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THE DEVALUATION OF ETHIOPIAN BIRR: WHAT HAVE WE LEARNED? EVIDENCE FROM VECTOR ERROR CORRECTION MODEL

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THE DEVALUATION OF ETHIOPIAN BIRR: WHAT HAVE WE LEARNED? VECTOR ERROR CORRECTION MODEL (VECM)

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This is to certify that the thesis prepared by Jiffara Abdisa Labata, entitled: "***The Devaluation of Ethiopian Currency: What have we Learned?" Vector Error Correction Model (VECM)*** and submitted in partial fulfillment of the requirements for the Degree of Master of Science in 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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List of Acronyms

ADB: African Development Bank

ADF: Augmented Dickey-Fuller Test

AIC: Akaike Information Criterion

ARDL: Autoregressive Distributed Lag Model

BOP: Balance of Payment

CE: Coefficient of estimation

CPI: Consumer Price Index

EC: Error Correction

FEVD: Forecast Error Variance Decomposition

HQ: Hannan-Quinn Criterion

IC: Information Criterion

IMF: International Monetary Fund

LM: Lagrange Multiplier

MPC: Marginal Propensity to Consume

MPA: Marginal Propensity to Absorb

MTD: Maria Theresa Dollar

NBE: National Bank of Ethiopia

NEER: Nominal Effective Exchange Rate

OLS: Ordinary Least Square

PP: Phillip-Perron Unit root test

PPP: purchasing power parity

R&D: Research and Development

RGDP: Real Gross Domestic Product

SBIC: Schwarz's Bayesian Information Criterion

SVAR: Structural Vector autoregressive

TB: Trade Balance

US: United State

VAR: Vector Autoregressive Model

VECM: Vector Error Correction Model

WB: World Bank

Abstract

Ethiopia is a small open economy and has been applying exchange rate devaluation as policy instrument repeatedly. The focus of this study was to look into the theoretical and empirical relationship between Ethiopian currency devaluation, trade balance, Inflation, External debt servicing, and Economic growth so as to draw constructive lessons. The study employed trend analysis along with Econometric analysis such as Johnson co-integration, Vector Error correction model (VECM), Granger causality tests, impulse response function, and forecast error variance decomposition to analysis long run and short-run relationship between variables. These model was estimated using quarterly data for the period ranging from 1992Q2 to 2017Q4. Depending on trend analysis and the results from econometric tools, this thesis confirmed the hypothesis that currency devaluation will lead to inflationary and high external debt servicing. However, it rejected the hypothesis that currency devaluation will boost economic performance and allow a stable trade balance. It is crystal clear that huge inflation and huge external debt servicing are the burdens for the Economy. Similarly, low economic performance and unstable trade balance are bad news too. Ultimately, the thesis argued that the Devaluation of Birr is inappropriate policy instrument for the Ethiopian economy yet.

Key words: *Devaluation, Macroeconomic Variables, Co-integration, and VECM.*

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Exchange rate movement is an important characteristic of many African countries including Ethiopia. An exchange rate is a rate at which a country's currency can be exchanged for the currency of another country. It is an important monetary policy instrument that has its own impact on macroeconomic variables such as; trade balance, inflation, economic growth, debt servicing, and the like. There are three types of exchange rate system: Free float exchange rate, managed float exchange rate, and fixed exchange rate.

According to Plibeam (2006), the fixed exchange rate is the system in which country's currency is fixed against the value of another single currency, or to another measure of value, like gold or to a basket of currencies. In the case of the fixed exchange rate, the government decides the worth of its currency in terms of either a fixed weight of gold or a fixed amount of another currency in a system. Free float exchange rate is the opposite of a fixed exchange rate. Under this exchange rate system, the market mechanism (demand for and supply of currency) determine the level of exchange rate without government interference. Managed float exchange rate shares the features of both fixed and free float exchange rate. In this system, the government sets upper and lower limits for the value of domestic currency within which it can float and intervenes when it goes beyond the limit to contain it within the predetermined bounds.

A fixed exchange rate does not mean its value remains unchanged (Mankiw 2012). If and when the need arises to change it to affect the trade and balance of payments position of the country, the government *devalues* or *revalues* the currency as the case may be. Under free float exchange rate system, the currency can either depreciates or appreciates depending on demand and supply for foreign exchange and the government cannot intervene to prevent the change nor limit the level. Revaluation and appreciation refer to an increase in the value of the domestic currency in terms of foreign currency under fixed and flexible exchange rate system respectively while devaluation and depreciation refer to decrease in the value of the domestic currency relative to foreign currency under fixed and flexible exchange rate systems respectively. The inquiry of this thesis has limited to the exchange rate

devaluation which is the part of fixed exchange rate system and obtains in the country of our interest in Ethiopia.

Devaluation is a circumstance in which government reduces the value of a country's currency within a fixed exchange rate system, by which the monetary authority formally sets a new fixed rate with respect to foreign reference currency or currency basket (Gandalfo, 2016). For instance, the Ethiopian government changes an exchange rate from 12Birr/1$ to 16birr/1$. This scene shows that the Birr loses its value (get devalue) relative to the US Dollar. This illuminates that, the Ethiopian dealers who want to buy a unit of good need too much Birr after devaluation compared to the amount it needs before the devaluation.

According to Draunivudi (2014), the reason why a country devalues its currency is that it renders domestically produced goods more attractive abroad while making foreign goods less attractive at home. This shift in the attractiveness of traded goods causes the level of exports to rise and the level of imports to fall thereby leading to an improvement in the trade balance and economic growth. While the main driving force behind the change in the value of the currency is the external position of the country i.e its trade and/or its current account balance, it does not necessarily mean that the result is automatic and given as this depends on a host of factors.

Early in its history, Ethiopia has been used salt blocks as amole chew as currency. Later amole *chew* circulated alongside MTD (Maria Theresa Dollar) which was adopted under the rule of Emperor Iyasu II who led the country from 1730 to 1755 (Ameha, 2018). The MTD is a silver bullion coin first minted in 1741 and named after Empress Maria Theresa who led Austria, Hungary, and Bohemia until 1780. It quickly became the preferred coin of international trade, even after it ceased to be the official currency of Austria in 1858 (Michael, 1996). In 1893, the MTD became the standard unit of currency in Ethiopia, where it was locally known as Birr, which means silver in Amharic (Taye, 1999). In 1903, a quarter Birr, and 1/16 Birr known as a ghersh began to circulate in Ethiopia, and the official accounting currency became 1 Birr = 16 ghersh = 32 Bessa (Michael, 1996). In 1915, the Bank of Abyssinia released banknotes, but primarily merchants and foreigners Used them (Eshetu, 2017).

Ethiopian legal tender currency was issued on 23 July 1945, by defining the monetary unit as the Ethiopian dollar (E$) with a value of 5.52 grains (equivalent to 0.355745 grams) of fine gold and replaced the Maria Theresa (Lencho, 2013). The linkage with fine gold was in accord with the monetary system established by the Bretton Woods Agreement of 1944 and it automatically established the exchange rate between the national currency and other currencies with the same arrangement (Alamayehu (2006), Derese (2011), Rao .etal (2016)). Accordingly, the official exchange rate of Ethiopian currency with the US dollar was created (with the official exchange rate of 2.48 Birr per US dollar) on July 23, 1945. After almost two decades, that is, on 1 January 1964, the Ethiopian Birr was adjusted for exchange convenience to 2.50 Birr per US dollar to make exchanges more convenient (Befekadu, 1995, Alamayehu, 2006 and Haile, 1994). In 1971, the US devalued its currency from US$ 35 per ounce of gold to US$ 37. This led to the revaluation of the Birr to 2.30. In 1973, the US delinked its currency from gold and let it float. The major currencies followed suit resulting in the collapse of the BW system. Despite the floating of the US dollar, the Ethiopian Birr retained its exchange rate with the dollar at Birr 2.07 per dollar (Befikadu, 1993). Ethiopia did not devalue its currency until the fall of the Derg regime.

1.2 Statement of the Problem

It was in 1992 that the Ethiopian Birr (a new designation coined by the Military Regime that took power following the creeping coup in 1974) experienced a real devaluation the percentage of which was not repeated thereafter despite the frequent reduction of the value of the currency. The 1992 devaluation reduced the Birr's external value from 2.07 ETB/1$ to 5.00 ETB/1$ or by 142 % (Haile, 1994). This 142% devaluation was followed by series of devaluation including devaluation on September 1, 2010 from 13.62 ETB/1$ to 16.35 ETB/1$ or by 16.7%, and devaluation on October 10, 2017 from 23.4 ETB/1$ to 26.91 ETB/1$ or by 15%. These devaluations have been instigated by the combined pressures of the WB and IMF. According to NBE and IMF, The purpose of these devaluations was to increase export and decrease import so that resulting in the improved current account balance, high economic growth, and high foreign exchange reserves.

According to evidence from neighbor countries and many studies in Ethiopia, for a country, the expected improvements did not materialize. However, these studies had been evaluating the impact of devaluation on the Ethiopian economy by confining their target on a single variable and their observations did not cover all large devaluations in Ethiopia (see; section 2.3.3: Asmamaw (2008), Abule and Abdi (2012), Helen (2012), Endale (2014), and etc.). This study does not claim that previously conducted studies were wrongly organized. Instead, there is an important issue that they did not take into consideration but this study did. The motivation for this research began after reading many works of literature around the devaluation of the currency and its outcomes in Ethiopia and many developing countries.

So far, there was no study, which attempts to examine:-

- ***first***, whether 1992 devaluation (***the initial large devaluation in Ethiopia***) was meet what the proponents of devaluation were remarking. Then, what were the reasons for the acceptance of the second large devaluation in 2010?
- ***Second,*** similarly, whether 2010 devaluation (***the second large devaluation in Ethiopia***) was meet what the proponents of devaluation were promised. Then, what was motivating Ethiopian government to accept the third large devaluation in 2017?
- ***Third***, whether 2017 devaluation (***the final large devaluation***) was the right decision or not.

In combination, the task of this paper is to seek the answer to the simple question of why the Ethiopian government continued to devalue the currency despite its own experiences as well as the global evidence.

1.3 Objectives of the Study for

The general objective of this study is to examine and give a clear picture of what we have learned from the recursive devaluation of Ethiopian Currency. Alongside the general objective, the specific objectives are.

- To investigate the trends of selected macroeconomic variables over time and developments in external accounts relating to both exports and imports in volume and value terms.
- To examine the long run and short run relationship between devaluation and selected macroeconomic variables.
- To draw lessons of policy that the government should seriously consider.
- To render suggestion of whether to or not to devalue the currency further.

