	0.98	33.94	0.65
Total	254.09	100	628.21	100	3272.83	100	4420.24	100	5247.2	100
Export in GDP %ge	1.96%		2.08%		3.63%		8.99%		3.74%	

Source: national bank of Ethiopia and own computation Na = not available

From the annual description, the major commodity that accounts about half of the total export is coffee. As the above figure showed, in the first five years, coffee export declines from 46.01% to 37.67% of the total export from 2000 to 2005. Following the 2010 devaluation, both coffee and total export showed a negative response of 32% to 26.57% to the devaluation in the first five years. Similar to this, there is evidence as to the report of Ethiopian economy by Ethiopian economic association 2011/12; the overall performance of the export sector has been weak for the past four decades due to the low export/GDP ratio and declining percentage share of export. But after fifteen years, it begins to rise from 26.57% to 32.09% in 2017, as shown in the above figure. Therefore, the increment of coffee export after fifteen years did not offset the reduction of the coffee export in the first fifteen years and thus the overall export performance is low in the major export item like coffee.

Table 3. 2 The average value of export earnings by major commodities (in millions) quarterly

Period	2017/18				2018/19	
	QI		QIV		QI	
	Amount A	%share	Amount B	%share	Amount C	%share
Coffee	215.6	31.8	278.1	37.0	204.4	32.6
Oil seeds	75.0	11.1	69.8	9.3	58.2	9.3
Leather and leather products	33.1	4.9	34.8	4.6	33.3	5.3
Pulses	45.9	6.8	70.1	9.3	43.5	6.9
Meat and products	24.2	3.6	31.2	4.2	24.2	3.9
Fruits & vegetables	15.6	2.3	16.0	2.1	14.8	2.4
Live animals	30.1	4.4	15.1	2.0	14.6	2.3
Chat	63.6	9.4	70.3	9.3	78.8	12.5
Gold(birr/kg)	28.6	4.2	6.7	0.9	15.7	2.5
Flower	54.5	8.0	59.3	7.9	52.9	8.4
Electricity	22.3	3.3	28.6	3.8	16.7	2.7
Others	69.9	10.3	72.5	9.6	70.9	11.3
Total export	678.5	100	752.5	100	628.0	100
Total export excluding electricity	656.2		723.9		611.4	

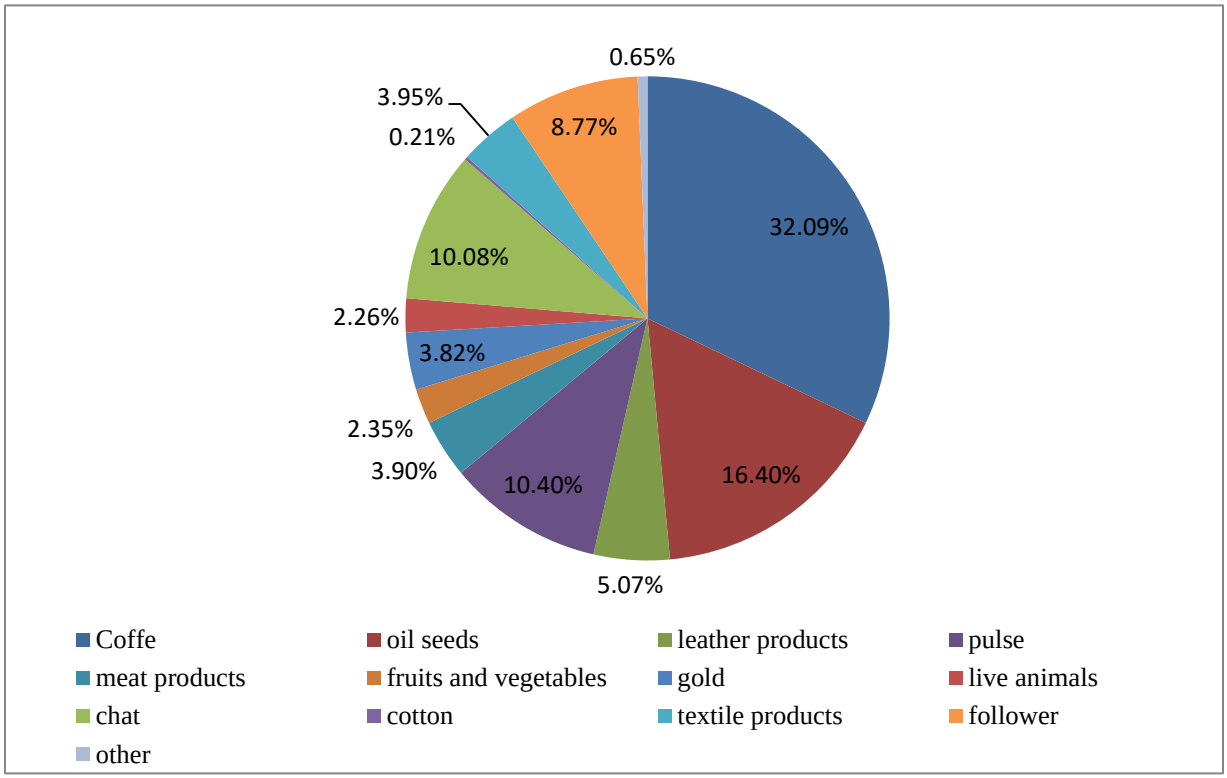
Source: National bank of ethiopia and own computation

Looking at the above figure the contribution of coffee to export is 31.8% and its contribution to GDP is 3.9% in 2017Q1 and 4.2% of GDP in 2017Q4. This indicates that the share of coffee and non-coffee increasing and decreasing respectively partly because of the rise of earning from coffee export in these periods. However, in the 2018/19Q1, the share of coffee export decline to 32.6% of total export and in this indicates that the earning from coffee export decrease due to a shortage of coffee product in this period. In these, the same periods the second largest export next to coffee is oilseeds it accounts for about 11.1% and 9.3% of export in 2017Q1 and 2017Q4 respectively by taking over chat and flower in 2017Q1.

The shares of other commodities such as pulses, leather, and meat have also been gradually increasing as the share of these commodities export improves. Other commodities such as fruits and vegetables and other commodities are among the products which have been showing a considerable increase in the value of export. This shows the exertion of the country to end the single commodity domination over other export commodities and it indicates that market and commodity diversification shortage.

In the first quarter of 2017/18 and in the fourth quarter of 2017/18 there was an improvement in export performance and in the first quarter of 2018/19 both coffee export and total export.

Figure 3.2 ***the percentage share of major commodities of export***



Source national bank of Ethiopia and own computation

Share of the major commodities of export

From the above pie chart, the major export commodity as explained in the above table is coffee and it comprises about 32.09%. The second major export commodity is oilseeds by 16.40%. Accordingly, the next major export commodities are pulse, chat, follower and so on respectively.

On the other hand gold, meat products and live animal contains a small export commodity of about 0.21%, 0.65%, and 2.26% respectively. Therefore as strived to explain in theory the major export commodity of Ethiopia is based on agricultural products and the trade balance of the country indirectly depends on the natural vagaries.

When we come to the structure of imports, it essentially remained the same for the period under consideration. In the 1980s, 1990s and the last ten years, capital goods and consumer goods together contributed for an average of more than 63% of total import which indicates heavy reliance on imported capital and consumer goods. It can be observed from (Table 3.2) that on average the shares of raw materials and capital goods are falling while that of consumer goods and semi-finished goods are rising and that of fuel has more or less remained constant. The share of import in GDP has consistently been increasing ever since 1991/92.

Table 3. 3 Average values of major import commodities

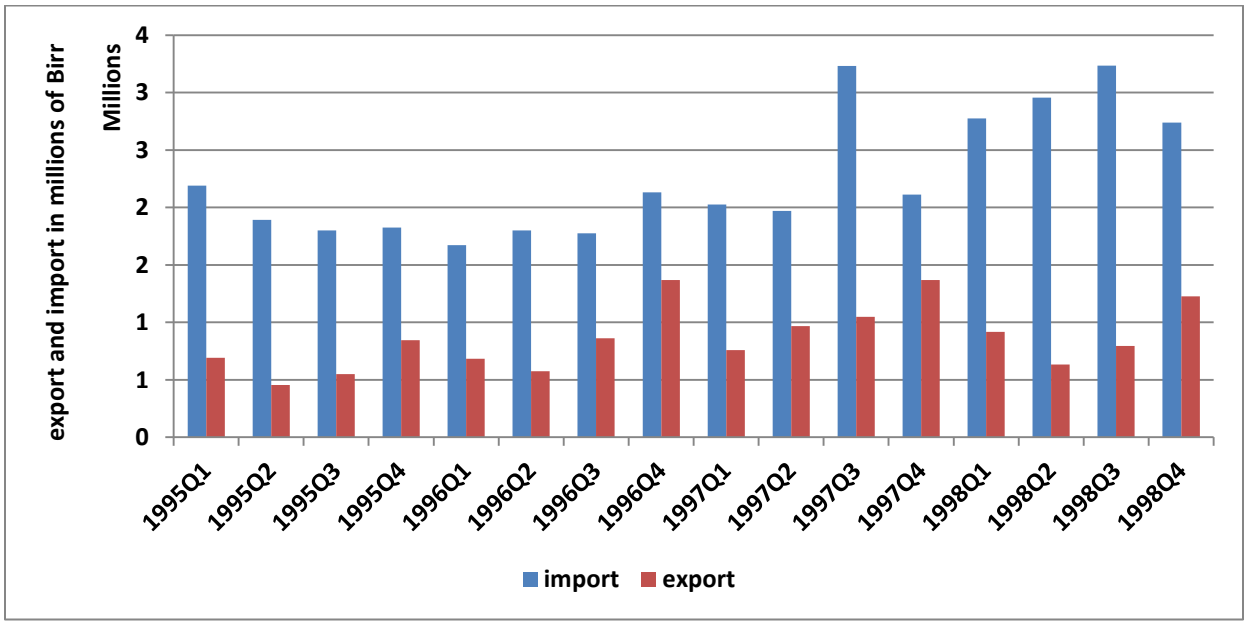
Goods category	2000/1	%share	2005/6	%share	2010/11	%share	2015/16	%share	2017/18	%share
Raw materials	**33.17833**	**1.61**	**111.75**	**1.681**	**499.55**	**2.31**	**524.54**	**0.892**	**602.97**	**0.911**
Semi-finished goods	**328.31**	**15.99**	**1188.82**	**17.88**	**3333.37**	**15.42**	**10201.29**	**17.34**	**10944.84**	**16.53**
Fuels	**363.45**	**17.70**	**1245.4**	**18.74**	**3837.493**	**17.75**	**4707.723**	**8.001**	**10168.99**	**15.36**
Capital goods	**617.4867**	**30.08727528**	**2102.35**	**31.63**	**7442.798**	**34.43**	**23990.58**	**40.78**	**22780.68**	**34.41**
Consumer goods	**649.58**	**31.6513**	**1854.64**	**27.90**	**6150.272**	**28.45**	**18538.12**	**31.51**	**20428.68**	**30.86**
Miscellaneous	**60.29**	**2.937**	**142.52**	**2.144**	**352.0717**	**1.62**	**873.3867**	**1.484**	**1259.73**	**1.90**
Total import	**2052.3**	**100**	**6645.51**	**100**	**21615.56**	**100**	**58835.64**	**100**	**66185.91**	**100**
Import in GDP		**6.3294**		**8.964**		**20.19**		**36.26**		**22.11**

Source: National bank of Ethiopia and own computation

The import structure of Ethiopia as discussed in the above figure shows that the major import volume of the country is capital good in each period. In the first five years, the percentage share of import to GDP raises from 6.32% to 8.96%. In Ethiopia obviously, there was a devaluation of birr in 2010 and following this devaluation the percentage share of import to GDP was strictly increased from 20.19% to 22.11%. However, as the theory states after certain years, it came down from 40.67% to 34.41% in 2017.