1.4 Hypothesis of the Study

To address the above-specified objectives the study develops the following hypothesis:

- There is a positive relationship between devaluation and inflation
- There is a positive relationship between devaluation and economic growth
- There is a positive relationship between devaluation and trade balance
- There is a positive relationship between devaluation and external debt servicing

1.5 Significance of the Study

By revisiting the above hypotheses, this study is expected to provide the following values. *First*, It will enable the Ethiopian people to have detailed information regarding the effects of devaluation on the country's economy. *Second*, It helps policymakers to look for appropriate monetary policy measures which would help to achieve economic stability and thereby cleaning the path for moving towards the middle-income countries. *Third,* Even though the study was conducted in Ethiopia, the results from this study may also hold for other developing countries, especially for most Sub-Saharan countries. *Fourth,* the paper might serve as reference material for other researchers who will conduct related researches.

1.6 Scope of the study

The scope of this study confined to the investigation of the suitability of devaluation as a policy instrument in the Ethiopian economy for the period of 1992q2-2017q4.

1.7 Organization of the Study

The rest of the thesis have organized as follows. Chapter two will survey the relevant literature (theoretically and empirically) while the third chapter introduces data used and specifies the model. Chapter four presents developments in external accounts relating to both exports and imports in volume and value terms. This chapter also discusses the structure and trends of selected macroeconomic variables. The fifth chapter analysis and interprets the econometric results. The final chapter shall conclude the thesis with policy recommendations

CHAPTER TWO: LITERATURE REVIEW

2.1 THEORETICAL LITERATURE REVIEW

2.1.1 Theory of Devaluation: What Devaluation Supposed to Achieve?

There are two main implications of a devaluation. *First*, devaluation makes the country's exports relatively less expensive for foreigners. *Second*, it makes foreigner products relatively more expensive for domestic importers. According to expenditure switching policy, devaluation makes imported goods expensive in the domestic market and exported goods relatively cheaper in the world market. As a result, the nation's trade balance improves following the adoption of devaluation.

Devaluation creates investment and employment opportunities in the devaluating country by improving the situation for foreign investors inviting an inflow of capital (World Bank, 1992). Especially in the countries whose demand for export is relatively income elastic, this means that a percentage increase in income of the country's trading partners increases the export demand of the devaluating by a larger percentage. Because of this, the nation's income from export rises following the devaluation. This calls forth investors to the export sector of the country. Devaluation is sometimes adopted to correct the inflationary situation caused by overvaluation.

The devaluation could result in a reduction of real wealth. When one nation say "Ethiopia" devalues, it's currency against the other nation say "United State" and the latter country devalues it"s currency against the former country. by doing so both nations may discourage their import demands while their export demand remains unchanged and this may result in a reduction in the total output of both nations. According to Umer (2015), frequent devaluation stimulates speculation and leads to confidence erosion; Continuous devaluation makes the domestic currency to lose its purchasing power continuously so that it creates distortion in many economic variables such as household real income, consumption, industrial growth, public finance, imports, exports, manufacturing growth, money supply and the like. Via its effect on these variables devaluation, reduce the real wealth of devaluing country

When a Country Should Devalue its Currency?

According to Haile (1994), the necessity of devaluation arises when:- the currency of a nation continues to be overvalued, domestic goods and services continues to be expensive relative to foreigners, and domestic inflation surpasses the foreign inflation.

2.1.2 The Effects of Devaluation on Selected Macroeconomic Variables

The effect of devaluation on macroeconomic variables in general and Trade balance, Inflation, economic growth and External debt, in particular, can be favorable, unfavorable and permanent or short lived. In this subsection of the essay, we focus on these issues.

2.1.2.1 Devaluation versus Trade Balance

Based on the discussed points there are three different approaches for analysis of the impact of devaluation on the trade balance. These are the elasticity, absorption and monetary approach.

2.1.2.1.1 The Elasticity Approach

The elasticity approach provides an analysis of what will happen to trade balance when a country devalues its currency and conditions that must prevail in the foreign exchange market for a devaluation or depreciation of the currency to improve the trade balance starting from equilibrium (PongsakHoontrakul, 1999). Lerner widened standard trade theory by including price elasticities of demand for imports and exports as important elements in determining the effect of exchange rate changes on the trade balance. An increase in exports and cut down on imports due to devaluation in the exchange rate does not necessarily mean a correction, or even an improvement, in the trade balance. The trade balance is not concerned with the amounts of physical goods but with their actual values (Lerner, 1944).

According to this approach, the devaluation of currency decreases the prices of domestic goods relative to foreign goods. In other words, devaluation increases the prices of imports in domestic currency and decreases the prices of exports (in the currency of the importing country) and may increase the volume of exports and reduce the volume of imports. However, the BOP position of the devaluing country depends upon the elasticity of demand and supply of goods – imports and exports in the countries. This is explained by the Marshall-Lerner condition, which states that a BOP position will eventually improve because of devaluation. However, this is possible, when there is a rise in the sum of demand elasticity of exports and imports. The immediate effect of devaluation is a fall in the prices of exports, which in turn will increase in the demand for exports. However, to have an increased volume of exports, the exportables must be price elastic so that production increase due to devaluation. Suppose that there are two countries; China and Ethiopia. According to the Marshall-Learner Condition, a devaluation of the Birr (which is an appreciation in the Chinese Yuan) results in the improvement in the current account balance of Ethiopia,

if the sum of elasticity of import demand (μ_m) and the export demand (μ_x) exceeds unity, i.e., $|\mu_x+\mu_m|>1$ (Kaur,1974).

Let's express the CA_t in terms of domestic currency

$$CA_t = P_tX_t - S_tP^*M_t \text{---------- (1)}$$

Where, **t'** time, **CA_t,** current account balance; **Xt** exports; **P_t**, domestic price; **P^*_t**, foreign price; **S_t** Nominal exchange rate, **M_t**, imports. What will happen to the current account if the exchange rate changed by a certain magnitude, say dSt?

This can be expressed as beneath:

$$\frac{\partial CAt}{\partial St} = ? \text{ ---------- (2)}$$

If the change (say devaluation of St) can improve the trade balance

$$\frac{\partial CAt}{\partial St} \geq 0 \text{---------- (3)}$$

Suppose that price levels are constant, then

$$\frac{\partial CAt}{\partial St} \geq 0 \leftrightarrow Pt\frac{\partial Xt}{\partial St} - P^*\left(\frac{\partial S}{\partial St}Mt + \frac{\partial Mt}{\partial St}St\right) \geq 0 \text{---------- (4)}$$

$$\rightarrow\rightarrow P^*M_t \left(\frac{Pt}{P*Mt}\frac{\partial Xt}{\partial St} - 1 - \frac{\partial Mt}{\partial St}\frac{St}{Mt}\right) \geq 0 \text{---------- (5)}$$

Multiplying and dividing the first term by StXt we obtain

$$\rightarrow\rightarrow P^*M_t \left(\frac{PtXt}{StP*Mt}\frac{St}{Xt}\frac{\partial Xt}{\partial St} - 1 - \frac{\partial Mt}{\partial St}\frac{St}{Mt}\right) \geq 0 \text{---------- (6)}$$

Suppose, $\frac{\partial Mt}{\partial St}\frac{St}{Mt} \equiv \mu_m$ and $\frac{St}{Xt}\frac{\partial Xt}{\partial St} \equiv \mu_x$ ---------- **(7)**

Then we can rewrite the above inequality as

$$P^{*}M_t \left(\frac{PtXt}{StP*Mt}\mu_x - 1 + \mu_m\right) \geq 0 \text{ ---------- } \mathbf{(8)}$$

Or

$$\left(\frac{PtXt}{StP*Mt}\mu_x - 1 + \mu_m\right) \geq 0 \equiv \frac{PtXt}{StP*Mt}\mu_x + \mu_m > 1 \text{ ---------- } \mathbf{(9)}$$

Equation (9) is the famous Marshall-Lerner condition.

This equation states that starting from a position of equilibrium in the current account; a devaluation will improve the current account only if the sum of the foreign elasticity of demand for exports and the home country elasticity of demand for imports is greater than unity. If the sum of these two elasticities is less than unity, then devaluation will lead to a deterioration of the current account. Here, there are two effects in play once a currency is devalued:

- The price effect: Exports become cheaper and imports become expensive
- The volume effect: encourage more exports (volume of X↑) and discourage imports(volume of M↓)

The J-Curve Effect

Theoretically, the trade balance deteriorates initially after devaluation and some time along the way it starts to improve until it reaches its long-run equilibrium. The time path through which the trade balance follows generates a J-curve. Krueger (1983) argued that the J-curve occurs because, at the time an exchange rate change occurs, goods already in transit and under contract have been purchased, causing a lag time in the effect of exchange rate adjustment. Therefore, once transactions that had already been in progress prior to the rate adjustment are concluded, subsequent commercial activity reflects the new competition environment, allowing the trade balance to begin to improve. The Theory of devaluation suggests that The trade balance improves in the long-run and will increase to a higher level than before the devaluation. The dip and the recovery take the shape of the letter J, hence the term J-curve effect.

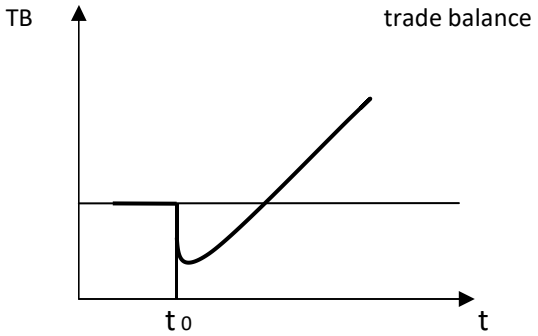


Figure 2.1 *Sketch of the J-curve effect, t_0 is the time of devaluation.*

Source: Authors own construction based on Gandolfo, 2016.

This theoretical point of view states that, after a real devaluation in the real exchange rate, it takes some time before the volume effect responds. Therefore, one can expect the trade balance over time to react as the J-curve; how? (1) immediately after the devaluation the trade balance is expected to decline and drop below its initial level; (2)the trade balance does generally rise over time since the volume effect is recognized gradually in the economy, and (3) In the long-run eventually the trade balance ends up at a higher level than its initial value.

2.1.2.1.2 The Absorption Approach

One of the major defects of the elasticity approach is that it based upon the assumption that all other things are equal. However, changes in export and import volumes will have implications for national income and consequently, income effects need to be incorporated in a more comprehensive analysis of the effects of devaluation.

Absorption approach due to Alexander (1952) and Johnsen (1967) and popularized by Miles (1979) was developed to overcome some of the shortcomings of the elasticity approach. 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 is viewed as the outcome of the difference between decisions to produce and spend or to save and invest.

Taking the national income identity:

$Y = C + I + G + X - M$ ---------- **(10)**

Where, Y, national income I, Investment; G,government expenditure; X,exports M,Imports. Now define domestic Absorption as

$A = C + I + G$ ---------- **(11)**

After some rearrangement

CA=X-M=Y-A ---------- **(12)**

Take the derivative of this equation to get

dCA=dY-dA----------**(13)**

This equation implies that the effects of devaluation on the current account balance will depend upon how it affects national income relative to how it affects domestic absorption. Absorption can be divided into two parts: a rise in income will lead to an increase in absorption which is determined by the marginal propensity to absorb, a, but there will also be a direct effect" on absorption, which is all the other effects on absorption resulting from devaluation, denoted by Ad.

This implies that:

dA=adY+dAd≡ dCA=(1-a)dY-dAd ----------(14)

Given equation (14), it is essential to look at how devaluation would affect the two parts:

I. The Effects of Devaluation on Absorption

If devaluation reduces direct absorption, then a devaluation will lead to an improvement in the current account balance, whereas if direct absorption increases then the effect on the current balance will lead to a deterioration of the current account. In this section, it is worthwhile to consider possible ways in which devaluation can be expected to impact absorption.

Marginal propensity to absorb: If MP to absorb is less than unity (a<1), with idle resources in the country, devaluation will increase exports and reduce imports. Output and income will raise the current account will improve. If on the other hand, a>1 there will be an adverse effect of devaluation on current account. It means that people are absorbing more than the country is producing. In such a situation, devaluation will not increase exports and reduce imports and the current account situation will worsen. Under the condition of full employment if a>1, the government will have to follow expenditure reducing policy measures along with devaluation whereby the resources of the economy are so reallocated as to increase exports and reduce imports. Ultimately the current account situation will improve.

The real balance effect: given an unchanged money stock and the assumption of that economic agents aims to maintain a given amount of real money balance, then devaluation raises the overall price index which means that economic agents have to maintain their real balance by cutting down

on direct absorption (Pilbeam, 2006). Economic agents will attempt to increase their money balances by selling assets, which pushes down the price of assets and rises the domestic interest rate. The rise in interest rate will reduce investment and consumption, so reducing direct absorption. Here, for the real balance to come into play, it must be emphasized that the authorities must not accommodate the increased money demand by increasing the money supply in line with the increased money demand.

Income redistribution effect: The rise in the general price index resulting from devaluation is likely to have a number of effects on income distribution. To the extent that it redistributes income from those with a low marginal propensity to absorb to those with the high marginal propensity to absorb this will increase direct absorption. While to the extent the reverse is true, it will lower direct absorption.

Money illusion effect: it is possible that even though prices rise because of devaluation, consumers suffer from money illusion and buy exactly the same bundle of goods as before, even though their real spending power has been reduced. If this is the case, they are actually spending more on direct absorption than before. However, money illusion may work in reverse and consumers may decide to cut back direct absorption to the price rise so that direct absorption falls.

Expectation effect: it is possible that economic agents regard the price rises induced by devaluation as likely to spark further price rises. This would lead to an increase in direct absorption, which would worsen the trade balance.

II. The effect of devaluation on national income

Understanding whether devaluation rise or lower national income is essential. If the marginal propensity to absorb is less than unity then a rise in income will raise the income to absorption ratio and so improve the current account. Whereas, if income were to fall this would raise the absorption to income ratio (as absorption would fall by less than income) which would worsen the current account (Gandalfo, 2016).

The important effect of devaluation on income that needs to be examined is:

The terms of trade effect: as mentioned above, devaluation tends to make imports more expensive in domestic currency terms, which is not matched by a corresponding rise in export prices; will mean that terms of trade deteriorate. Deterioration in terms of trade represents a loss of real national

income because more units of exports have to be given to obtaining a unit of imports. Hence, the terms of trade effect lower national income.

2.1.2.1.3 Monetary approach

The formal monetary approach to the balance of payments model based on Johnson (1976) and Pilbeam (2006) specifies a money supply identity, a money demand function, and an equilibrium condition. This model is built on three basic assumptions, which are stable money demand function, vertical aggregate supply schedule, and the purchasing power parity.

The theme of this theory is that the trade deficit and surplus in the balance of trade are designated as disequilibrium in the money market. Therefore, the trade deficit, surplus, or disequilibrium in the money market is a short-lived phenomenon, which lasts only until the government responds by changing the money supply. According to monetary theory, the country's supply of money is given by:

$$\mathbf{M^S = Db + F_b} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (15)$$

Where, M^S, Db, and F_b are the nation's total money supply, domestic components of the nation's monetary base and the foreign components of the nation's monetary base, respectively. This money supply equation can be written as:

$$\mathbf{\Delta NFA=\Delta M^s - \Delta D} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (16)$$

Where ΔNFA, ΔM^s and ΔD denote the change in net foreign assets, the total money supply of a nation, and the central bank's extension of domestic credit. The above equation states that the change in the central bank's holding of foreign assets is equal to the change in the stock of high-powered money minus the change in the domestic credit.

The important point about the above equation is that ΔNFA is the balance of payment. The domestic component of the nation's monetary base (D) is the domestic credit created by the nation's monetary authority. Thus, the external balance is given by:

$$\mathbf{M-X=Fs-\Delta R} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (17)$$

However, ΔR is a change in international reserve and the same as ΔNFA. Thus, Equation 17 shows that import minus exports are equal to foreign saving (Fs) less than the change in international reserve (ΔR). Therefore, the relationship between trade balance (external balance) and the monetary account can be written as follows from Equations 16 and 17:

X-M= (ΔH-ΔD)-Fs…….…… (18)

Equation 18 shows how the external account and the monetary accounts are related and the monetary theory of trade balance states that change in domestic money supply is negatively related to the trade balance of a country. This means an excess stock of money supply will lead to an outflow of reserves (import increases) or a balance of payment deficit. It is clear from Equation 18 that devaluation improves the trade balance of a nation in line with the monetary theory. If there is disequilibrium in the money market, this will lead to greater import or export which in turn brings equilibrium in the money markets via its impact on the nation's monetary base. This implies that when the money market is in equilibrium, so does the balance of payments. Therefore, the nation's balance of payments surplus/deficit is a temporary and self-correcting phenomenon (Dornbusch, 1990, 1998; Dornbusch and Fischer, 1996).

According to Thirlwall (2004), there are two reasons why the monetary approach to the balance of trade has died a slow death. The first is that 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 rates under which the balance of trade 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 trade. The second, and more 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.

2.1.2.2 Devaluation versus Inflation

According to Jehingan (1997) devaluation of currency raise the price level in the country and thus increase the rate of inflation. This happens because of two reasons. *First*, because of devaluation the domestic price of imported finished and intermediate goods rise (direct effect). When the price of imported intermediate goods increases domestic industries increase their sales price to cover their increased cost of production (indirect effect) which is inflationary. As input prices increase the price of exportables increase (indirect effect). *Second,* devaluation makes exports cheaper in foreign currency and therefore more competitive in the world market. This causes exports of goods to increase and reduces the supply and availability of these goods in the domestic market that tends to raise the domestic price level. Besides, due to higher prices of imported goods, people of a country

tends to substitute domestically produced goods for the more expensive imports. As a result, aggregate demand or expenditure on domestically produced goods and services will increase causing either expansion in output of goods or rise in their prices or booth. However, if the economy is working close to full capacity output, the effect will be more on raising prices of goods (Mukher, 2003).

According to Befikadu and Kibre (1995), devaluation is naturally inflationary. The impact is sent to domestic prices both straightaway through the higher prices of imports (consumer goods, fuel, raw materials, and spare parts) as well as indirectly through the higher demand arising from the tradable sector. The pass-through would be higher the lower the elasticity of demand for imports and import substituting goods. Overall, the exchange rate pass-through into inflation can be direct or indirect.

The Direct and Indirect channels of Exchange Rate Pass-through

The direct channel works through the external sector i.e. import prices. At the first stage, the change in the exchange rate affects import prices. The change in import price may affect consumer prices in two ways.

a) If the imported goods are finished goods which are used directly for consumption purpose, the change in the exchange rate affects its price and eventually increase the consumer prices.

b) If the imported goods are intermediate good and are used for further production of the change in exchange rate (depreciation) increase the price of the input which in turn increase cost of production and this results in higher market prices (because the producer wants to change the price to match with the changing cost of production) (Ranadive and Burange, 2014).

Actually, higher costs of imported raw material and capital goods are linked with an exchange rate devaluation which increases marginal costs and leads to higher prices of domestically produced goods. In short, when a currency depreciates, it will result in higher import prices while lower import prices result from appreciation in the exchange rate. This response of import prices to variation in the exchange rate also holds true in case of a small open economy like Ethiopia (Hyder and Shah, 2004).

The degree and magnitude of exchange rate pass-through to consumer prices may also differ depending on whether the imported goods are final goods, intermediate goods, capital goods, raw materials or imported components that are assembled in the domestic market and then exported to other countries (Chiparawasha, 2015). The magnitude of exchange rate pass-through is most likely to be complete for imported final goods depending on the market structure. Capital goods and raw materials are likely to

have low pass-through, especially at the consumption level. Moreover, the exchange rates pass-through of capital goods may also be low because these goods are used in the production of other goods for a long time. Components which are imported for assembling and then exported are likely not to have a big impact on the local market. However, they may have an effect on the potential income that can be generated through the export sector. Similarly, pass-through is likely to be more on tradable goods than non-tradable goods.

The indirect channel refers to the competitiveness of goods and services in the international market relative to the domestic market. The depreciation of the exchange rate makes domestic products relatively cheaper for foreign buyers, and as a consequence, exports and aggregate demand will rise and induce an increase in the domestic prices level. The increase in domestic demand is driven by the fact that imported tradable goods which are denominated in domestic currency become relatively expensive (domestic substitution). This is also referred to as the expenditure switching effect of the exchange rate depreciation. On the other hand, the increase in foreign demand for domestic goods as a result of the goods become relatively cheaper in the foreign market increase (foreign substitution) because national currency denominated prices of imported goods go up and boost foreign demand for domestic goods (foreign substitution) (Ponomarev *et al,* 2014). Since nominal wage contracts are fixed in the short run, real wages will decrease and output will increase. However, when real wages go back to their original level over time (due to the effect of the labor union), production costs increases, the overall price level increases and output falls. Thus, in the end, the exchange rate depreciation leaves a permanent increase in the price level with only a temporary increase in output (Hufner and Schroder, 2002).

If the foreign demand for a domestic tradable finished goods rises, the local producer may charge a higher price (Chiparawasha, 2015). In comparison, if the foreign demand for the intermediate goods rises, producers are likely to increase prices and eventually consumer prices will also rise. Thus, the exchange rate fluctuations have two indirect effects on domestic prices and they are the competition effect and the wage effect.

2.1.2.3 Devaluation Versus External Debt Servicing

The question of the impact of exchange rate fluctuations on the overall economy has been the subject of much debate among academic researchers and economic policymakers for decades. On the one hand, the Marshall-Lerner condition implies that exchange rate depreciation should foster economic growth

through an increase in net exports. However, on the other hand, the exchange rate depreciation leads to an increase in liabilities denominated in foreign currency.