Structure of export and import from 1995Q1 to 1998Q4

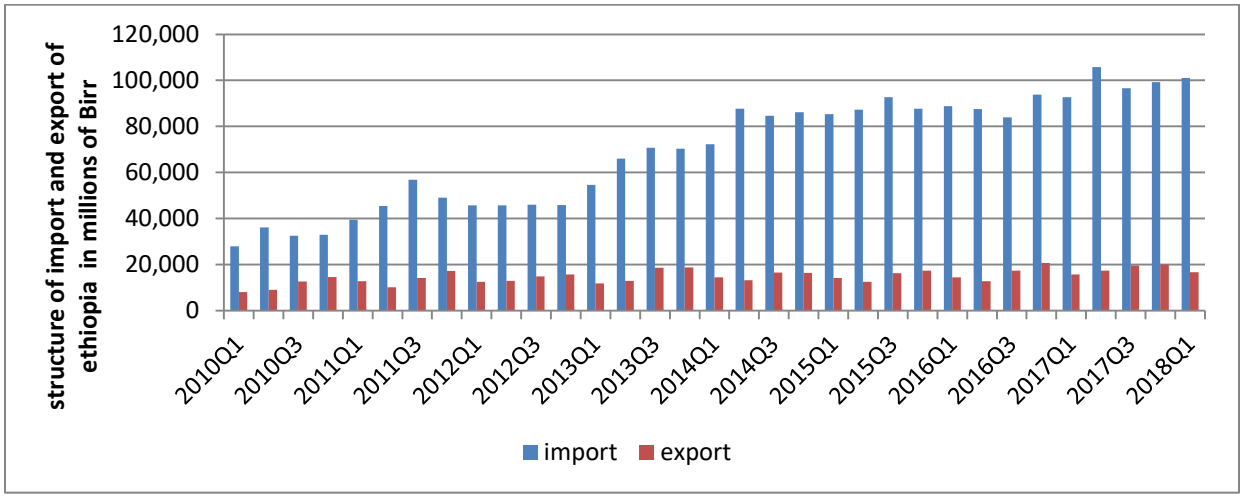
Figure 3 3 Export and import performance between 1995Q1 and 1998Q4



Grasping from the figure above the import of the country goes almost approaches to the same volume whereas the export highly declines and increase from 1995Q1 to 1997Q2.in 1997Q3 the import increases by large amount and the export of the country remain the same as it was in 1997Q2, as a result, the trade balance of the country deteriorated as the difference between import and export negatively diverge from each other. Even though, the devaluation of 1992 has been for encouraging the export and improving trade balance, but the structure of the economy performance indicates that import of the country strictly increases while the export performance remains the same from period to period and no question that the trade balance of the country has been long persisting in deficit. The import and export structure holds true the same from the third quarter of 1997 to the late quarter of 1998.

The structure of Export and import from 2010Q1 to 2018Q1

Figure 3 4 Export and import performance Ethiopia between 2010Q1 and 2018Q1

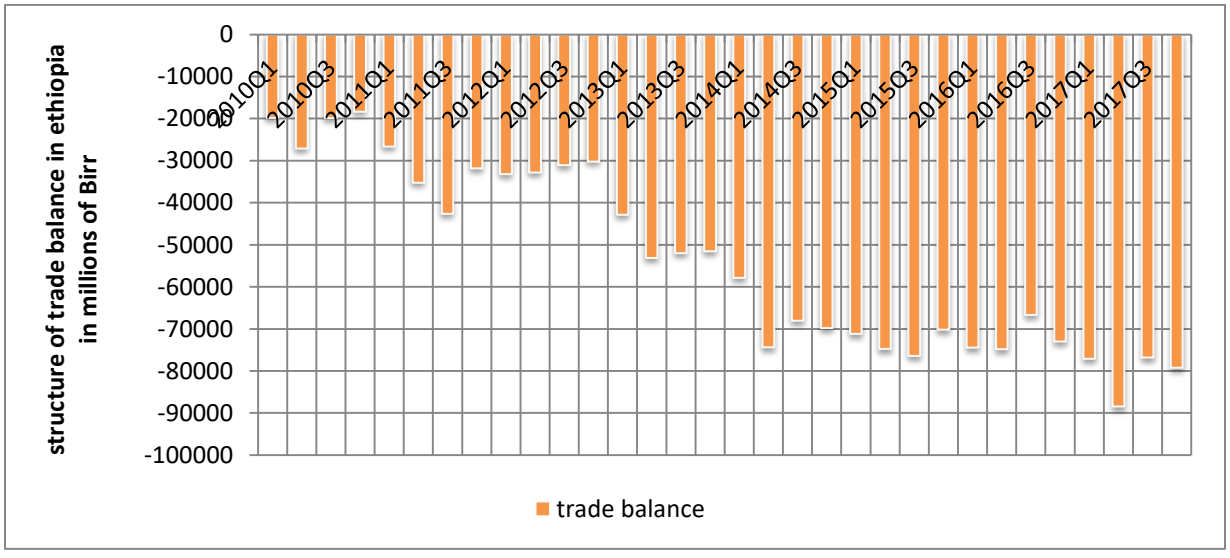


Source: National bank of Ethiopia

Ethiopia has also undertaken devaluation of her currency in 2010 for the same purpose of boosting export, but after devaluation took places the data reveals that import volume of the country accelerates positively as the export performance again closest to the same from 2010 to 2011Q4. Not only that, the country continued to undertake devaluation in 2017 yet for the same purpose but data revealed that the growth of import increases while there is steady in the growth export from 2017Q1 to 2018Q1 it this situation that makes the deterioration of the balance of trade through the whole period. The following figure reflects the structure of the trade balance.

The structure of trade balance from 2010Q1 to 2017Q4

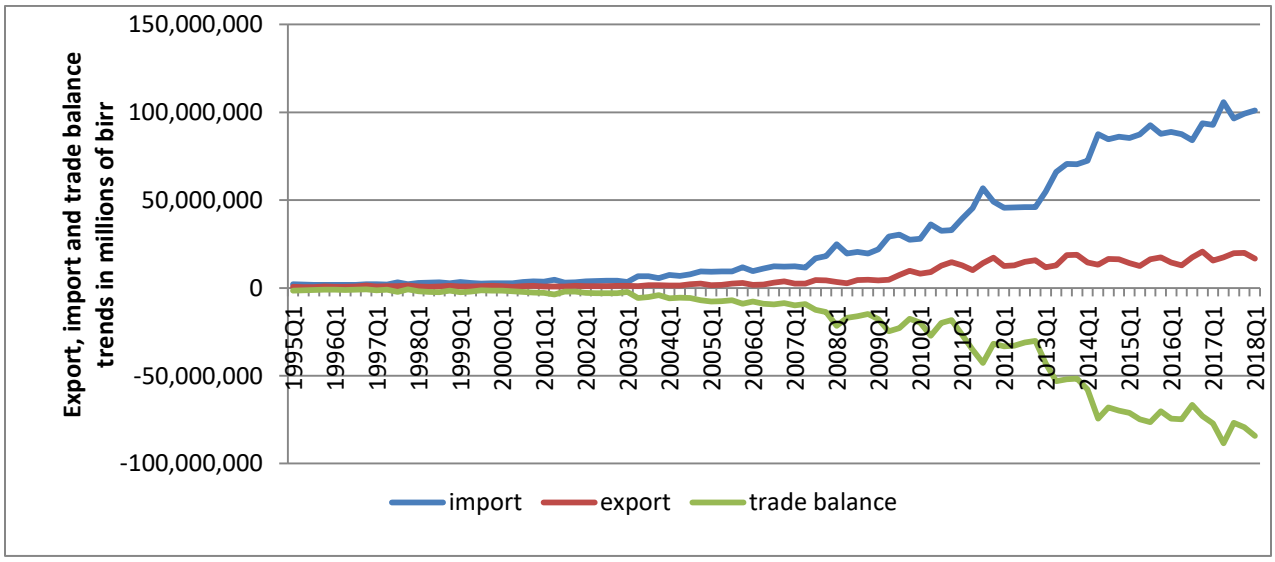
Figure 3.5 Trade balance structure of Ethiopia from 2010Q1 to 2017Q4



Almost, all of the sub-Saharan African countries have been facing a negative trade balance for a number of years. Ethiopia being one of the sub-Saharan countries faces a persistent trade deficit regardless of devaluation it undertakes to encourage export. From figure 3.4 above, the trade balance of the country shows a continuous deterioration from 2010Q1 to 2012Q3. For four quarters, it showed stagnant negative trade balance and it came down to be deteriorated starting from 2013Q1 through 2017Q4 for the time horizon under the consideration.

In general, the structure of export and import have basically remained the same even though there are notable changes in the percentage share of import to GDP in the relative share of the individual commodity for the period under review from 2000 to 2017. Looking at the contribution of items in two components, exports are largely dominated by primary commodity whilst imports are very nearly dominated by capital and consumer goods.

Figure 3.6 Trends of export, import and trade balance (in millions of birr)

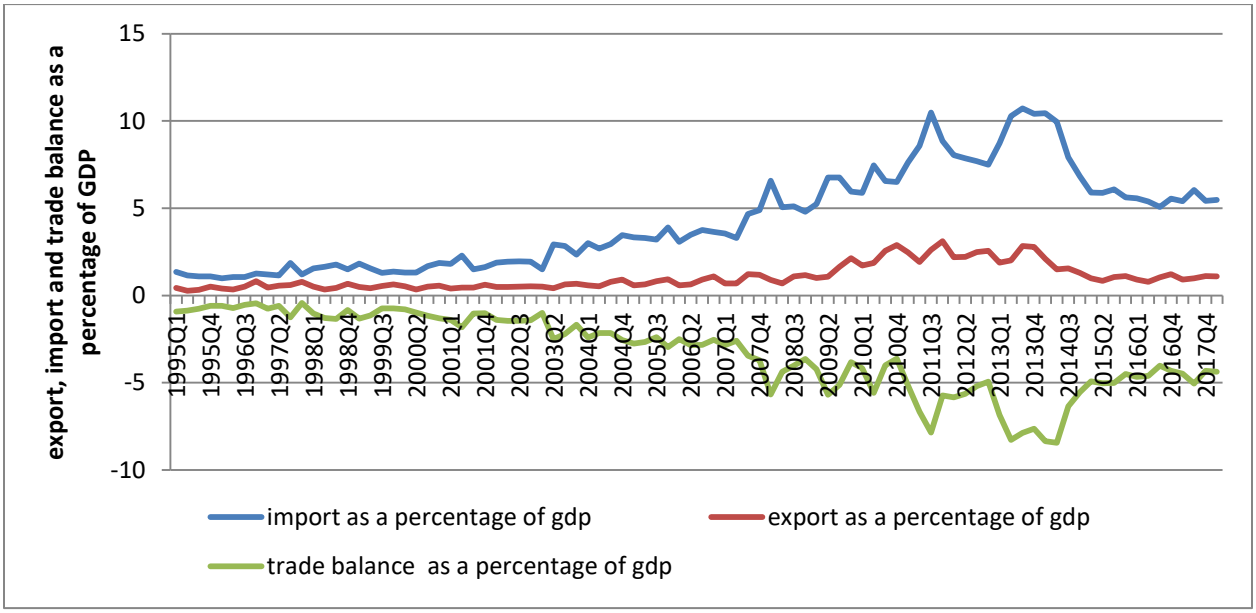


Source: National bank of Ethiopia

Figure 3.6 shows that the growth of both import and export is steady from 1995/96Q1 to werr452007/8/Q1. In 2007/8 Q2 the growth of import is relatively higher than export so that trade balance decline by a large amount. However, following the devaluation of 2010 the growth of import is continually growing higher than export growth and trade balance declined up to 2011/12 Q3. After two years in 2013/14Q1, the growth rate of the import dramatically declined while export grows by a relatively steady rate and trade balance starts to improve through 2013/14Q3.

After reaching its maximum, import starts to grow by a strictly very high rate of growth rate for the first three quarters up to 2014/15Q1 and trade balance strictly declined in these periods. Finally, after 2014/15Q1, it grew slowly up to 2014/15Q4, as well and import growth came to decline following the devaluation of 2017/18 from 2017/18Q1 while export moves steadily and trade balance tries to improve.