The national debt, also known as public debt, is the sum total of government financial obligations, resulting from state's borrowing from its population, foreign governments, or international institutions such as the International Bank for Reconstruction and Development(the World Bank). According to Bamidele and Joseph (2013), debt is defined as the resource or liquid asset that is used up in an organization, without being contributed by the owner and does not in any other way belong to the organization. However, public debt could be internal or external. Internal debt involves a re-arrangement of assets such that citizens surrender current purchasing power in return for government securities, and no increase in a real resource is directly created as a result. That is, it is a situation whereby the borrowing unit acquires the money from itself (lends to itself) hence taxpayers can be said to be borrowing from themselves (Musgrave, 1959). External debt is the amount, at any given time, of disbursed and outstanding contractual liabilities of residents of a country to nonresidents to repay principal, with or without interest, or to pay interest, with or without principal (The World Bank et al., 1998).

2.1.2.4 Devaluation versus Economic Growth.

Economic Growth is one of the main objectives of economic policy and economic decision-making. Among economic variables, the variable that most closely and directly related to the external sector is the exchange rate, which can provide economic growth. Because fluctuation of exchange rate can cause high fluctuation in foreign trade and balance of payments so that affect growth. Today, due to deep changes in exchange systems; the exchange rate shows off as a key factor in economic policy-making more than ever (Jafari, 1999). On the other hand, one of the effective factors in choosing the appropriate exchange system in developing countries is the relationship between exchange rate and economic growth. Choosing an ineffective exchange system and inappropriate exchange policies in many countries has had negative effects on their economic growth. Fluctuations of the exchange rate in a flexible exchange system make ample changes in investment and international trade, thereby on economic growth (Mehdi, et.al, 2011). In the Keynesian system, devaluation has an expansionary effect on output and employment whereby the mechanism behind the expansion was the improvement in the trade balance. The framework considers the switch of demand from imported goods and services to locally produced outputs, which stimulates growth

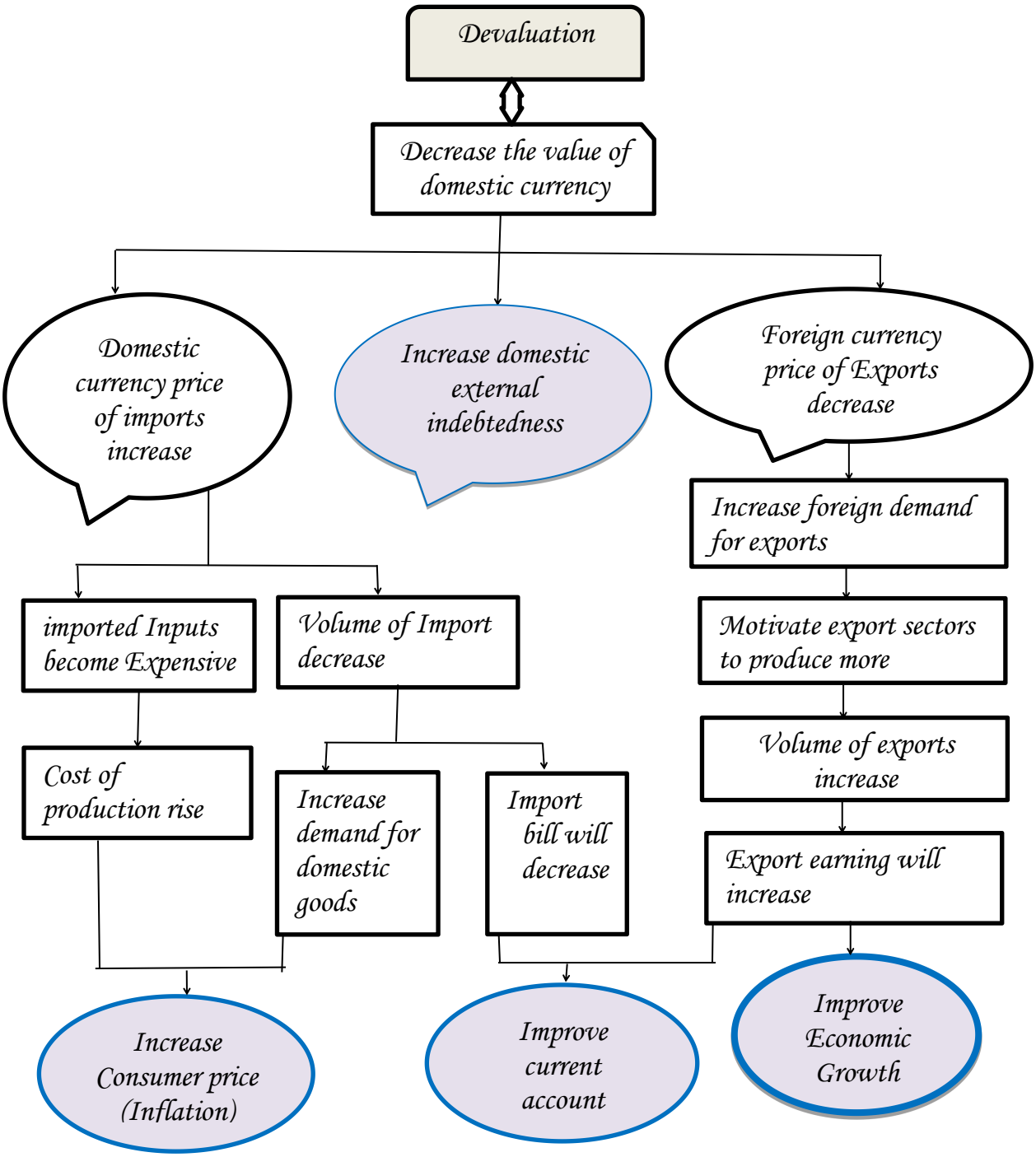
in the domestic industry hence switching expenditures to domestically produced goods (Charusheela, 2013).

There are a strong opinion and evidence of devaluation being contractionary rather than expansionary. There are a number of theoretical reasons for a contractionary effect of devaluation. First, devaluation increases the price of traded goods, which feeds into the general price level rendering a negative real balance effect. This, in turn, will result in lower aggregate demand and output (Edwards, 1986). Second, the contractionary effect might also result from income distributional effect of devaluation. This point was first mentioned by Diaz Alezandro (1963) who argued that devaluation could lead to a redistribution of income from people with the high marginal propensity to consume to the high propensity to save rendering a negative effect on aggregate demand. Third, if the demand for imported goods is inelastic due to the dominance of capital and essential intermediate and consumers' goods in a country's import basket, then devaluation may be contractionary (Upadhaya and Upadhaya, 1999).

2.2 TRANSMISSION MECHANISMS OF DEVALUATION

According to theory, devaluation of currency could have a positive or negative impact on economic performance. The most important issue is; how the effects of devaluation cascading on to macroeconomic variables. The following diagram expounds the transmission mechanism of exchange rate devaluation on some macroeconomic variables of interest.

Fig 2.1. Transmission mechanisms of currency devaluation onto macroeconomic variables



Source: author's construction

2.3 EMPIRICAL LITERATURE REVIEW

There are a large number of studies carried out by different researchers about the impact of exchange rate Devaluation on different economic (macro or micro) variables. Many times, economists do not agree on the net effect of devaluation on macro-economic variables. While some of them argue that devaluation has a positive effect, others do not support the view that devaluation has a positive effect. As it is difficult to exhaust the consequence of devaluation on all macroeconomic variables with an individual study, this study would look at the effects of devaluation on selected macroeconomic variables. In order to build up additional knowledge, this study has briefly reviewed the major available studies carried out in developed and developing countries including Ethiopia on some of the macroeconomic variables.

2.3.1 Experience from Developed Countries

Devaluation has multiple consequences on the economies of developed countries of which inflation, trade balance, and economic growth.

Banche(2006), Goldfajin and Werlang (1999), Gregorio and Borensztein(1999), Eward(2006), Hufner and Schroder (2002) Killic (2016), and Campa and Goldberg (2002) Studied the degree of exchange rate pass-through on imports in domestic currency and concluded that the pass-through was less than the amount of devaluation. While all agree on the inflationary consequences of devaluation they also point out that the results are asymmetric.. Most notably, pass-through into import prices is lower for countries with low average inflation and low exchange rate variability.

Hufner and Schroder (2002) conducted a study on five Eurozone countries of France, Germany, Italy, Spain and the Netherlands covering a 20-year period (from January 1982 to January 2001), using IMF and Bank of England data. The objective of the study was to examine the effects of the change in the exchange rate on consumer prices for the euro area. They used the weighted harmonized index of consumer prices to measure the elasticity of consumer prices to the change in the nominal exchange rate. At the aggregate level, (using the relative weights of each country's inflation rate in the harmonized index of consumer price) the study found that on an average, a 10 percent depreciation of effective euro nominal exchange rate leads to an increase of 0.4 percent inflation rate in the euro area after one year. The total effect converges to 0.8 percentage point after about three years, confirming earlier findings of exchange rate pass-through into consumer price is incomplete.

While the link between devaluation and inflationary overwhelming, some exceptional studies need to be pointed out. In this instance, we refer to Takhtamamova(2008), Amitramo et.al(1997), and Hafer(1989) who argued that exchange rate devaluation increases the import price and domestic price, but that increases in import and domestic price should not be considered as Inflation. For instance, Hafer(1989;28) stated that "Inflation is a persistent increase in the general level of prices. This definition provides a consistent framework in which to distinguish inflationary trends from transitory relative price shocks. While a depreciating dollar may cause an increase in the dollar price of some imported goods and services, these relative price increases are not inflationary nor do they promote an upward spiral of wages and prices in the future."

Hossian(2010), Welker(2008), and Cooper (1971) have conducted their study on the possible effect of devaluation on the trade balance. Hossian(2010) have been revisited whether devaluation closes the US trade deficit or not. He used the descriptive method and time series data from 2000 to 2009. He found that dollar devaluation could reduce U.S trade deficit mainly by stimulating exports, provided that the dollar has been depreciated against every single country's currency of US trade partners, at least the larger ones. The main conclusion of this paper is that a dollar devaluation can reduce the U.S trade deficit. Pro-cyclically, Cooper (1971) also supported the similar view that depreciation of a nation's currency will shift its trade balance towards surplus only if it can fulfill the Marshall-Lerner condition, or in other words, if the combined elasticities of demand for exports and imports is *elastic* (i.e. the coefficient is greater than one. Evidence suggests that in the US today, the Marshall-Lerner Condition is in fact being met as in the 2006 fiscal year an increase in exports of 12% in response to a 6% weakening of the dollar indicates a price elasticity of "more than one" for America's exports, meaning foreigners are highly responsive to cheaper US goods (Welker,2008). The overwhelming finding of these writers is the availability of a positive relationship between devaluation and trade balance. Therefore, devaluation is the viable tools to improve trade disequilibrium for them.