Figure 3.7 The trends of export, import and trade balnce as a percentage of GDP



Source: National bank of Ethiopia

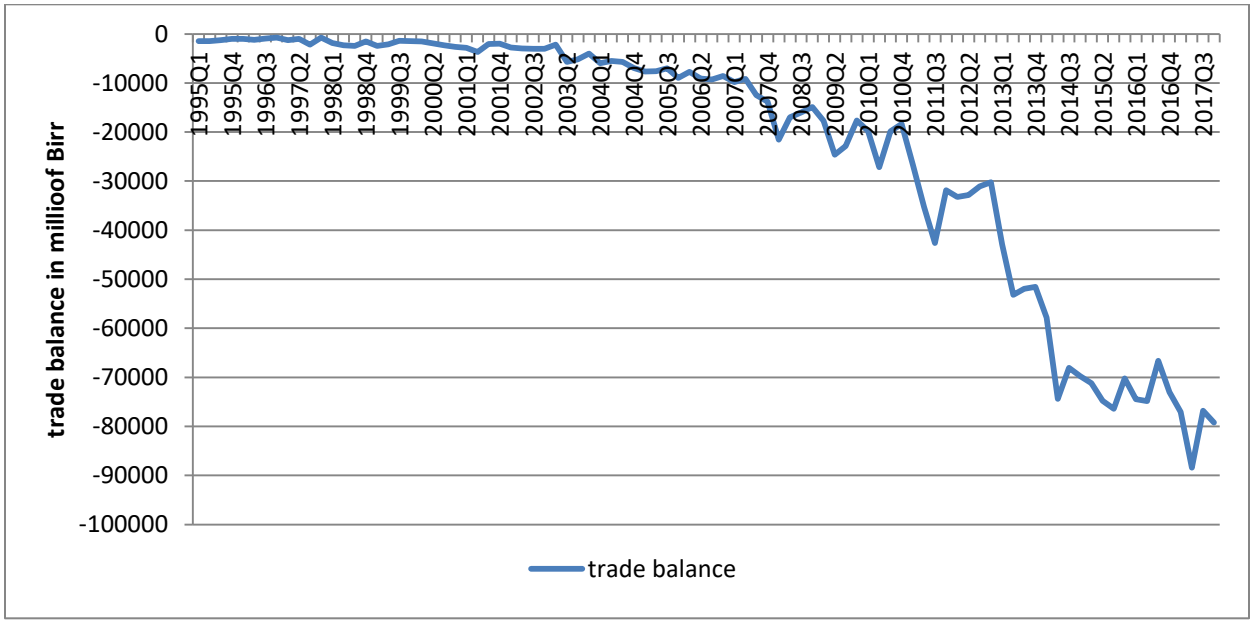
As shown in the above figure as import percentage of GDP has been increasing faster than the export percentage of GDP and the trade deficit percentage of GDP had been increasing, as the export percentage was unable to match the increase in import percentage of GDP in 2010. From figure 3.6 and 3.7 the trend depicts that trade deficit in both absolute and the percentage has been increasing persistently in this period. This is because, in one hand, it is a common consensus that Ethiopian export is highly characterized by agricultural commodity and geographical attentiveness in turn due high dependence of export volume on the agricultural productivity it depends on the vagaries of nature, high price elasticity, and low-income elasticity of demand and low supply response. On the other hand, arguably the Ethiopian export again subjected to high exposure to external shocks.

From the import side, the import intrinsically highly prices inelastic which is either necessitate in production or consumption or premeditated commodity which habitually required by the country. Due to these structures and trends of export and import, it is unlikely to expect the application of the neoclassical theory in the country. However, based on this mere trend analysis is not ample to say whether the theory is applicable or not. Thus in general, to examine the applicability of theory, it needs methodological and data analysis that would be discussed as follow.

3.4 Trends of trade balance from 1995Q1-2017Q4 in Ethiopia

The trade balance of Ethiopia is negative for the entire period of this study from 1995Q1 to 2017Q4. Particularly, the growth of trade balance was closer to steady for the consecutive of eight years from 1995/96Q1 to 2002/3Q4. In the next five years, the growth of trade balance is decline slowly up to 2008Q1. In order to examine the effectiveness of currency devaluation whether to improve or worsen trade balance, this study has investigated the period in which the country devalued the domestic currency. The first period of devaluation in this study is the devaluation of 2010. In this period the trade balance growth has declined strictly until 2016Q2 for a successive of six years even though the objective of devaluation is to boost export and improve the trade balance. In 2016 after showing some positive growth for two quarter it came to decline even after the further devaluation of Ethiopian Birr in 2017Q1 through 2017Q4.

Figure 3.8 trend of trade balance from 1995Q1 TO 2017Q4



Source national bank of Ethiopia

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Data source and types

To build an appropriate model, there should be classification, the nature, and source of data that has been used in the study. This study uses quarterly data from 1995/96Q1 to 2017/18Q4 to investigate the effect of exchange rate changes on the trade balance of Ethiopia. The major sources of data for this study were the World Bank and the national bank of Ethiopia. Real effective exchange rate, money supply, domestic real GDP, export, and import were collected from the national bank of Ethiopia while world income which is proxied by USA real GDP was collected from the World Bank. The first four domestic variables and world income were available in quarterly while domestic real GDP was converted from its annual.

4.2 Model specification

In order to examine the effect of exchange rate changes on the trade balance an extensive part of the empirical literature on foreign trade equations has worked with export and import demand equations. The objective is to investigate whether the exchange rate significantly affects trade balance (Marshall Lerner condition holds) or not. The modeling of trade balance in this study follows a similar equation chosen by Shirvani and Wilbratte (1997), Baharumshah (2001), Gomez and Alvarez-Ude (2006), which emphasized the bilateral trade balance evidence to exchange rate change. According to their investigation, it begins from the equilibrium goods market in an open economy described as the following equation:

$$Y = C(Y - T) + I(Y, r) + G - IM(Y, E) + X(Y^*, E), \quad \text{---------- 4.1}$$

where Y represents aggregate domestic income, C is aggregate consumer's expenditure, T – income tax, I represents investment, r – interest rate, G is government expenditure E – nominal exchange rate, IM is value of import, EX - is a value of export and Y^* represent foreign income. Coming to the study under the consideration real exchange rate (E) is defined as the number of unit domestic currency for a given basket of goods and services in terms of foreign currency. Symbolically $E = \frac{\epsilon P^*}{P}$ where p is domestic price, P^* is foreign price, E real exchange rate, and ϵ- is nominal exchange rate.

Import (IM) is determined by domestic income (Y) and real exchange rate. Higher income implies a high value of import good. Thus, import is directly related to domestic income. Higher exchange rate (E) leads to lower the import of good as the foreign product is relatively expensive in domestic currency. Export (X) on the other hand is the function of foreign income (Y^*) and reathe l exchange rate (E). The higher the foreign income implies the higher the volume of export. On the exchange rate side, an increase in real rate (devaluation) implies the cheaper price of domestic goods in terms of foreign currency and leads to increase in export. Once the demand of import and for export is determined it is the time to evaluate the net export by assuming other variables remain the same.

$NX = X - IM$----------4.2

By substituting the functions of import and export into equation (4.2) trade balance equation becomes; $NX = X(Y^*, E) - IM(Y, E)$ ---------- 4.3

Again substituting for the real exchange rate: $NX = X\left(Y^*, \frac{\epsilon P^*}{P}\right) - \text{IM}(Y, \frac{\epsilon P^*}{P})$ ---------- 4.4

Assuming $\frac{\epsilon P^*}{P}$ is stationary; equation 4.4 can be rewritten as: $NX = X(Y, Y^*, E)$ ---------- 4.5

Therefore, trade balance can be expressed as the function of domestic income, foreign, income, and real exchange rate. Thus the approach concentrates on the reduced- form model through the expression of trade balance as a function of supposedly the above variables and money supply to measure the monetary policy effectiveness. In functional form, trade balance can be expressed as

$$\boldsymbol{LnTB = \beta_0 + \beta_1 LnREER + \beta_2 LnGDP + \beta_3 LnFGDP + \beta_4 LnMS + \varepsilon}$$ ---------- 4.6

Where TB - trade balance, REER- real effective exchange rate, GDP – domestic income, FGDP - world income with which the domestic country trades, MS –money supply and finally **ε –** white noise error term which is normally distributed with zero mean and constant variance: N (0, σ2)

Trade balance (TB) is proxied by dividing the nominal value of export by the nominal value of import $\left(\frac{X}{M}\right)$, because this ratio will be used in many empirical investigations of the trade balance and exchange rate relationship. The reason why this ratio is preferable is that it is not sensitive to the unit of measurement and can be interpreted as represented either in nominal or real trade balance (Bahmani 1999). Moreover, it solves the problem of using long-form of the trade deficit.

Definition and their pass-through to trade balance

REER- is defined as the units of the home currency as a measurement of the average weighted value of domestic currency against its trading partners. REER will be chosen to represent the exchange rate since a country trades with multiple partners and only REER can reflect a country's currency value relative to other currencies (after we adjusted for inflation). All variables in the above model are preferred in logarithm form because the log-linear model is attractive as the slope coefficient measures the elasticity of the dependent variable with respect to the independent variables (Khan and Hossain 2010, p.382). In this model the REER and TB variables are expected to have a positive relationship (β1>0), indicating that currency depreciation will improve trade balance and vice versa.

RGDP –The gross domestic product of the country in aggregate that is after the purchasing power of every society has been considered. Following classical theory, the impact of domestic GDP on trade balance could be positive or negative because an increase in the domestic output raises imports, but could also boost exports. The expected signs under the absorption and monetary approaches are negative and positive respectively with some courageous assumptions as already discussed in the literature part. Higher income levels stimulate increased import demand as well as increased domestic production of tradable goods, leaving the ultimate impact on the trade balance somewhat indeterminate. Hence the net effect on trade balance could either improve or worsen. However, it is argued that the former effect dominates the latter in some cases.

FGDP – Is the world income that may affect the trading competiveness of the country and it is similarly, the relation between FGDP and trade balance could be either positive or negative. The sign of β_2 would be depend on whether the supply side factors dominate demand side factors $(\beta_2 > 0)\ or (\beta_2 < 0)$.

RMS – is the broad money supply (M_2) divided by domestic price which is included as a control variable and the money supply by the monetary authority negatively affects the trade balance. Because increasing the money supply increase the domestic price of the domestically produced goods, hence the export demand decrease as the price of domestic good by domestic prices goes up given the exchange rate regime.

Real money supply

This variable measures how developed a financial system in a country and its impact on the development of the economy. Any change in real money supply has an effect on every macroeconomic variable. An increase in real money supply will result in an increase in the general price of goods and services keeping other things remain the same, in turn, reduces net export. Conversely, a decrease in money supply will reduce the price of goods and services and at the same time increase the value of the domestic currency. As a result of the second effect, export increase relative to imports and it improves the balance of trade. Thus, the money supply is considered as an important variable by a monetary approach to the balance of payment.

An increase in the money supply causes a reduction in the domestic exchange rate and it gives three reasons. First, some of the excess money will be spent on a foreign asset, which may increase the supply of domestic currency and thus reduces the exchange rate. Second, interest will fall because of an increase in money supply, and the demand for domestic assets will also fall, and hence the demand for domestic currency will fall. Third, speculators expect the domestic currency to fall, so they sell the domestic currency and buy foreign currency. Thus, increasing the money supply will affect the balance of trade negatively and vice versa.

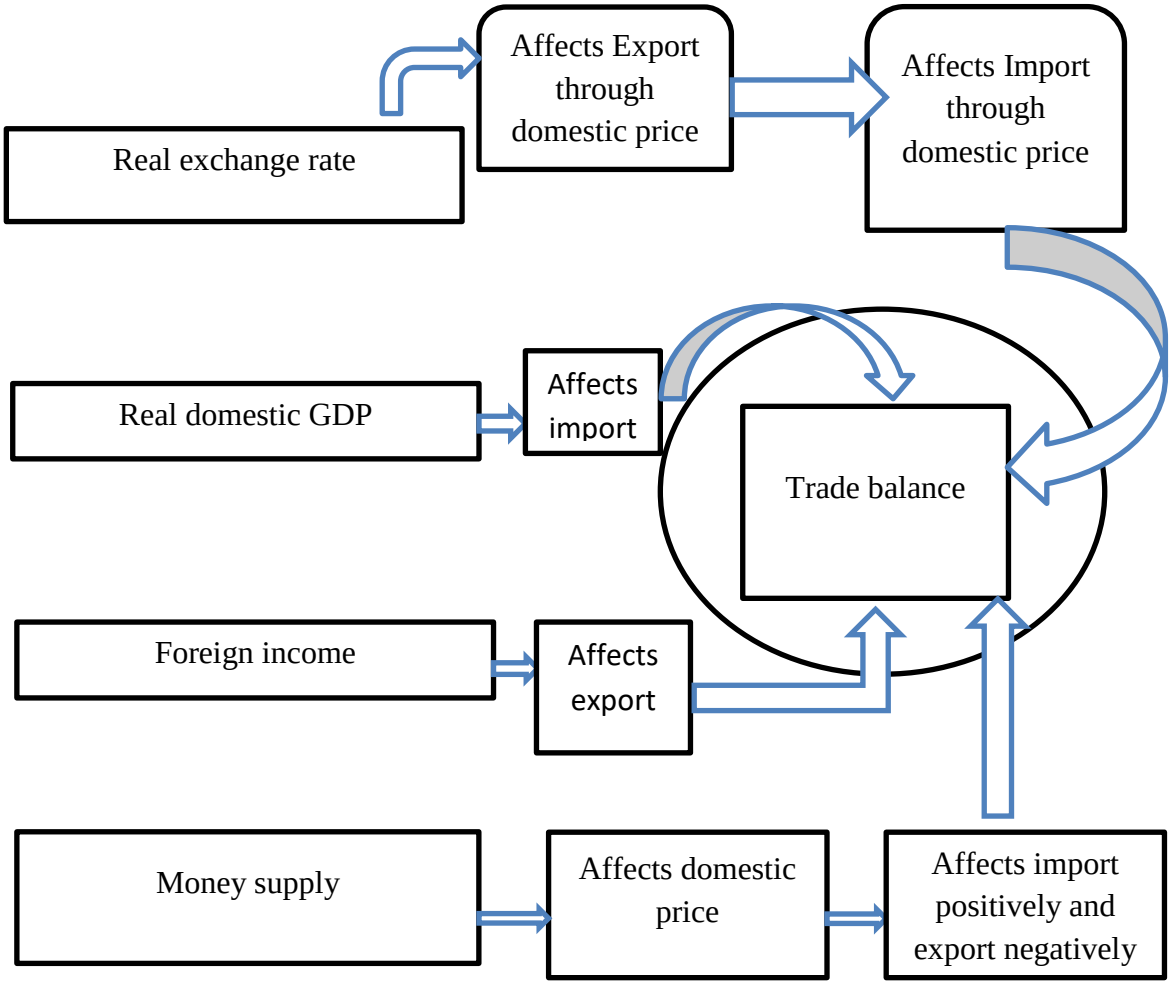
Following Buluswar et al. (1996), "the monetary model of exchange rates is built on money market equilibrium" (p. 430), and is specified as.