2.3.2 Experience from Developing Countries

Rowland (2003) Yetman and Devereux (2010), Bangura et al (2012), Bwire et al (2013) Hussainai (2017), Choudhri et,al (2006), Bhattacharya et al (2008), Onyowo et.al (2016), and Michael (2018) have examined the exchange rate pass-through and conclude that the exchange rate movement pass-through into import price is incomplete. For example, Rowland (2003) have used two different econometric frameworks to study the exchange rate pass-through to import, producer and consumer price in Colombia. He has used the unrestricted VAR model and Johanson cointegration. He found that the exchange pass-through is incomplete. His regression shows that 80 percent, 15 percent and 12 percent of change in the exchange rate is passed into import, consumer and producer price respectively within 12 months. In an akin manner, Bangura et al (2012) have employed the Structural Vector Autoregression (SVAR) model for the Sierra Leone economy to estimate the pass-through effects of exchange rate changes to consumer prices. The findings show that the pass-through to consumer prices is significant and incomplete. Thus, they suggested that exchange rate depreciation is a potential source of inflation in Sierra Leone. Bwire et al (2013) have studied the exchange rate pass-through in Uganda with quarterly data over the period 1999 to 2012 using triangulation of well-specified VECM and SVAR models. They found a strong and significant association between the exchange rate movements and inflation in Uganda. The pass-through to domestic inflation, although incomplete, was modest and persistent with a dynamic exchange rate pass-through elasticity of 0.48. Thus, they suggested that exchange rate movements are a potential source of inflation in Uganda.

Similarly, Bhattacharya et al (2008) have investigated the relationship between inflation and the exchange rate devaluation in the post-reform period in India for the period 1997 to 2007. They have also estimated the impact of a change in the nominal exchange rate on the wholesale and consumer price indexes. They found that a one percent increase in the exchange rate causes a 3.7 to 17 percent rise in CPI level in the long-run. The short-run effect was found to vary from 10.1 to 11.3 percent. According to them, if the effects of monetary policy are not taken into consideration, 10 percent of the exchange rate shock passes into the CPI in the next period and falls to 6.8 percent after two years. Thus, they found that the exchange rate pass-through is asymmetric for India.

Kemisola and Jacob (2014), Yusuf and Babale(2016) and Draunivudi(2014) and Lizando and Montiel (1989) have analyzed the likely effect of devaluation on the trade balance. They found the positive effect of devaluation on the trade balance. For instance, Lizando and Montiel (1989) viewed that a properly

administered devaluation will improve the trade balance is widely accepted. Nevertheless, there is much less consensus about the possible effects of devaluation on output and employment.

On the other hand, (Rodseth, 2000), Edwards (1989) Oskooee and Cheema (2009); Bhagwati and Onitsuka (1974), Shahbaz *et al.* (2010); Rahman *et al.* (2012); Hameed and Kanwal (2009) and Khan et al.(2016) argued that devaluation cannot correct trade balance disequilibrium. For example, Khan et al. (2016) researched the relationship between devaluation and balance of trade by using ARDL over the period of 1980 to 2014. the regression coefficient of the real exchange rate is negative(-0.067). Keeping other variable constant, when REER changed by one unit trade balance would be deteriorated by about 0.06. This result clearly indicates that devaluation will disfavor trade balance.

Similarly, Bhagwati and Onitsuka (1974) after having an empirical study on 46 African countries, which devalued their currencies, concluded that imports continued to grow after devaluation and in the majority of cases, the growth rate exceeds the pre-devaluation growth rate, that is, conditions that require the elasticity of export and import demand to be more than unity is not satisfied. This is because of the very strong demand for imported necessities and inelastic foreign demand for African exports. Thus, with relatively inelastic demand for exports and imports, devaluation has little or no effect in changing trade balance in the contest of African countries (UNECA, 1989).

2.3.3 Empirical Evidence in Ethiopia

Various literature argued around the impact of devaluation on macroeconomic variables in Ethiopia.
Helen (2012) undertook study concerning the impact of exchange rate pass-through on price. The study relates to the period 1991-92 and 2010-11 based on secondary data from NBE, CSA, and IFS. The objective of the study was to examine the exchange rate pass-through. To that end, the study applied CVAR and SVAR models. Her study found that Exchange Rate Pass-through (ERPT) in Ethiopia during the study period has been significant and persistent in the case of import prices. However, the ERPT was low and short-lived in the case of consumer prices. More specifically, she found that the elasticity of import prices to the change in the exchange rate was about 0.29 and showed that the degree of exchange rate pass-through to import prices, in the long run, is incomplete. However, the degree of exchange rate pass-through to consumer prices was found to be insignificant in the long run which indicated an absence

of exchange rate pass-through to consumer prices (Befekadu & Kibre, 1995). Zerihun and Nara (2017), Asmeron (1997) also found that the low pass through to the very low weight of imports in the basket of consumer goods.

Abule and Abdi (2012) evaluated the effect of exchange rate variability on the export of oilseed production in Ethiopia. They used the Auto-Regressive Distributive Lag (ARDL) model covering the 1992-2010 period. Their finding shows that the continuous devaluation of Ethiopian currency adversely affected the export of oilseed. They also argued that the export of oilseed is positively related to terms of trade. Befikadu and Kibre (1995) elucidate that, Devaluation is naturally inflationary. The effect is passed on domestic prices both explicitly via the higher prices of imports (consumer goods, fuel, raw materials, and spare parts) as well as implicitly via the higher demand appearing from income side of the tradeable sector. The pass-through would be higher the lower the elasticity of demand for imports and import-substituting goods.

Mekasha and Molla (2015), used data from CSA and WBDIDB, studied the exchange rate pass-through for the period 1993 to 2010. The study was based on quarterly data and applied the SVAR model to realize their objective. They found that the exchange rate pass-through to consumer price index is small and incomplete, where only about 16 percent of the variation in consumer prices is explained by changes in nominal exchange rates.

Asmamaw (2008) used the OLS, Instrumental variable and Error correction model to investigate the impact of devaluation on the trade balance. He concluded that Ethiopian exports have increased following the devaluation of the Birr during the period under study. This could be due to; first, the amount of money the country receives from a given quantity of exports has increased in terms of the domestic currency. Second, the domestic consumption of exportable goods may have declined due to the rise in the price of export commodities. On the other side, He revealed that the country's import did not show a declining trend following the devaluation. This may due to the fact that most of the imports are strategic goods, and price elasticities are low. He mainly concluded that the country trade balance has not improved since exports and imports have increased and an increase in exports was not sufficient to overcome the increase in imports. Similarly, Haile (1994) has attempted to estimate the effect of devaluation on the trade balance using the elasticity approach. According to him, the sum of elasticities of export and import is greater than one. Since the Ethiopian trade balance was initially in deficit, the Marshal-Learner condition is not

satisfied and is not enough. He concluded that in the Ethiopian case, devaluation is not strong enough to satisfy what the country is in need.

Befekadu and Kibre (1995), in their study on the possible effect of the 1992 devaluation on the Ethiopian trade balance, argued that in the short-to-medium term both imports and import substitute goods are unlikely to respond to price changes given the structure of the Ethiopian economy. According to them if the devaluation of Birr succeeds in decreasing imports, it is likely to reduce capacity utilization and therefore output growth. Thus, the decrease in the current account deficit would be at the cost of the growth of the economy. For them, though the increases in domestic currency prices are necessary, they are definitely not sufficient to increases the volume of exportable. Furthermore, they argued that the greater foreign exchange availability from higher exports and from easier access to foreign capital made it possible to translate the increase in demand into actual imports

Endale (2014) assess the effects of exchange rate devaluation on the trade balance of Ethiopia. The data used in this study were from the period 1976-2012. He has been used co-integration and ordinary least square method (OLS). This study found that both export and import are elastic to change in the exchange rate (devaluation in our case), but the import is more elastic compared to the elasticity of export. Based on this clue, He concluded that since the Ethiopian export has a low response for the rise in exchange when compared with import, Devaluation is not sufficient to improve the trade balance.

Different writers had motivated into examining the link between devaluation and economic growth. For example, Umer (2015) point out the likely possible relationship between Devaluation and gross domestic product in the Ethiopian Economy. He was used the OLS model and cointegration test to assure or reject the theory. Theoretically, following devaluation the nations import will be negatively affected and export will be positively affected so that output will increase to some extent in order to meet the increase in export. The Johansen co-integration test empirically indicates as there is no long run co-integration between the variables of both the export and import equation such as (export, world income, and real exchange rate) and (import, domestic income, and real exchange rate) respectively. Therefore, changing the nation's exchange rate in terms of another hard currency (Devaluation) will not affect both the nation's imports and exports in the long run as a result, output, as well as trade balance, will not be affected in the long run whether devaluation applied in the economy or not.

Yilkal (2014) on his part assess the effect of devaluation on output growth in both the short run and long run. He used the quarterly time series data of 981Q1- 2010Q4 and Vector Autoregression (VAR) model. He found that devaluation has a negative effect on output in the long run while its effect is insignificant in the short run. According to his finding One percent devaluation, promote Real Gross Domestic Product (RGDP) by about 0.29% in the long run.

According to Seid (2010), on its work concerning "devaluation of Birr: Layman's Guide" disclosed that devaluation increase external debt servicing. Given that, the Ethiopian government is the biggest consumer of foreign exchange. Hence, the devaluation of the Birr could only exaggerate its cash and debt service requirements.

2.4. Summary of Empirical Framework

According to studies conducted in developed countries, the outcome of devaluation is more or less pro-cyclical with what the countries supposed to achieve. However, those study conducted in developing countries discovered that devaluation delivers favorable results for some developing countries while it is worthless for some developing countries. In combination, the significance of devaluation for a developing country is ambiguous. More specifically, most of the studies conducted in Ethiopia exhibited that, devaluation is not the right monetary instrument to improve Ethiopian economic problem.

CHAPTER THREE: METHODOLOGY, DATA SOURCES, AND MODEL SPECIFICATION

3.1 Data and Methodology

The study considers the Ethiopian economy. It relied on secondary data (time series data) to investigate the effect of devaluation on Inflation, External debt servicing, Economic growth, and trade balance. The major sources of data for the study are the National bank of Ethiopia (NBE) and World Bank Development Indicators Data Base. Depending on obtained data, the researcher used descriptive analysis to study the trend of variables over time and used the econometric model for detail empirical analysis. For descriptive analysis, annual data from 1992 to 2018 have used. The reason why the standing point limited to 1992 is that the Ethiopian government has used exchange rate devaluation as a policy instrument since 1992. Before this year more or less, there was no currency devaluation in Ethiopia. For econometric analysis, Quarterly data from 1992q2 to 2017q4 have used. The reason why the standing point limited to 992q2 is that the first largest devaluation in Ethiopia took place in the second quarter of 1992. Nominal effective exchange rate, consumer price index and trade balance are quarterly data. However, Real Gross Domestic Product (RGDP) and external debt servicing were annual data and transformed into quarterly data by using EViews 10. Relying on data on these variables, the econometric model shall be used to estimate the long-run and short-run elasticity the variables.