This is given as, $\frac{M^S}{P} = L(Y, E, i)$ …….4.7

where M^S is nominal money supply, P is the domestic price of goods and services, L- denotes the demand for money, i- interest rate, E- is the value of foreign currency in terms of Ethiopian Birr and Y- is domestic real income. Equation (4.7) drawn on the grounds that money market is in equilibrium, which makes real money supply determined by the demand for money and exchange rate. Like a higher volume of foreign currency in Birr would worsen the purchasing power of Birr and thus increase and increase demand for money needed to maintain imports; an increase in domestic money supply would encourage domestic spending and in turn depleting cash balances and as a result it worsen trade balance (Johnson 1972, Dornbush 1973, 1975). Thus, the trade balances finally fall as the volume of export declines relative to import volume ($\beta 4 < 0$).

Generally, these can be described by the optimization mathematics and instantaneous change of the explanatory variables as: $\frac{dTB}{dY}$ > or < 0, $\frac{dTB}{dY^*}$ >or < 0, $\frac{dTB}{dREER}$ > 0, and $\frac{dTB}{dMS}$ < 0

Conceptual frame works of the model



The above chart describes the list of all variables with their direction of impacts on the target variable (the trade balance). Real exchange rate and real money supply pass through to trade balance by altering the domestic price of goods and services regardless of their direction of effect. On the other side, domestic and foreign incomes affect the import volume and export volume respectively again based on the elasticity demand of export and export by exporter and importer. Thus the impact of income on the trade balance is ambiguous due to the fact that it relies on the elasticity demand.

4.3 Unit root test

Stationary series is the series of a variable with constant mean, constant variance and constant autocovariance for each given lag between the two times periods, not on the time at which the covariance is calculated (Gujarati, 2003). Otherwise, it is a non-stationary series. The major problem of a time series is the stationary problem because most time series variables contain the nonstationary process. While doing with the time series data, it is very important identifying whether the variable follows the stationary process or not.

The reason why we need to identify whether the variable is stationary or not is that if the variable is non-stationary series the result of OLS regression gives us what is known spurious or nonsense sometimes fake regression. Spurious regression is the case where the coefficient significantly shows the casual ration ship between two variable while in reality there no relationships between them. The name unit root came from stationary series case whether the coefficient is unity or less than unity. This can be described in stochastic process with drift and trend as:

$$\boldsymbol{y_{t=}\alpha+\beta_t+\rho y_{t-1}+\varepsilon_t} \quad \text{.....4.8}$$

Where y_{t-1} is the lag value of the stochastic variable y_t and ρ the coefficient of stochastic variable and its lag and Ɛ is the random walk at time t. The presence of the unit root can be examined by Augmented Dickey fuller (ADF) test as it corrects the short fall of Dickey fuller (DF) by adding a lagged differenced term for high order serial correlation while Dickey fuller (DF) does not take in to account the possible autocorrelation in the error term (ε_t). ADF employs the following equation: $\boldsymbol{\Delta y_t = \alpha + \delta y_{t-1} + \sum_{i=0}^{m} \Phi_i \Delta y_{t-1} - 1 + \epsilon_t}$ ----------4.9

Hypothesis:H_0: δ = 0 the time series process is stationary (no unit root problem), I (0)

H_1: δ < 0 there is a unit root problem in the series (non- stationary process)

A stationary series is a time series which has no unit root problem and the joint density function does not depend on time (Favero 2001:35). If the series is integrated of order zero I (0) estimation may not lead to problem and no difference is required. However, if the non-stationary series converted into the stationary process after differencing it is called integration of order d i.e. (d). For example, if the series is denoted as I (1). It is to mean the series is converted to stationary process after the first difference.

4.4 Co-integration analysis

Co-integration means in spite the fact that the series is not stationary at a level and if there is a linear combination between two or more variables the series can be stationary and there exist a long-run equilibrium relationship among them (Gujarati 2003). If the series are cointegrated, modeling of the long run relationship among variables is necessary. The model to be app/lied for such a case is VECM, to reconcile the static long-run equilibrium relationship of cointegration with its dynamic short-run equilibrium in time series (Maddala and In moo Kim 1998).

Two approaches are used to test the cointegration among variables are Engel and Granger (1987) and the Johansen and Juselius (1990). The Johansen and Juselius (1990) define maximum likelihood estimation to establish the rank of the cointegrating vector and it is considered superior to Engel and Granger (19787) approach (Shao 2009: 19-20). The normality test was undertaken on the basis of this assumption. Thus, the Johansen cointegration approach is applied in this study. Therefore, the Johansen approach is working with the formulation of a VAR system, with a vector of K variables and is generated by k-order of vector autoregressive process with Gaussian errors.

$\boldsymbol{Z_t = A_t Z_t + A_k Z_{t-1} + \mu + \varepsilon_t}$, **t = 1, 2, 3…T …4…………………………………………… 4.10**

Whereas Z_t is px1 a vector of endogenous variables, A_k are the coefficient estimates and μ is the vector of px1 constants andε_t, error term with $iind$ (0, δ).

4.5 VAR Lag Length Selection

VAR Lag Length Selection Criteria Before estimating the VAR, we have to decide the maximum lag lengths, to generate the white noise error terms. To determine the optimal lag length different information criteria can be employed. The objective of the information criteria (IC) method is to select the number of parameters which minimize the value of the IC. The most popular ICs are the Akaike (1974) information criterion (AIC), Schwarz's (1978) Bayesian information criterion (SBIC), and the Hanna-Quinn information criterion (HQIC). However, to determine the possible optimal lag length looking for the major criteria's at which the model selects than other criteria would be the number of lag length.

4.6 Vector error correction model

After testing the long run relationship among the variables by Johansson cointegration test, the next task is developing a vector error correction model (VECM). Once the long run co-integration test is confirmed the vector error correction model (VECM) that indicates the short run dynamics parameters (the speed of adjustments by which any shocks in the short run is converged to long-run equilibrium) is followed. This standard is denoted by ECM and the model is estimated as:

$$\boldsymbol{\Delta Z_t = B_t + A_k Z_{t-1} + \sum_{t=1}^{p-1} A_t \Delta Z_t + \lambda_i ECM_{t-1} + \mu_i} \quad \textbf{4.10}$$

Where ECM_{t-1} represents error correction lagged by one period and λ is a negative value and which indicates by how much speed the shocks in the short run is corrected towards of the long run equilibrium while(p - 1) are the optimal lag length of ach variables.

4.7 VEC Diagnostic Tests

After estimating the VEC model there are some diagnostic test to be checked which are vital for ensuring whether the results obtained from VEC estimation used for forecasting policy. The most important post-estimation tests in time series analysis mostly performed on the residual of the VEC model are LM tests for residual serial correlation, Jarque-Bera test for residual multivariate normality, Breusch-Pagan –Godfrey for the presence of heteroscedasticity of the residuals and stability of the model.

4.7.1 Autocorrelation or serial correlation test

In simple regression models, one of the assumptions of the classical linear regression is that, the$cov(u_i\, u_j) = 0$, for i ≠ j, which implies that successive values of disturbance term u are temporarily independent, i.e. disturbance occurring at one point of observation is not related to any other disturbance. This means that when observations are made over time, the effect of disturbance occurring at one period does not carry over into another period. If the above assumption is not satisfied, that is, if the value of error term in any particular period is correlates with its own preceding value(s), we say there is autocorrelation of the random variables.

Hence, autocorrelation is defined as a 'correlation' between members of series of observations ordered in time or space. Consider this process: $\mu_t = \rho\mu_{t-1}$. The above relationship states the simplest possible form of autocorrelation; we observe that coefficient of autocorrelation ρ represents $-1 < \rho < 1$, ---------- (1)

If the value of ρ is 1 it is called perfect positive autocorrelation, if $\hat{\rho}$ is -1 it is called perfect negative autocorrelation and if $\rho = 0$, no linear autocorrelation among successive random errors.

4.7.2 Heteroscedasticity test

It is the scenario where the distribution of error term (μ_i) around the mean is not constant (no constant variance).it signifies that the individual variance disturbance term around the independent variable may be different. Hetroscedasticity problem does not affect biasedness but the consistency properties of OLS estimators are no longer minimum variance or efficient. In the presence of hetroscedasticity, the variance of OLS estimators are not computed by the usual OLS formulas and hence t and F tests based on this problem can be highly misleading, resulting in an erroneous conclusion. The following are some detection of heteroscedasticity test.

(1) Spearman's Rank correlation test, (2) Breusch-Pagan –Godfrey test and (3) Whites general heteroscedasticity test. Among these detection methods, this study has used the Breusch-Pagan – Godfrey test.

Hypothesis test: H_0 the error variances are all equal H_1: the error variances are multiplicative function of one or more variables.

Decision rule: if the computed Chi-square (x^2) exceeds the critical x^2 value at the chosen level of significance, one can reject the hypothesis of homoscedasticity. Otherwise, the alternative hypothesis would be accepted.

4.7.3 Normality test

Normality tests are used to determine if a data set is well modeled by a normal distribution and to compute how likely it is for a random variable underlining the data set to be normally distributed. More generally, the tests are a form of model selection and can be interpreted in several ways depending on one's interpretation of probability.

The test would use Jarque-Bera test and the Jarque-Bera test is goods of fit test of whether sample data have the skewness and kurtosis matching a normal distribution. The test was named after Carlos Jarque and Anil.K.Bera.

4.7.4 Stability test

The stability test is vital if the system is supposed to use for forecasting and policy analysis. The stability test can be detected by a cumulative sum (CUSUM) test. Stability test checks whether the root characteristics polynomials lies inside the unit circle or not. If all roots lie inside the unit circle the model is considered as the stable it can be used for policy analysis.

4.8 Granger causality test

The term granger causality refers to the existence of causality from exchange rate to trade balance, domestic income, foreign income, money supply, and vice versa and from all these variables to exchange rate itself.

Hypothesis test: $\boldsymbol{H_0}$: Real exchange rate does not granger cause trade balance of Ethiopia

H_1: Real exchange rate granger causes the trade balance of Ethiopia

Decision rule: if the probability of the significance level is less than 5 percent we can reject the null hypothesis of no Granger causality and if not we accept the null hypothesis. If there is Granger causality from real exchange rate to trade balance and from trade balance to real exchange rate we call it bidirectional causality.

4.9 Impulse response function and variance decomposition

Variance decomposition analysis is used to provide some information about the relative importance of random innovations (Narayan 2004). Impulse response functions show the effects of shocks on the adjustment path of the variables. Forecast error variance decompositions measure the contribution of each type of shock to the forecast error variance. Both computations are useful in assessing how shocks to economic variables resound through a system. Impulse response functions (IRFs) and forecast error variance decompositions (FEVD) can be produced after using the VECM or VAR commands. The results can be presented in a table or a graph. The analysis of the dynamic interactions among the variables in the post-sample period is conducted through variance decompositions (VDCs) and impulse response functions (IRFs).

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 Unit root (Stationarity) test

To get a rough idea of a time series whether it is stationary or not, it is important to consider the plots that the variable follows. In this study Augmented Dickey-Fuller (ADF) test has been employed.

5.1.1 Augmented Dickey-Fuller

Before doing an estimation of any time series data, it is mandatory to check whether the series of data follows a stationary process or not unless the regression analysis falls under the problem of what econometricians say spurious or fake sometimes nonsense regression as discussed above in methodology part. In order to determine the degree of stationarity, a unit root testing would carried out through the standard Augmented Dickey-Fuller (ADF) test which chosen over the Dickey-Fuller (DF) test. See table (5.1)

Table 5.1 *Augmented Dickey-Fuller test*

Variables at level and 1st difference	t-statistics	t-critical at (5%)	Probability
LNTB	-1.965125	-2.895109	0.3016
ΔLTB	-11.11169**	-2.894716	0.0001**
LNREER	-1.061822	-2.893956	0.7278
ΔLNREER	-7.347713**	-2.893956	0.0000**
LNRDGDP	0.736668	-2.893956	0.9924
ΔLNRDGDP	-6.235169**	-2.893956	0.0000**
LNFGDP	-2.552245	-2.893956	0.1069
ΔLN LNFGDP	-10.98143**	-2.893956	0.0001**
RMS	0.275310	-2.893956	0.9758
ΔLNRMS	-3.498737**	-2.893956	0.0102**

Source EVIEW 10

*** indicates a variable that is stationary at 5%*

All variables are stationary at 1% and 5% with drift and trend after the first difference i.e. I (1), but for the non-exclusion of the trend, the data has been put with drift only and the whole variables are stationary at 5 percent after the first difference.

The result from the above table shows that all variables are non-stationary in their level at 5% level of significance. But, after the first difference, all variables are stationary at a 5% level of significance. Since all variables are I (1), it is possible to use the Johansen cointegration approach. Once the stationarity test is checked, the next step is choosing the optimal lag selection which determines the number of the co-integrating equation.

5.2 Vector autoregressive (VAR) and lag selection criteria

Before going to check for the multivariate time series analysis, choosing the optimal lag length for the basic VAR model in advance is needed. It is obvious that the result of the Johansen co-integration test is very quiet sensitive to optimal lag length. Based on the lag selection criteria, five of them, modified LR test statistics (LR), final prediction error criteria (FPE), Akaike's information criteria (AIC), Schwarz information criterion (SC) and the Hannan and Quinn information criteria (HQ) revealed, that the lag length of the model is at lag 2 as indicated below.

Table 5.2 lag selection criteria

VAR Lag Order Selection Criteria

Endogenous variables: LNTB LNREER LNDGDP LNFRGDP LNRMS

Exogenous variables: C, Sample: 1995Q12017Q4 Included observations: 84

Lag	LogL	LR	FPE	AIC	SC	HQ
0	544.5975	NA	1.81E-12	-12.8476	-12.7029	-12.7894
1	1213.822	1242.845	3.95E-19	-28.1862	-27.3181	-27.8372
2	1298.725	147.5696*	9.56e-20*	-29.61249*	-28.02089*	-28.97268*
3	1318.634	32.23424	1.10E-19	-29.4913	-27.1762	-28.5607
4	1338.96	30.48947	1.26E-19	-29.38	-26.3415	-28.1586
5	1359.242	28.00822	1.49E-19	-29.2677	-25.5057	-27.7554
6	1381.841	28.51737	1.70E-19	-29.2105	-24.7251	-27.4074
7	1391.038	10.51055	2.78E-19	-28.8342	-23.6253	-26.7403
8	1410.926	20.36166	3.68E-19	-28.7125	-22.7802	-26.3278

Source: Author's own computation on national bank of Ethiopia using eviews10

** indicates lag order selected by the criterion*

Table 5.2 reveals that all information criteria's are calling for lag 2 at which * denoted. Once the optimal lag length of the model is identified, the next task to be preceded is testing for the existence of the Johansen co-integration.

5.3 Johansen co-integration test

From the lag selection criteria, the optimal lag is 2 and at this lags, both trace value and maximum Eigen value indicates 1 co-integrating equation among the five variables at 5%. Therefore, there one is only co-integrating equation among trade balance real exchange rate, domestic income, foreign income, and real money supply. The Johansen tests are called the maximum eigenvalue test and the trace value test. To make it clear let r be the rank of Π matrix. As the discussion above indicated, this is the same as the number of cointegrating vectors. The Johansen tests are likelihood-ratio tests. There are two tests: the maximum eigenvalue test, and the trace value test. For both test statistics, the initial Johansen test is a test of the null hypothesis of no cointegration against the alternative of cointegration. The tests differ in terms of the alternative hypothesis. Let's check for maximum eigenvalue test and trace value test one by one.

Table 5.3 Johansen co-integration test (Trace statistics Test)

Trend :constant Included observations: 89 after adjustments Sample: 1995Q4- 2017Q4				
Maximum rank	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
0	**0.323236**	**78.70908**	**69.81889**	**0.0082***
1	**0.205135**	**43.96055**	**47.85613**	**0.1108**
2	**0.184109**	**23.52766**	**29.79707**	**0.2211**
3	**0.057778**	**5.418451**	**15.49471**	**0.7629**
4	**0.001366**	**0.121647**	**3.841466**	**0.7272**

Source authors computation based on national bank of Ethiopia using EVIEWS 10

If $\lambda 1 = 0$ and $\lambda 1 \geq \lambda 2 \geq \ldots \geq \lambda n$, then $\lambda 1 = 0 = \lambda 2 = \ldots = \lambda n$

$H_{0:}\ \lambda 1 = \lambda 2 = \lambda 3 = \ldots = 0$ against $H_{1:}\ \lambda 1 = \lambda 2 = \lambda 3 = \ldots \neq 0$

Table 5.3 above revealed the existence of co-integration by trace statistics test at 5%.according to Johansen co-integration, maximum rank represents a number of co-integrating equations in the system. At maximum rank zero, the null hypothesis says there is no co-integration among the variables whereas the alternative hypothesis says that there is at least a co-integration among them. To determine the presence of co-integration, the trace statistics should compare with the critical value at 5 percent.

In the above-computed table, the trace statistics is greater than the critical value at 5 percent level of significance and thus we can reject the null hypothesis of no cointegration. At maximum rank 1 and 2 however the trace statistics is less than the critical value at 5 percent level of significance, and hence we cannot reject the null hypothesis and the data set had one number of co-integrating equation. We can also check the presence of co-integration by the maximum Eigenvalue test.

Table 5.4 Johansen co-integration test (maximum Eigen value)

Trend :constant **Included observations: 89 after adjustments** **Sample: 1995Q4 -2017Q4**				
Maximum rank	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
0	**0.323236**	**34.74853**	**33.87687**	**0.0393***
1	**0.205135**	**20.43289**	**27.58434**	**0.3120**
2	**0.184109**	**18.10921**	**21.13162**	**0.1258**
3	**0.057778**	**5.296804**	**14.26460**	**0.7040**
4	**0.001366**	**0.121647**	**3.841466**	**0.7272**

Source: Author's computation based on national bank of Ethiopia using EVIEWS 10

*Indicates the rejection of the null hypothesis (no co-integration) at 5 percent

Maximum Eigenvalue revealed that it was the maximum rank 1 its maximum Eigen value is less than the critical value at 5 percent level of significance. These two tests of the above tests showed there is one co-integrating equation to among all variables. Therefore from the evidence of the long run associations, we can run a vector error correction model (VECM).

5.4 Vector error correction model (VECM)

After the evidence of co-integration relationship among the variables have been checked, the next step is obviously running the vector error correction model (VECM) using one less lag length (p-1). Where p is the optimal lag length determined with vector autoregressive (VAR), hence the optimal, lag length of the model was 2 and therefore vector error correction model (VECM) requires 1 lag length to run a regression. The following table depicts the long run result relation.

5.5 Long Run of Model Estimation

Table 5.5 long run equation of the model

Target variable LNTB			
Retgressors	Coefficient	Standard deviation	t-statistics
LNREER(-1)	- 1.357009*	(0.43964)	[3.08662]
LNDGDP(-1)	1.703972*	(0.38449)	[-4.43173]
LNFRGDP(-1)	-1.787998*	(0.53407)	[3.34788]
LNRMS(-1)	- 1.430458*	(0.29389)	[4.86725]
C	*-12.85624**		

Source: Author's computation based on national bank of Ethiopia data using EVIEWS 10

**indicates the significance of the coefficients (the rejection of the null hypothesis) at 5 percent*

The result in the above table shows that all variables are statistically affecting the balance of trade in Ethiopia. Each variable except the real effective exchange rate (REER) are as they expected and discussed under the theory. However, the real exchange rate is antagonistic to the discussion given under the literature. The result thus, revealed the real effective exchange rate (REER) significantly deteriorates the trade balance of Ethiopia even in the long run. While domestic income has a positive impact on trade balance the foreign income on the other side has a negative impact on the trade balance of Ethiopia. The reason for the former one is that due to the absorption approach effect dominates monetary approach and the overall effect would be boosting export and in turn, improve trade balance whilst the later deteriorates trade balance because of the low price elasticity demand of foreign exporters for the Ethiopian export good. This finding is similar to earlier studies conducted by Fikreyesus and Menasbo (2012), Haile (2008); Alemayehu (2014), Zelalem (2014, Yigermal (2018), that the exchange rate has a negative effect on the trade balance. In general the long run equation of the model between the regressors and trade balance would be written with the respective t-ratio in parenthesis as follows.

$$\boldsymbol{LNTB_t = -12.856 - 1.357LNREER_t + 1.7LNDGDP_t - 1.788LNFRGDP_t - 1.43LNRMS_t}$$

[3.08662] [-4.43173] [3.34788] [4.86725]

The result of this equation shows that real effective exchange rate negatively affects the trade balance of Ethiopia. It implies that the devaluation of Birr would cause Ethiopia's trade balance

to deteriorate in the long-run; therefore keeping the effect of other variables as constant, increasing the real effective exchange rate by 1% deteriorates trade balance of Ethiopia by **1.357%** even in the long run**.** This is why the major export items of the country are primary and raw materials and they cannot offset increases the deterioration in the short run due to price effect. The foreign GDP and real money supply negatively affect the trade balance of Ethiopia whereas domestic real GDP negatively affects the trade balance. Therefore, keeping the effect of other variables remain the same, increasing/decreasing domestic real GDP by 1 percent will increase/decrease the trade balance of Ethiopia by 1.7% respectively in the long run, whereas the coefficient of world income depicts that, the increase/decrease of real FGDP by 1 % will decrease/increase the trade balance of the country by the same amount of domestic real GDP 1.7% respectively regardless of its sign. Finally, the real money supply negatively affect trade balance and increasing money supply by 1% leads to deteriorates trade balance by 1.43%

Therefore, elasticity approach does not effectively work for Ethiopia and hence the null hypothesis of no marshal learner condition is accepted. According to Laffer (1997), criticize the elasticity approach on the following points. This result supports the criticism forwarded by him. First, import demand and supply of export defining the model depend on the nominal prices measured in domestic currency rather than on relative prices and appropriate scale variables such as real income real expenditure real money balances, or productive capacity. Second, there are markets or goods not accounted for explicitly. Finally it relies overly on a partial approach for analyzing a problem that uses a general equilibrium. Generally, there is no marshal-learner condition holds in the country rather the real effective exchange rate is negatively related to the trade balance of Ethiopia.

5.6 Short-run dynamics of the model

After the estimation of long run coefficients, the next step is estimating the short run ECM model. The coefficient of error correction term (ECM) as discussed in the methodology part indicates the speed by which any deviation in the short-run from equilibrium is restored to its equilibrium in the dynamic model. The coefficient of the ECM obtained from the regression of one lagged period residual of the dynamic long-run model. The coefficient of the error correction (ECM) term thus, indicates how quickly variables converge to their equilibrium.

Moreover, to have this function it should have a negative sign and statistically significant at standard significant level i.e. its probability value must be less than 5%.