3.2 Econometric Model Specification

Model specification needs knowledge about the theoretical relationship among variables of interest and their expected sign (Lütkepohl, 2005). In line with theoretical and Empirical framework discussed in the literature review section, the following time series econometric techniques are applied. Johansen cointegration technique based on the VAR model, vector error correction model (VECM), Granger causality and variance decomposition to capture both short-run and long-run effects of devaluation on selected macroeconomic variables. Granger causality and variance decomposition have estimated after the estimation of VEC Model. The reason why VECM is candidate model is, all variables fall stationary at the level and stationary at their first difference or I (1). This could check first by construct VAR model. The study employed the standard international monetary fund theoretical framework of exchange rate devaluation as an endogenous factor that affects the economy. This is a premise on the hypothesis that macro-economic variables are expected to respond positively to currency devaluation. Hence, given the purposes of this study the functional relationship between the variables can be specified below:

$TB=f(CPI, RGDP, NEER, EDS)$……**(19)**

Where, *RGDP*= Real Gross Domestic Product

CPI= Consumer Price Index

TB=Trade Balance

NEER=Nominal Effective Exchange Rate

EDS=External Debt servicing

3.2.1 Description and Measurement of Variables

The study has made use of the following variables.

1. ***Consumer Price Index (CPI)*:** this study used the Consumer Price Index as one of endogenous variable and the base year is 2010 = 100, as used by the National Bank of Ethiopia (NBE). The CPI reflects changes in the cost to the average consumers purchasing a basket of goods and services. This may be fixed or changed at specified intervals, such as quarterly. Generally, the study has used the Laspeyres formula and are period averages.

2. Real Gross Domestic Product (GDP): the impact of the real income variable on the trade balance is ambiguous. The expected signs under the absorption and monetary approaches are negative and positive respectively with some bold assumptions as already discussed in the literature part. Higher income levels stimulate increased import demand as well as increased domestic production of tradable, leaving the ultimate impact on the trade balance somewhat indeterminate. However, it is argued that the former effect dominates the latter.

3. Nominal Effective Exchange Rate (NEER): in our study, the Nominal effective exchange rate is defined as the units of the home currency per a unit of the foreign currency taken accounts of trade partners. An increase in NEER is expected to improve the trade balance (+), boost economic growth (+), increase external debt servicing (+) and tramp inflation rate (+).

4. Trade Balance (TB): Is the difference between the monetary value of a nation's exports and imports over a certain period. If a country export earning is greater than value than its import payment, the country runs a trade surplus or favorable trade balance. On the contrary, if a country import payment exceeds its export earning, it runs a trade deficit or unfavorable trade balance. If import payment and export earning equal, the country runs balanced trade during that period.

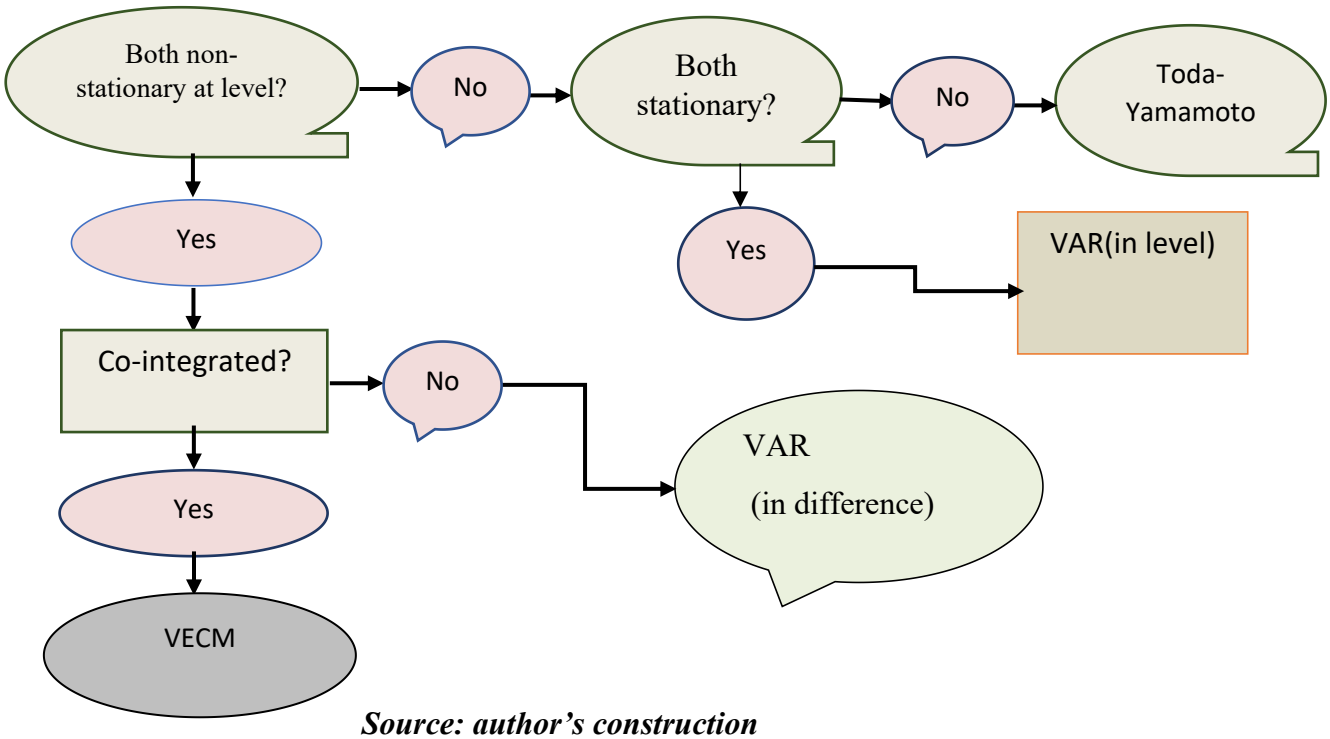
5. External Debt Servicing (EDS): It refers to the ability of nations to repay money borrowed from a source outside the country. External debts have to repaid in-terms of currency it was borrowed. E.g, if the

Ethiopian government borrowed in terms of the dollar, it has to repay in terms of the dollar when due date comes up. Exchange rate devaluation immediately aggrandizes the external debt servicing. External debt can be obtained from foreign commercial Banks, International Financial Institutions like IMF, World Bank, African Development Bank (ADB) and from the government of foreign nations.

3.2.2 Procedures for selecting a representative model for the study

The representative model for this thesis would path through the flowing procedures. Depending on the behavior of the data obtained, the following flowchart provides how the used models for the thesis have selected.

Figure 3.1: Flowchart of the Model selection



Source: author's construction

Note: VECM model is special cases of VAR models only applicable to systems classified as nonstationary and co-integrated. Detail explanation would be given in the following subsections.

3.2.3 Vector Auto Regressive (VAR) Model

The VAR methodology makes use of economic theory to trace the contemporaneous association between the variables of interest (Sims, 1986; Bernanke, 1986). The model requires an identification of assumption to allow contemporaneous correlations to be causally identified. We assume that Exchange rate shocks affect inflation, economic growth, external debt servicing, and trade balance simultaneously. For instance, in the floating exchange rate regime, the exchange rate is an endogenous variable that affects economic variables (Ito and Sato, 2007). Therefore, VAR is a useful approach that permits such interactions among the exchange rate and selected macroeconomic variables only if the variables are stationary at level. With the objective of this study, which has to do with the interrelationship between the variables, functional relationship in eq (19) can be formulated in form of Vector Auto-regressive (VAR) equation and VAR equations must be identified in their level form, not in difference form. All variables have transformed into their logarithmic form for the seek of simplicity. Hence, log-log VAR equations can be constructed as follow:

logTBt= $\beta o+\sum_{i=1}^{k}\beta 1i$logRGDPt-i +$\sum_{i=1}^{k}\beta 2i$logTBt-i + $\sum_{i=1}^{k}\beta 3i$logNEERt-i + $\sum_{i=1}^{k}\beta 4i$logEDSt-i +$\sum_{i=1}^{k}\beta 5i$logCPIt-i +μt……………………….**(21)**

logRGDPt=αo + $\sum_{i=0}^{k}\alpha 1i$ logRGDPt-i + $\sum_{i=0}^{k}\alpha 2i$ logTBt-i + $\sum_{i=0}^{k}\alpha 3i$ logNEERt-i+ $\sum_{i=0}^{k}\alpha 4i$logEDSt-i +$\sum_{i=0}^{k}\alpha 5i$logCPIt-i +εt… …………………..…**(20)**

logNEER*t*= γo+ $\sum_{i=1}^{k}\gamma 1i$ logRGDPt-i + $\sum_{i=1}^{k}\gamma 2i$ logTBt-i + $\sum_{i=1}^{k}\gamma 3i$ logNEERt-i+ $\sum_{i=1}^{k}\gamma 4i$logEDSt-i +$\sum_{i=1}^{k}\gamma 5i$logCPIt-i+vt……………………..…..(22)

log*EDS*t= δo+$\sum_{i=1}^{k}\delta 1i$logRGDPt-i +$\sum_{i=1}^{k}\delta 2i$logTBt-i + $\sum_{i=1}^{k}\delta 3i$logNEERt-i + $\sum_{i=1}^{k}\delta 4i$logEDSt-i +$\sum_{i=1}^{k}\delta 5i$logCPIt-i+ηt…….……………………..**(23)**

logCPIt= λo+$\sum_{i=1}^{k}\lambda 1i$logRGDPt-i +$\sum_{i=1}^{k}\lambda 2i$logTBt-i + $\sum_{i=1}^{k}\lambda 3i$logNEERt-i+ $\sum_{i=1}^{k}\lambda 4i$logEDSt-i +$\sum_{i=1}^{k}\lambda 5i$logCPIt-i +ζt……………………….**(24)**

Where; αi, βi γi, δi and λi are parameters to be estimated. "i" represents individual time lag and K represent an optimal level of lag which will be determined based on lag selection information criterion. While, εt, μt, vt, ηt, and ζt represents white noise, innovations, shocks or some times called impulse.

Equations (20-24) can be formulated in matrix representation for the seek of simplicity as follows:

$$\begin{bmatrix} logRGDPt \\ logTBt \\ logNEERt \\ logEXDt \\ logCPIt \end{bmatrix} = \begin{bmatrix} \alpha o \\ \beta o \\ \gamma o \\ \delta o \\ \lambda o \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \alpha 1i & \alpha 2i & \alpha 3i & \alpha 4i & \alpha 5i \\ \beta 1i & \beta 2i & \beta 3i & \beta 4i & \beta 5i \\ \gamma 1i & \gamma 2i & \gamma 3i & \gamma 4i & \gamma 5i \\ \delta 1i & \delta 2i & \delta 3i & \delta 4i & \delta 5i \\ \lambda 1i & \lambda 2i & \lambda 3i & \lambda 4i & \lambda 5j \end{bmatrix} \begin{bmatrix} logRGDPt_{-i} \\ logTBt_{-i} \\ logNEERt_{-i} \\ logEDTt_{-i} \\ logCPIt\_i \end{bmatrix} + \begin{bmatrix} \varepsilon t \\ \mu t \\ \nu t \\ \eta t \\ \zeta t \end{bmatrix} \text{---------- (25)}$$

5x1 5x1 5x5 5x1 5x1

logyt ***θ*** βi ***log Xt-i*** ***Uti***

Further, the above matrix representation [eq (25)] can be reformulated as reduced VAR form with appropriate definition as:

$$Logyt=\theta+\sum_{i=1}^{k} \beta i LogXt\text{-}i + Uti \text{---------- (26)}$$

Equation (26) can be estimated by using standard ordinary least square method (OLS). Logyt is (n x 1) vector of macroeconomic variables of interest, θ is (n x 1) vector of constants, βi is (n x n) matrix of coefficients, *LogXt-i* is (n x n) the lags of endogenous variables and et is (n x 1) vector of white noise, innovations or shocks.

3.2.4. Unit Root Test

In econometrics, it is important to undertake the unit root test for data set to reach on generalization for the population. A time series data is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed" (Gujarati, 2004). If a time series is not stationary in the sense just defined, it is called a non-stationary time series. In other words, a non-stationary time series will have a time-varying mean or a time-varying variance or both. Why are stationary time series so important? According to Gujarati (2008), there are at least two reasons. First, if a time series is non-stationary, we can study its behavior only for the period under consideration. Each set of time series data will, therefore, be for a particular episode. As a result, it is not possible to generalize it to other periods. Second, if we have two or more non-stationary time series, regression analysis involving such time series may lead to the phenomenon of spurious or nonsense regression.

3.2.4.1 Augmented Dickey-Fuller Test for Unit Roots

In the case of the Dickey-Fuller test for stationarity, the problem of auto-correlation usually arises. To tackle this problem developed a test called the Augmented Dickey-Fuller test (ADF). As presented below which must be satisfied for stationarity to exist:

Model I: $\Delta Logyt = \delta logXt\text{-}1 + \sum_{i=1}^{k} \phi i \Delta LogXt\text{-}i + ut$ ---------- (28) _Random walk without drift

Model II: $\Delta Logyt = \theta + \delta logXt\text{-}1 + \sum_{i=1}^{k} \phi i \Delta LogXt\text{-}i + ut$ ---------- (29) _Random walk with drift

Model III: $\Delta Logyt = \theta + \nu T + \delta logXt\text{-}1 + \sum_{i=1}^{k} \phi i \Delta LogXt\text{-}i + ut$ ---------- (30) _Random walk with drift and trend. Where, $\delta = (\phi i - 1)$

The hypothesis to be tested are:

H_o: the variable has unit root – the time series is non-stationary or ($\delta = 0$)

H_1: the variable doesn't have unit root – the time series is stationary or ($\delta < 0$)'

Decision rule: If t statistics value is greater than ADF critical value, we fail to reject H_o and if the reverse is true, we reject H_o and accept H_1.

3.2.5 VAR Lag Length Selection Criteria

To determine how many lags of each variable should be included in the VAR model, Akaike Information Criterion (AIC), Hannan-Quinn (HQ), and Schwarz Information Criterion (SIC) were used.

3.2.6 Test for co-integration

If we regress the non-stationary variable X on the non-stationary variable Y, the "spurious regression" may arise, which leads to incorrect estimation results. However, there exists one exception, that is, if two or more time series variables are themselves nonstationary, but a linear combination of them is stationary, then the series is said to be co-integrated (Verbeek, 2008). Co-integration is an econometric technique and is used to examine the correlation between non-stationary time series variables. In practice, many economic series which contain unit roots (non-stationary) move together over time, that is to say, although the variables under consideration may drift away from equilibrium for a while, there exist some forces on the series that make them converge upon some long-run value. We are concerned about the concept of co-integration because making a variable stationary by differencing only gives the short run dynamics while we are also interested in knowing the long run relationship. Economically speaking, two variables will be co-integrated if they have long-run relationships between them. In VAR models, the test

for co-integration is vital because if there is co-integration between variables we must use VECM. On the other hand, if there is no co-integration relationship between the variables under consideration then there is no point in estimating VECM. A simple error correction term is defined by:

$_{ETC} = logy_t - \sum_{i=1}^{k} \psi i logXt\text{-}i$ ---------- (31)

Where ψ is the cointegrating coefficient, and ETC is the error term from the regression of logyt on $\Sigma \log x_t$. Representation of *logyt* and *logxt* are as stated above.

There are five different assumptions in accordance with EViews 10 options

Model 1: There is no deterministic trend in data and no intercept or trend in cointegration equation (CE);

Model 2: There is no linear trend in data but an intercept (no trend) in CE;

Model 3: There is a linear trend in data and intercept (no trend) in CE;

Model 4: There is a linear trend in data, while intercept and trend exist in CE;

Model 5: There is a quadratic deterministic trend in data, intercept and trend in CE.

In practice, model 1 and model 5 are rarely used. We only consider the model 2-4. It is easy to find that model 2 is most restrictive and model 4 is least restrictive.

3.2.9 Granger Causality Test

Granger causality test was made to the selected model to identify the direction of causality between the endogenous variables. That is a pairwise Granger causality test is applied on the selected model to know whether exchange rate devaluation granger cause trade balance, consumer price index(inflation), real gross domestic product(economic growth) and external debt servicing or not. According to Granger (1969 In time series analysis we are interested in knowing whether changes in one of the variables will influence changes in the other variable and identify the direction of the causality (unidirectional, bidirectional, none). If variables are co-integrated, a vector error correction model (VECM) is applied in order to confirm the correlation between the variables, however, in case of no cointegration; causality should be examined in the vector autoregressive (VAR) model specified in first difference (Dorsman et al., 2012).

3.2.10 Vector Error Correction Model (VECM)

The VAR model is a general framework used to describe the dynamic interrelationship among stationary variables. If the time series is not stationary the VAR specified above needs to be modified to allow consistent estimators of the relation among the variables. In order to capture both short run and long run relations in the models the study Vector Error Correction Model (VECM), a special case of the VAR for the variables in their first differences. VECM also takes co-integration among the variables under consideration. If there is a long run relation among the variables, an error correction model can be formulated to show the long run interaction between variables (Verbeek, 2008). VECM shows the achievement of long term and the rate of change in the short run to achieve equilibrium. It is useful in determining short term dynamics between variables by restricting the long-run behavior of variables. Therefore, the vector error correction model is perfectly suited for carrying out analysis in this paper. The vector error correction model is small steps from the VAR model; we change VAR equations into their respective first difference and the lag of error correction term. The VECM for this thesis is simply derived from eq (26) and can be set up as:

$$\Delta logyt = \theta + \Omega ETCt\text{-}k + \beta 1 \Delta logXt\text{-}1 + \cdots + \beta k{-}1 \Delta logXt\text{-}k(\text{-}1) + ut$$

Or,

$$\Delta logyt = \theta + \sum_{i=1}^{k-1} \beta i \Delta logXt\text{-}i + \Omega ETCt\text{-}k + ut \quad \text{---------- (32)}$$

Where, k-1= shows that the lag length is reduced by 1

βi=short run dynamic coefficients of the model adjustment to long-run equilibrium. ***Ω***=speed of adjustment parameter. ***ETCt-1***=the error correction term is the lagged value of the residual obtained from the co-integrating regression of the dependent variables on the regressors. Contains long-run information derived from the long run co-integrating relationship. ***Ut***= residual and often called white noise, stochastic error terms, Impulses innovations or shock.

Equation (32) is obtained by subtracting yt-i from both sides of equation (26). This VECM is composed by first differenced g variables on the LHS, and k-1 lags of the dependent variables (differences) on the RHS, each with a ß short-run coefficient matrix. Ω consist on a long-run coefficient matrix, since in equilibrium, all $\Delta yt\text{-}i = 0$, and establishing ut with the expected value of zero it implies that ΩETCt-k= 0. Ω illustrates the speed of adjustment back to equilibrium, that is, it measures the proportion of last period´s equilibrium error that is corrected for (Brooks, 2014). To be consistent with VAR model in equation (20-24), equation 32 can be expand as follows.

$\Delta \boldsymbol{logTBt} = \beta o + \sum_{i=1}^{k-1} \beta 1i\ \Delta logRGDPt\text{-}i + \sum_{i=1}^{k-1} \beta 2i\ \Delta logTBt\text{-}i + \sum_{i=1}^{k-1} \beta 3i\ \Delta logNEERt\text{-}i + \sum_{i=1}^{k-1} \beta 4i \Delta log\mathrm{EDS}t\text{-}i + \sum_{i=1}^{k-1} \beta 5i \Delta logCPIt\text{-}i + \Omega_1 ETCt\text{-}i + U2t$ …………………………**(33)**

$\Delta \boldsymbol{logRGDP_t} = \alpha o + \sum_{i=1}^{k-1} \alpha 1i\ \Delta logRGDPt\text{-}i + \sum_{i=1}^{k-1} \alpha 2i\ \Delta logTBt\text{-}i + \sum_{i=1}^{k-1} \alpha 3i\ \Delta logNEERt\text{-}i + \sum_{i=1}^{k-1} \alpha 4i \Delta log\mathrm{EDS}t\text{-}i + \sum_{i=1}^{k-1} \alpha 5i \Delta logCPIt\text{-}i + \Omega_2 ETCt\text{-}i + U1t$… ………………………**(34)**

$\Delta \boldsymbol{logNEERt} = \gamma o + \sum_{i=1}^{k-1} \gamma 1i\ \Delta logRGDPt\text{-}i + \sum_{i=1}^{k-1} \gamma 2i\ \Delta logTBt\text{-}i + \sum_{i=1}^{k-1} \gamma 3i\ \Delta logNEERt\text{-}i + \sum_{i=1}^{k-1} \gamma 4i \Delta log\mathrm{EDS}t\text{-}i + \sum_{i=1}^{k-1} \gamma 5i \Delta logCPIt\text{-}i + \Omega_3 ETCt\text{-}i + U3t$………………………..*(35)*

$\Delta \boldsymbol{log}\mathrm{EDS}\boldsymbol{t} = \delta o + \sum_{i=1}^{k-1} \delta 1i\ \Delta logRGDPt\text{-}i + \sum_{i=1}^{k-1} \delta 2i\ \Delta logTBt\text{-}i + \sum_{i=1}^{k-1} \delta 3i\ \Delta logNEERt\text{-}i + \sum_{i=1}^{k-1} \delta 4i \Delta log\mathrm{EDS}t\text{-}i + \sum_{i=1}^{k-1} \delta 5i \Delta logCPIt\text{-}i + \Omega_4 ETCt\text{-}i + U4t$…………………………..**(36)**

$\Delta \boldsymbol{logCPIt} = \lambda o + \sum_{i=1}^{k-1} \lambda 1i\ \Delta logRGDPt\text{-}i + \sum_{i=1}^{k-1} \lambda 2i\ \Delta logTBt\text{-}i + \sum_{i=1}^{k-1} \lambda 3i\ \Delta logNEERt\text{-}i + \sum_{i=1}^{k-1} \lambda 4i \Delta log\mathrm{EDS}t\text{-}i + \sum_{i=1}^{k-1} \lambda 5i \Delta logCPIt\text{-}i + \Omega_5 ETCt\text{-}i + U5t$………………………..**(37)**

Where, ETC_{t-1} is the lagged error correction term departure from the long-run co-integrating relations between these five variables. The above equation constitute a vector auto-regression model (VAR) in its first difference, which is a VAR type of ECM. Therefore, a VECM is a VAR in its first difference form with the addition of a vector of co-integrating residuals.