Table 5.6 Short run dynamics of VECM

Dependent variable : TB Method : Vector error correction model Sample: 1995Q4 -2017Q4				
Model: VECM	Coefficient	Standard deviation	t-ratio	P-value
CointEq1	-0.8775*	(0.11558)	[-7.59206]]	0.0000*
D(LNTB(-1))	0.221670*	0.094030	2.357441	0.0208*
D(LNREER(-1))	-0.437684	0.604654	-0.723858	0.4712
D(LNDGDP(-1))	-3.559775*	1.508332	-2.360073	0.0206*
D(LNFGDP(-1))	10.97750*	4.130587	2.657612	0.0094*
D(LNRMS(-1))	2.045736	1.300784	1.572695	0.1196
C	-0.011038	0.016426	-0.671975	0.5035

Source: EVIEWS 10 result

According to Banerjee *et al*. (2003), as cited in Kidanemarim (2014), the highly significant error correction term further confirms the existence of a stable long-run relationship. Based on the above result, the error correction coefficient, estimated -0.8775 is highly significant, and has the correct negative sign, and imply a very high speed of adjustment to equilibrium. According to Bannerjee *et al*. (2003), as cited in Kidanemarim (2014), the highly significant error correction term further confirms the existence of a stable long-run relationship. The coefficient of the speed of adjustment is negative and also statistically significant which is -0.8775 shows that the deviation by any of explanatory variables would be corrected by the speed of 87.75% in the long run per quarter. In other words, the shocks of each explanatory variable on trade balance would move towards long-run equilibrium by 87.75%. Moreover, it implies that any deviation in the short run from equilibrium level of trade balance in the current period is corrected by 87.75% in the next period to bring back equilibrium when there is a shock to a steady state relationship. Furthermore, the short-run dynamics of the vector error correction model captured by the system for the statistically significant coefficients can be written with their respective p-value in parenthesis as follows.

DLNTB = 0.222D (LNTB) (-1)) -3.56D (LNGDP (-1)) + 10.98D (LNFGDP (-1)) -0.8775ECM (-1))

[0.0208]* [0.0206]* [0.0094]* [0.0000]*

All coefficients whose probability denoted by the * symbol indicates the significance of coefficients at 5% significance level. According to the estimation result, the trade balance is affected by its own lag, the lag of domestic income and the lag of foreign income. The real effective exchange rate deteriorates the balance of trade in the short run but it is not statistically significant at 5%. The domestic real money supply also did not significantly affect the balance of trade in Ethiopia as its probability is greater than 5 percent. The lag of trade balance and foreign income has positive effects while the domestic income has a negative impact on trade balance on trade in the short run. Therefore, real effective exchange rate and trade balance have no significant relationship in the short run regardless of the negative value of its coefficient. All variables are specified and hence the larger percentage of variation in the trade balance is explained due to the variation in foreign income about 10.98% in the short run.

5.7 Diagnostic Tests

5.7.1 Serial correlation LM test

Serial correlation is a case where the period error term is correlated with the last period error term. The study used the Breusch-Godfrey test to check whether data experienced autocorrelation or not (Gujarati, 2003). The following hypothesis test can be inferred for autocorrelation of residuals. H_0: There is no autocorrelation among residuals

H_1: Residual are correlated

If the p-value of the Chi-Square is greater than 5 percent we accept the null hypothesis of no autocorrelation otherwise we reject the null hypothesis and accept the alternative one.

Table 5 7 autocorrelation (Breusch-Godfrey) Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.364390	Prob. F(2,81)	0.6958
Obs*R-squared	0.802535	Prob. Chi-Square(2)	0.6695

Source: EVIEWS 10 result

Hence from the above result, the probability of Chi-Square (2) is greater than 5 percent there we accept the null hypothesis of no autocorrelation because its p-value is 0.6695. Therefore, it is confident that the model has no autocorrelation problem.

5.7.2 Heteroscedasticity test

Heteroscedasticity refers to when the variance of residual from each explanatory variable is not constant (no homoscedastic). In this study, heteroscedasticity problem is detected by the Breusch-Pagan –Godfrey test. Hypothesis test of the heteroscedasticity problem is given below.

Hypothesis: $\boldsymbol{H_0}$: Residuals are homoscedastic

$\boldsymbol{H_1}$: Residuals are not homoscedastic

Thus, based on this hypothesis if the probability value of R-squared is greater than 5 percent then we cannot reject the null hypothesis of no heteroscedasticity otherwise we enforced to reject the null hypothesis and accept the alternative hypothesis.

Table 5.8 Breusch-Pagan-Godfrey heteroscedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
			Prob –value
F-statistic	1.109736	Prob. F(10,79)	0.3655
Obs*R-squared	11.08537	Prob. Chi-Square(10)	0.3509
Scaled explained SS	9.874578	Prob. Chi-Square(10)	0.4516

Source: EVIEWS 10 result

The result of the estimation indicates that hence the p-value of the R-squared is 35% greater than 5 percent we cannot reject the null hypothesis of homoscedasticity. Therefore, in this model, there is no heteroscedasticity problem and hence the variance of the residuals is homoscedastic.

5.7.3 Normality test

In testing for normality, of the error term, the Jarque-Bera test was used and the result of the test could be shown in table 5.10. Hypothesis testing: $\boldsymbol{H_0}$ – Error term is normally distributed where

$\boldsymbol{H_1}$ – Errors are not normally distributed

Decision rule: based on the probability value if the p-value is greater than 5 % we can reject the null hypothesis which says that errors are not normally distributed unless we are forced to accept.

Table 5.9 Normality test of the residual

variable	Observation	Jarque-Bera at lag 1		Prob chi-sq.	Jarque-Bera at lag 2		Prob chi-sq.
Residual	90		0.7886	0.3745		0.4063	0.5238
H_0: **Errors are normally distributed**							

Source: EVIEWS 10 result

According to the decision ruled of the normality test, the errors are normally distributed I the p-value of the Jarque-Bera greater than 5 percent. Based on table 5.11 because the p-value is 0.0702 and the result revealed that errors are normally distributed. Therefore, the normality test of the errors at 5 percent I fully achieved.

5.7.4 Stability test

Visual examination of the graphs of the recursive parameter estimates can be useful in evaluating the stability of the model. It would be useful to have a formal statistical test that we could apply to test the null hypothesis of the model stability. In this case, the cumulative sum (CUSUM) test, which is based on the residuals from the recursive estimates, provides such a test.

Hypothesis:H_0: the CUSUM distribution is a symmetric distribution centered at 0.

H_1 : The CUSUM distribution is not symmetrically distributed and no normal distribution. The null hypothesis could be rejected when the graph of the CUSUM statistics lays between the bounds the critical region for a test at the 5 percent level of significance.

5.8 Granger causality test

The main objective of this study is to investigate the effect of the real effective exchange rate on the trade balance of Ethiopia. Recall that although co-integration between two variables does not specify the direction of a causal relationship between variables, economic theory guarantees that there is always Granger causality in at least one direction. Researchers verify the direction of Granger causality between real exchange rate and trade balance. In this study, the estimation results for Granger causality between each variable is presented in table 5.8. The study used chi-square statistics and probability to measure causality between variables.

Hypothesis testing: H_0 – There is no granger causality from REER to TB

H_1- There is granger causality from REER to TB

Statistically, significant probability value indicates the rejection of the null hypothesis at 5 percent. There are two types of causality running: unidirectional causality and multidirectional causality. If real effective exchange rate (REER) granger causes trade balance (TB) but trade balance does not cause real effective exchange rate we say there is only unidirectional causality from real effective exchange rate to trade balance at the appropriate significance level. On the other side, the multi-causality would be run if there is causality from real effective exchange rate (REER) to trade balance (TB) and vice versa.

Table 5.10 Granger causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREER does not Granger Cause LNTB	90	5.24154	0.0071*
LNTB does not Granger Cause LNREER		4.36286	0.0157*
LNDGDP does not Granger Cause LNTB	90	5.13110	0.0079*
LNTB does not Granger Cause LNDGDP		0.50322	0.6064
LNFRGDP does not Granger Cause LNTB	90	10.6875	7.E-05*
LNTB does not Granger Cause LNFRGDP		0.82429	0.4420
LNRMS does not Granger Cause LNTB	90	5.55807	0.0054*
LNTB does not Granger Cause LNRMS		1.00782	0.3693

Source: EVIEWS 10 result

In the above table result, it implies real effective exchange rate, domestic income, world income and real money balance granger cause trade balance of Ethiopia as their probability value is statistically less than 5%. Trade balance of Ethiopia also granger causes real effective exchange rate and as a result there is bidirectional causal relationship between them.

5.9 Variance decomposition

In the variance decomposition analysis, we obtain information on the percentage of variation in the forecast error of a variable as explained by its own innovation and proportional variation explained by other variables in the system. Based on the result, the variance decomposition of trade balance as variable endorsed to its own innovation and to shocks in the other variables for a forecast horizon of 1 through 12 are presented in appendix 11. This result showed, in the first period the variation in the trade balance is its own innovation and it is 100%.

The second variation in trade balance forecast error due to exchange shock which 6.72% and the third source of variation is foreign income which covers about 4.16% whereas domestic income and real money balance have limited percentage of a shock to the variation in the trade balance.

In the third period, the shock of the exchange rate in trade balance forecast variation is 15.56% whereas foreign income shock to the trade balance is about 4.3%. In this period, both domestic income and real money balance comprises 1.83% and 0.12% respectively. At the 10^{th} quarter, in Ethiopia, the significant source of variation in the trade balance forecast error is its own innovations and its average of progress is 57.67 % in the forecast horizon. The real exchange rate innovation explains about an average of 34.63 percent of the variation in the trade balance.

In the final period of the horizon, the real exchange rate innovation explains about an average of 38.14 percent of the variation in the trade balance. The foreign income and domestic income explain an average of 6.48% and 5.96% of the variation in trade balance respectively. Finally, the innovation in real money supply shows about 0.28% percent of the variation in the trade balance of the country. In general, the result of the model suggested that the effect of the real exchange rate and foreign income on trade balance of Ethiopia appears to be highly significant.

Table 5.11 Variance decomposition

Period	S.E.	LNTB	LNREER	LNDGDP	LNFRGDP	LNRMS
1	0.099270	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.112628	87.86164	6.720781	1.131191	4.160895	0.125492
3	0.120282	78.09008	15.56585	1.834663	4.380978	0.128423
4	0.124089	73.53014	20.02034	1.872365	4.449434	0.127716
5	0.127125	70.59796	22.56389	1.805732	4.898426	0.133998
6	0.130030	67.85594	25.24547	1.739924	5.022152	0.136511
7	0.132916	64.97174	28.09302	1.669977	5.120863	0.144400
8	0.135756	62.29000	30.58135	1.601192	5.363952	0.163505
9	0.138497	59.88346	32.70105	1.545397	5.679691	0.190402
10	0.141178	57.67531	34.63618	1.500090	5.967792	0.220629
11	0.143828	55.60110	36.45584	1.462325	6.227120	0.253613
12	0.146446	53.65456	38.14322	1.431723	6.481004	0.289497

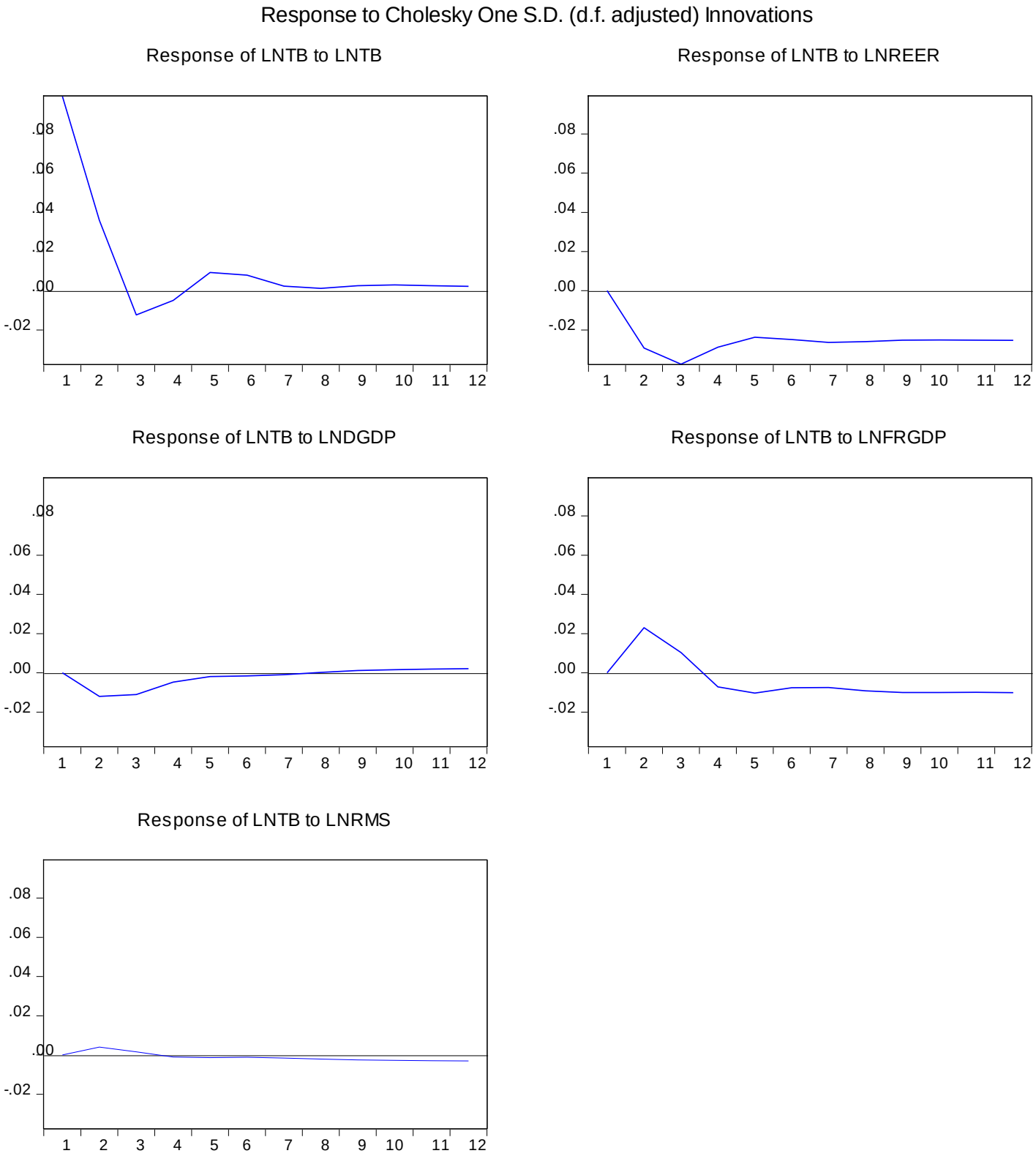
Source national bank of Ethiopia and own computation using EVIEWS 10

5.10 Impulse Response Function

Figure 5.1, plots the impulse response of the trade balance to one standard deviation shock in the real exchange rate for Ethiopia. As the figure depicts after the shock of REER, the trade balance deteriorates by 1.8 percent. However, as time goes, the price effect does not persist for a long period as the figure evidenced. After the initial shock of REER about three periods later, the trade ratio reaches its balance. It starts to improves in some period after three periods later but the increase in that period does not offset the deterioration in this period after five periods later it again starts to deteriorates. On average, a one percent real depreciation of Ethiopian Birr has a long run negative impact of 0.3 percent.

Therefore with a given confidence level, the J curve effect is insignificant. Therefore, the null hypothesis of the J curve existence of trade in Ethiopia would be rejected. According to this result, it guarantees that the assumption of a short run inelastic response of import volume to import prices, common in the conventional theory of many studies is likely to open itself to question. Descriptive analysis of devaluation experiences, mainly in the developing countries, have illustrious the phenomenon of "import compression" immediately following devaluation of the currency. The in turn magnifies, regardless of the numerical values of the estimated import demand elasticity, devaluation quickly forces a reduction in the volume of imports, probably due to a binding foreign exchange constraint. If this holds true, there is no reason to expect a negative short-run component of the J curve. Since the perverse valuation effect rests on the assumption that import volumes continue unchanged in the short run (Yang: 2004). Finally, the exchange rate pass to import prices may be slow or even incomplete and foreign producers may lower their prices of supply to captivate the effect of a rise in the exchange rate. Therefore with a given confidence level, the J curve effect is insignificant. Therefore, there is no evidence of J curve existence of trade in Ethiopia.

Figure 5.1 Response functions of REER, DGDP, FGDP, and RMS to TB



Source national bank of Ethiopia and own computation EVIEWS 10

CHAPTER SIX

CONCLUSION AND POLICY IMPLICATION

6.1 Conclusion

Nowadays, there is indisputable issue of debate among economic researchers and policymakers on whether the devaluation of currency improves the trade of balance in the long run. The marshal learner condition is among this issue where it argues that the devaluation of currency improves the balance of trade in the long run which holds under the elasticity approach of the balance of payment. But, there are a number of limitations with this approach to holding as stated in theory. First, the import demand and export supply functions, depend only on the nominal prices (measured in domestic currency units) rather than on relative prices and appropriate scale variables such as real income, real expenditures, real money balances, or productive capacity. Second, there are markets or goods not accounted for explicitly. Finally, it relies overly on a partial approach for analyzing a problem that should use a general equilibrium framework.

The study has examined the impact of exchange rate on the trade balance performance of Ethiopia both in the short run and long run using the quarterly data from 1995Q1 to 2017Q4. In addition to real exchange rate other variables like domestic real GDP, world income which is proxied by USA real GDP and domestic real money supply as the determinants of trade balance in line with different approaches of the balance of payment discussed under literature part. Although the study focused on a different approach of the balance of payment it clearly forwarded to the current account part which measures the balance of the goods and services sold and bought by the country to and from the rest of the world. The study has also undertaken the stationarity test for each variable before running regression estimation using the ADF test. In this investigation, there is one cointegrating equation by using maximum Eigenvalue and trace value of Johansen cointegration test. The data analyze method in this investigation has employed both descriptive and econometrics models accordingly. In order to examine the long run relationship among cointegrating variables the study also employed vector error correction model (VECM) and the result of the study revealed that there is a significant negative long-run relationship where there is no causal relationship between real exchange rate and trade balance of Ethiopia.

This result is opposite to the marshal learner condition that is proposed by the BRM model that says devaluation of a currency improves the balance of payment of the devaluing country in the

long run. Thus, based on this analysis the real exchange rate worsens the trade balance of country both in econometric empirical and descriptive analysis. This mainly due to the agricultural product of export items and inelasticity of demand for a country's export while the country enforced to import huge amount because Ethiopian imports are strategic goods as it is very critical for the growth of the country than domestically produced goods.

On the other hand, foreign income and real money balance negatively affect whilst the domestic income positively affects trade balance the trade balance of Ethiopia. This is because, obviously a major export item of a country is agricultural products, as a result of the trading partner's elasticity demand decline when their income increases as they lured for capital goods. From the domestic income viewpoint, domestic income will improve trade balance if it increases the production of domestic tradable goods. Generally, the null hypothesis of no positive relationship between real exchange rate and trade balance of Ethiopia is accepted.

6.2 Policy implication from the study

Based on the empirical findings of the paper the following policy implications are drawn. It is obvious that the trade balance of Ethiopia has been facing a negative balance from year to year as the huge proportions of the country's export is primary and agricultural products which are price inelastic domestic supply and foreign demand.

Hence, the country should give attention for the control of inflationary phenomena that undertaking devaluation as it cannot attain the wanted goal due to price fluctuation and foreign inelasticity demand of the county's export.

In particular, diversifying and marketing any domestically produced good in domestic country is highly recommended because the domestic income has a great contribution in trade balance of the country. Apart from product diversification and market creation, the government has to make a relevant and appropriate monetary policy that equilibrates the money market of the country.

In addition apprehending new export markets may also reduce a high competition between the country's supply similar export products. The country should give attention to the new market destinations to encourage export and improve trade balance rather than using direct devaluation.

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Appendixes

Appendix 1 Lag selection criteria

VAR Lag Order Selection Criteria

Endogenous variables: LNTB LNREER LNDGDP LNFRGDP LNRMS

Exogenous variables: C

Date: 06/09/19 Time: 17:38

Sample: 1995Q1 2017Q4

Included observations: 84

Lag	LogL	LR	FPE	AIC	SC	HQ
0	544.5975	NA	1.81e-12	-12.84756	-12.70287	-12.78939
1	1213.822	1242.845	3.95e-19	-28.18623	-27.31808	-27.83724
2	1298.725	147.5696*	9.56e-20*	-29.61249*	-28.02089*	-28.97268*
3	1318.634	32.23424	1.10e-19	-29.49129	-27.17622	-28.56065
4	1338.960	30.48947	1.26e-19	-29.38001	-26.34149	-28.15855
5	1359.242	28.00822	1.49e-19	-29.26767	-25.50569	-27.75539
6	1381.841	28.51737	1.70e-19	-29.21050	-24.72506	-27.40739
7	1391.038	10.51055	2.78e-19	-28.83423	-23.62534	-26.74030
8	1410.926	20.36166	3.68e-19	-28.71252	-22.78017	-26.32776

* 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 2 Johansen co-integration test

Date: 06/09/19 Time: 17:40

Sample (adjusted): 1995Q4 2017Q4

Included observations: 89 after adjustments

Trend assumption: Linear deterministic trend

Series: LNTB LNREER LNDGDP LNFRGDP LNRMS

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 *	0.323236	78.70908	69.81889	0.0082
At most 1	0.205135	43.96055	47.85613	0.1108
At most 2	0.184109	23.52766	29.79707	0.2211
At most 3	0.057778	5.418451	15.49471	0.7629
At most 4	0.001366	0.121647	3.841466	0.7272

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 *	0.323236	34.74853	33.87687	0.0393
At most 1	0.205135	20.43289	27.58434	0.3120
At most 2	0.184109	18.10921	21.13162	0.1258
At most 3	0.057778	5.296804	14.26460	0.7040
At most 4	0.001366	0.121647	3.841466	0.7272

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 3 Vector error correction model

Vector Error Correction Estimates

Date: 06/09/19 Time: 17:41

Sample (adjusted): 1995Q3 2017Q4

Included observations: 90 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNTB(-1)	1.000000
LNREER(-1)	1.357009
	(0.43964)
	[3.08662]
LNDGDP(-1)	-1.703972
	(0.38449)
	[-4.43173]
LNFRGDP(-1)	1.787998
	(0.53407)
	[3.34788]
LNRMS(-1)	1.430458
	(0.29389)
	[4.86725]
C	-12.85624

Error Correction:	D(LNTB)	D(LNREER)	D(LNDGDP)	D(LNFRGDP)	D(LNRMS)
CointEq1	-0.877500	-0.037849	0.001993	0.003480	0.001705
	(0.11558)	(0.02041)	(0.01306)	(0.00284)	(0.01319)

	[-7.59206]	[-1.85465]	[0.15258]	[1.22713]	[0.12920]
D(LNTB(-1))	0.221670	0.053258	-0.009017	-0.003701	-0.013483
	(0.09403)	(0.01660)	(0.01062)	(0.00231)	(0.01073)
	[2.35744]	[3.20787]	[-0.84873]	[-1.60405]	[-1.25603]
D(LNREER(-1))	-0.437684	0.167845	0.026211	-0.018574	0.071203
	(0.60465)	(0.10676)	(0.06832)	(0.01484)	(0.06903)
	[-0.72386]	[1.57218]	[0.38367]	[-1.25194]	[1.03153]
D(LNDGDP(-1))	-3.559775	0.630747	0.744330	0.062704	-0.080963
	(1.50833)	(0.26632)	(0.17042)	(0.03701)	(0.17219)
	[-2.36007]	[2.36842]	[4.36763]	[1.69431]	[-0.47020]
D(LNFRGDP(-1))	10.97750	1.034970	-0.638706	0.361985	-0.820298
	(4.13059)	(0.72931)	(0.46670)	(0.10135)	(0.47155)
	[2.65761]	[1.41911]	[-1.36857]	[3.57167]	[-1.73959]
D(LNRMS(-1))	2.045736	-0.601716	-0.020091	-0.052703	0.822042
	(1.30078)	(0.22967)	(0.14697)	(0.03192)	(0.14850)
	[1.57269]	[-2.61991]	[-0.13670]	[-1.65129]	[5.53576]
C	-0.011038	-0.001899	0.004848	0.001564	0.005023
	(0.01643)	(0.00290)	(0.00186)	(0.00040)	(0.00188)
	[-0.67198]	[-0.65465]	[2.61235]	[3.88136]	[2.67874]
R-squared	0.478304	0.262099	0.535138	0.201618	0.600506
Adj. R-squared	0.440591	0.208757	0.501533	0.143903	0.571627
Sum sq. resids	0.817926	0.025498	0.010441	0.000492	0.010660
S.E. equation	0.099270	0.017527	0.011216	0.002436	0.011333
F-statistic	12.68275	4.913547	15.92458	3.493373	20.79381
Log likelihood	83.83120	239.8982	280.0758	417.5157	279.1455

Akaike AIC	-1.707360	-5.175517	-6.068352	-9.122572	-6.047678
Schwarz SC	-1.512930	-4.981087	-5.873922	-8.928142	-5.853248
Mean dependent	-0.000845	0.001212	0.011589	0.002626	0.011435
S.D. dependent	0.132725	0.019704	0.015886	0.002632	0.017315

Determinant resid covariance (dof adj.)	5.44E-20
Determinant resid covariance	3.63E-20
Log likelihood	1375.828
Akaike information criterion	-29.68507
Schwarz criterion	-28.57404

Appendix 4 Equation result of the model

Dependent Variable: D(LNTB)

Method: Least Squares (Gauss-Newton / Marquardt steps)

Date: 06/09/19 Time: 17:42

Sample (adjusted): 1995Q3 2017Q4

Included observations: 90 after adjustments

D(LNTB) = C(1)*(LNTB(-1) + 1.35700935014*LNREER(-1) -
1.70397155985*LNDGDP(-1) + 1.78799757459*LNFRGDP(-1) +
1.43045836015*LNRMS(-1) - 12.8562376349) + C(2)*D(LNTB(-1)) +
C(3)*D(LNREER(-1)) + C(4)*D(LNDGDP(-1)) + C(5)*D(LNFRGDP(-1))
+ C(6)*D(LNRMS(-1)) + C(7)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.877500	0.115581	-7.592059	0.0000
C(2)	0.221670	0.094030	2.357441	0.0208
C(3)	-0.437684	0.604654	-0.723858	0.4712
C(4)	-3.559775	1.508332	-2.360073	0.0206
C(5)	10.97750	4.130587	2.657612	0.0094
C(6)	2.045736	1.300784	1.572695	0.1196
C(7)	-0.011038	0.016426	-0.671975	0.5035

R-squared	0.478304	Mean dependent var	-0.000845
Adjusted R-squared	0.440591	S.D. dependent var	0.132725
S.E. of regression	0.099270	Akaike info criterion	-1.707360
Sum squared resid	0.817926	Schwarz criterion	-1.512930
Log likelihood	83.83120	Hannan-Quinn criter.	-1.628954
F-statistic	12.68275	Durbin-Watson stat	2.074321
Prob(F-statistic)	0.000000		

Appendix 5 Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.364390	Prob. F(2,81)	0.6958
Obs*R-squared	0.802535	Prob. Chi-Square(2)	0.6695

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 06/09/19 Time: 17:44

Sample: 1995Q3 2017Q4

Included observations: 90

Presample missing value lagged residuals set to zero.

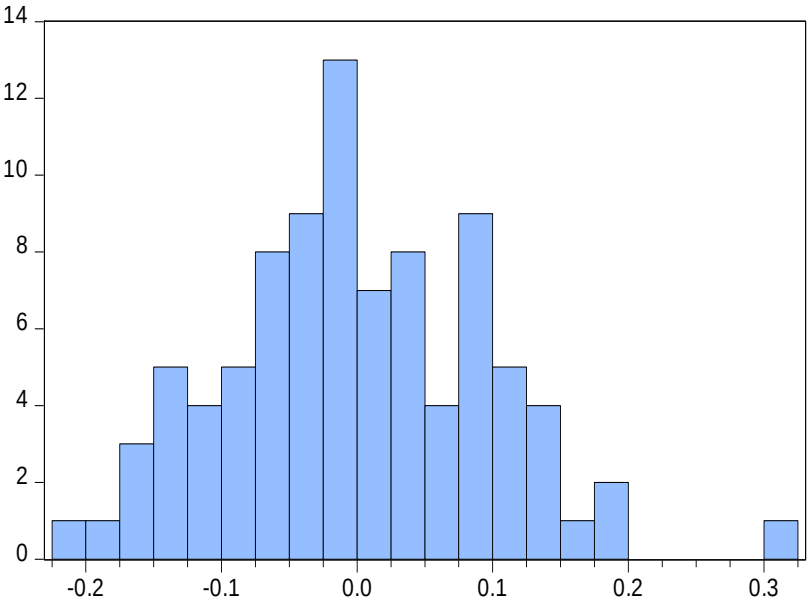
****

Appendix 6 Heteroscedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

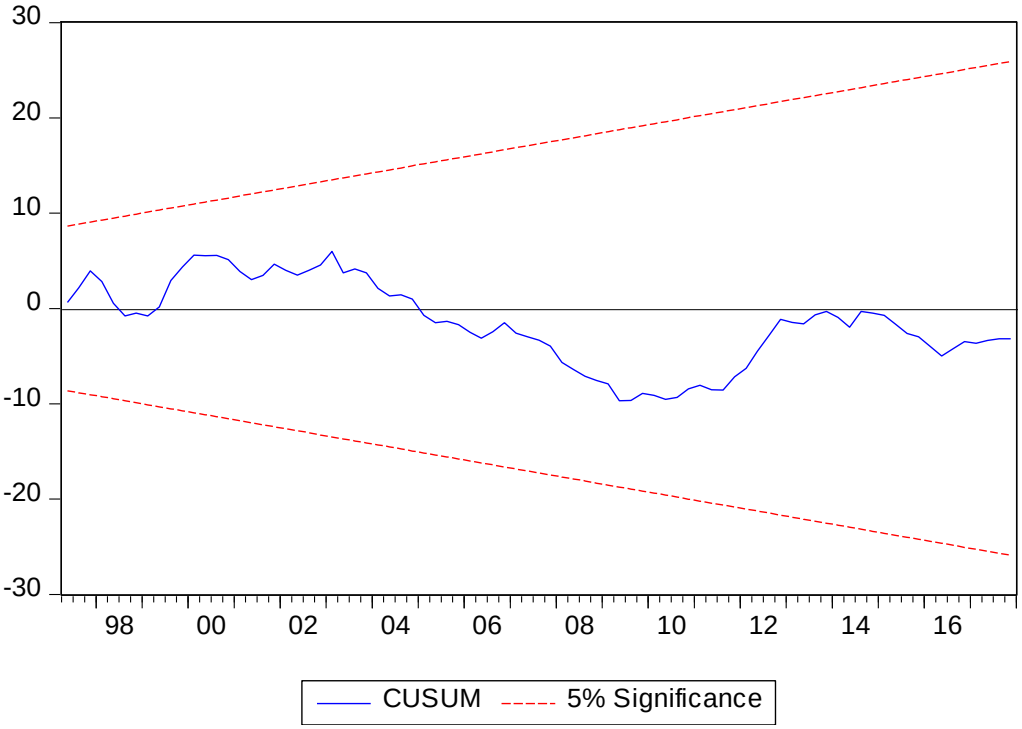
F-statistic	1.109736	Prob. F(10,79)	0.3655
Obs*R-squared	11.08537	Prob. Chi-Square(10)	0.3509
Scaled explained SS	9.874578	Prob. Chi-Square(10)	0.4516

Appendix 8 Jarque-Bera normality test



Series: Residuals	
Sample 1995Q3 2017Q4	
Observations 90	
Mean	7.86e-17
Median	-0.007807
Maximum	0.300009
Minimum	-0.219300
Std. Dev.	0.095865
Skewness	0.229295
Kurtosis	3.094727
Jarque-Bera	0.822295
Probability	0.662889

Appendix 9 CUSUM stability

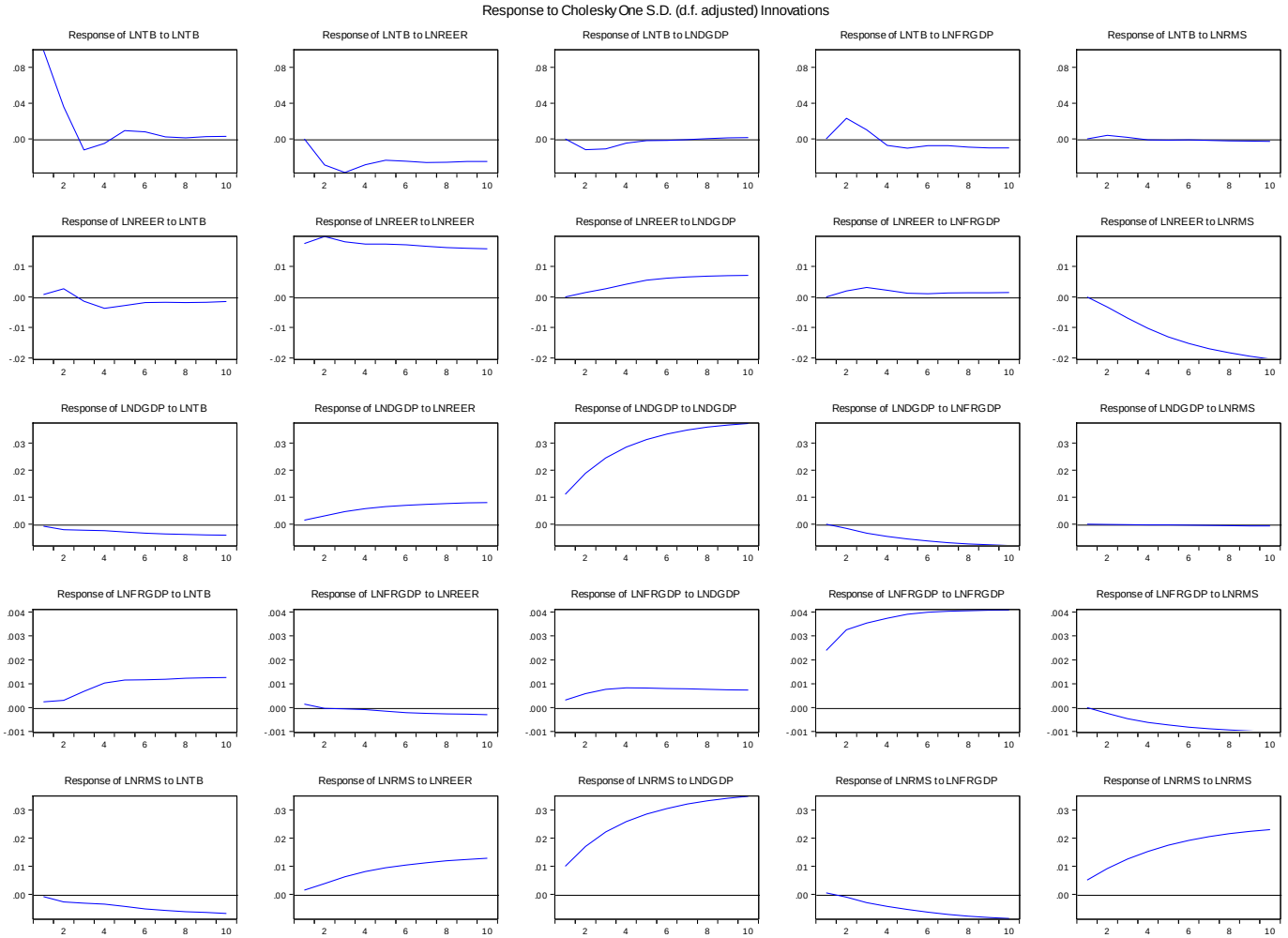


Stability test by roots characteristics

Root	Modulus
0.999292	0.999292
0.923255	0.923255
0.889666 - 0.095295i	0.894755
0.889666 + 0.095295i	0.894755
0.734707	0.734707
0.664555	0.664555
0.112347 - 0.522064i	0.534016
0.112347 + 0.522064i	0.534016
0.306195 - 0.157361i	0.344265
0.306195 + 0.157361i	0.344265

No root lies outside the unit circle.
VAR satisfies the stability condition.

Appendix 10 Impulse response function



Appendix 11 Variance decomposition

Variance Decomposition of LNTB:

Period	S.E.	LNTB	LNREER	LNDGDP	LNFRGDP	LNRMS
1	0.098485	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.110937	95.71963	0.629049	0.154020	2.808388	0.688909
3	0.121569	79.73499	10.53215	0.626051	8.490306	0.616500
4	0.126891	76.31940	12.29927	1.453417	9.241167	0.686745
5	0.135551	77.05764	10.82924	2.322339	9.156645	0.634134
6	0.139089	75.38408	10.31366	3.086992	10.56265	0.652620
7	0.141259	73.29564	10.65671	3.705008	11.58146	0.761184
8	0.143770	72.82120	10.37807	4.227944	11.64825	0.924532
9	0.147338	72.63739	9.897079	4.618088	11.50342	1.344024
10	0.149700	71.51804	9.631297	4.990219	11.73935	2.121086
11	0.151784	70.24277	9.555915	5.329926	11.84965	3.021736
12	0.154369	69.40826	9.279461	5.623535	11.69621	3.992539

Appendix 12 Granger causality test

Pairwise Granger Causality Tests

Sample: 1995Q1 2017Q4

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREER does not Granger Cause LNTB	90	5.24154	0.0071
LNTB does not Granger Cause LNREER		4.36286	0.0157
LNDGDP does not Granger Cause LNTB	90	5.13110	0.0079
LNTB does not Granger Cause LNDGDP		0.50322	0.6064
LNFRGDP does not Granger Cause LNTB	90	10.6875	7.E-05
LNTB does not Granger Cause LNFRGDP		0.82429	0.4420
LNRMS does not Granger Cause LNTB	90	5.55807	0.0054