In nutshell, the basic steps to estimate VECM are: *First,* All series must be stationary at I (1), not I (2). *second*, Determine optimal lag length (p) for the model. *Third* Perform Johansen co-integration test with (p) lags. *Fourth,* If no co-integration estimate unrestricted VAR model Specified in eq (26) or eq (20-24), and if there is a co-integrated equation, estimate VECM with (p-1) lags specified in eq (32) or eq (33-37).

3.2.11 Variance Decomposition (VD)

Variance decomposition of the forecast error gives the percentage of unexpected variation in each variable that is produced by shocks from other variables. It also indicates the relative impact that variable has on others. The variance decomposition enables assessment of the economic significance of this impact as a percentage of the forecast error for a variable.

3.2.12 Post Estimation Tests

It is a standard tool to conduct a diagnostic check to identify a model before it can be used for forecasting. The following post-estimation test would be undertaken to check the healthiness of data to be used for analysis and interpretation.

1. Normality Test: Testing for normality of residuals is a test designed to determine the normality residual of data. To testing for normality, we can use the Jarque-Bera (JB) Test of Normality. This test used the measure of skewness and kurtosis. In its application to decide whether the null hypothesis is rejected or not, we compare the value of Jarque-Bera (JB) with the value of chi-square (χ^2) with 2 degrees of freedom. Decision rule: if the probability value of Jarque-Bera statistics is less than 5 percent, then the residuals are not normally distributed and vice versa.

2. **Auto-correlation Test:** Auto-correlation, also known as serial correlation, is the correlation of a signal with a delayed copy of itself as a function of delay. To test this problem, the study was used the Breush-Godfrey Serial Correlation LM test. The null hypothesis of the test is: no serial correlation in residual and Alternative hypothesis is: there is a serial correlation in residual***. Decision rule***: if the probability value is less than 5 percent, then we can reject the null hypothesis, meaning that the model has serial correlation and vice versa. However, we have to remove serial correlation from the model. Therefore, what will be done is to create one period lag of the dependent variable. Alternatively, we have to change all the variables into the first difference (Gujarati, 2012).

3. **Heteroscedasticity Test**: This study used the Breush-Pagan-Godfrey test to test the presence of Heteroscedasticity and its hypothesis is that the Null hypothesis: homoscedasticity, Alternative hypothesis: Heteroscedasticity. Null hypothesis (H0) says the residuals are homoscedastic and the alternative hypothesis (H1) says residuals are heteroscedastic. ***Decision rule***: if the probability value is less than 5 percent, then we can reject the null hypothesis, meaning that the model has Heteroscedasticity and vice versa.

4. **Stability and Structural break Test:** The stability system VAR can be from the inverse roots characteristics polynomial of AR. The VAR system is said to be stable (stationary) if all roots have a modulus of less than one and all are contained within the unit circle. Structural break was tested for each devaluation period by using chow test. ***Decision rule:*** if F-statistics is significant there is structural break at specified point and if F-statistics is insignificant there is no structural break at specified point.

CHAPTER FOUR: DESCRIPTIVE ANALYSIS

As noted in the methodology part, before doing the econometric investigation, a detail statistical examination shall be carried out for each variable. For better understanding, this study starts from the benchmark by looking at items that Ethiopia is importing from abroad and exporting to abroad. Then, it proceeds to analyze the trends of all selected variables over time. The aim of the trend analysis is to have a basic knowledge about the behavior of variables over time. Hence, in this section, this study was present the general overview of the development and performance of the Ethiopian economy from 1991/92 to 2017/18 with emphasis given to variables of interest.

4.1 The Types of Products Ethiopia Exporting and Importing

Agriculture is the keystone of the Ethiopian economy. It accounts for about 41 percent of GDP, 80 percent of exports and 84 percent of the labor force employment. Production in this sector is overwhelming of a subsistence nature and a large part of exportable commodities are provided by the smallholder cash crop producers (Muktar, 2010). Having this fact, the Ethiopian government was devaluing its currency three times in large percentage in order to manage current account disequilibrium. As it was mentioned in the introductory part, These devaluations were taken place: *First,* On October 1st 1992 from 2.07 Birr to 5 Birr per a dollar by *142 percent*, *second,* on September 1st 2010 from 13.62 to 16.35 by *16.7 percent* and *third,* on October 10th 2017 from 23.4 Birr to 26.91 Birr per dollar by *15 percent* (NBE Report). In addition to these devaluations, there were exchange rate adjustments (daily, weekly, monthly) in between of these three large episodes of devaluations. At first glance, critical knowledge about what types of items Ethiopia is exporting and importing is important issue toward a decision about whether to devalue or not. The following table set forth the top products that Ethiopia imports from the rest of the world, exports to the rest of the world and their features.

Table 4.1 import and export items by major products

Export items	In metric tones		
	1992/93	*2010/11*	*2017/18*
Coffee	67,374.52	172,217.23	238,572.83
Pulses	1,527.00	224,482.34	438,061.53
Chat	1,936.40	40,971.74	47,023.94
Oilseed	-	254,186.46	348,548.01
Cotton	-	152.17	3,529.38
Leather and leather products	5,573.71	5,167.39	6,400.79
Fruit and vegetables	6,051.48	91,587.26	188,976.92
Meat and meat products	40.42	16,877.37	19,954.85
Live animals	311.99	112,802.55	31,936.99
Tantalum	-	331.17	2,860.36
Textile and textile product	-	8,537.56	16,761.81
Sugar	13,123.18	-	35,958.09
Bee's Wax	131.00	362.51	358.70
Flower		41,562.61	50,100.88
Gold	3.50	11.18	2.82
Cereals and Flour	-	122,344.23	11,805.28

Import items	In metric tones		
	1992/93	*2010/11*	*2017/18*
Food and lives animal	440,582.2	547,512.7	2,217,510.2
Beverages	610.5	2,308.8	26,551.5
Electric materials	6,632.2	64,156.8	119,953.9
Glass & Glass Ware	2,446.8	25,489.8	232,072.1
Petroleum prod	332,905.0	1,795,018.8	3,770,588.9
Chemicals	22,856.8	56,496.0	183,265.1
Fertilizers	10,308.4	622,239.2	15,421.0
Medical and pharmaceutic product	2,587.2	15,022.9	1,105.1
Machinery and aircraft	7,248.5	231,077.7	255,910.3
Metal and metal manufacturing	43,720.9	772,360.7	1,381,381.2
Grain*	421,496.9	438,137.4	640,192.1
Textile	17,577.9	38,370.2	88,081.1
Clothings	317.6	31,669.4	50,756.5
Rubber products	6,888.9	37,465.4	124,577.2

Source: National Bank of Ethiopia

From this table, one can understand that almost all Ethiopian exports are commodity export, while its imports are strategic and sophisticated items which have no domestic substitute. Ethiopian exportable commodities need too much time (at least three years) to reach for sale (e.g. coffee and chat which

constitute a high percentage of Ethiopian export). In addition to this reality, some exportable are more or less perishable (e.g. fruit, vegetable, etc.). Due to its perish nature, Even if the price of these products comes down and leading great loss, there is no alternative than sell out at ongoing prices. In contrary, what Ethiopia's imports are very necessary products and inevitable. E.g. chemicals, fertilizers, Medical and pharmaceutic product which may difficult to cut its import. Discouraging the import of these products is possible only at the expense of weak economic growth. Most of the Ethiopian industries depending on these imported inputs. therefore, if Ethiopian government try to minimize imports of these items it must be ready to accept low performance of domestic industries those relying on imported inputs, high unemployment due to less performance of domestic industries, low output, low economic growth, and high inflation. According to Lenco (2013), Chemicals and fertilizers are the backbones of Ethiopian agricultural sectors, which constitutes about 85 percent of gross domestic product. Hence, importing such items is inevitable in order to boost the productivity of the agricultural sector, which expected to boost our capacity to export. Here, the most important issue that everyone must grasp with is, there are no such substitutable products for most of the products that Ethiopia importing from the rest of the world. Having this scenario's, we can wrap-up that our imports need too much time to discouraged and our exports need too much time to grow up.

4.2 Volume of Exports and Imports by Major Products

We have just identified the types of product that Ethiopia exporting to and importing from the rest of the world along with their respective features. In this sub-section, it is the time to glimpse at the export volume and import volume during and after each scene of large devaluations. Knowledge about the position of exports and imports volume over time helps toward judgment whether devaluation satisfy the hypothesized goals or not. The following table shows what happened to import and export volume following each large devaluations.

Table 4.2 Volume of exports and imports by major products

.year	Exports volume	Imports volume
The first episodes of devaluation and its cascading effects (in 1992 by 142 percent)		
1991/92	293,839.74	546,317.49
1992/93	324,830.48	2,114,668.81
1993/94	683,838.684	2,124,653.64
1994/95	814,352.108	2,912,510.17
The second episodes of devaluation and its cascading effects (in 2010 by 16.7 percent)		
2010/11	827,067.592	4,906,260.62
2011/12	971,419.873	6,304,187.29
2012/13	996,863.855	8,223,383.58
2013/14	1,160,652.08	8,338,054.78
The last episodes of devaluation and its cascading effects (in 2017 by 15 percent)		
2016/17	113,773.091	9,283,906.79
2017/18	116,615.723	9,487,535.74

Source: National Bank of Ethiopia and author's computation

Did export volume increased and Import volume decreased after each devaluation? Table 4.2 shows that both export and import volumes increased following each scene of devaluations. After Ethiopia applied the first large devaluation (1992), export volume increased by 10.5 percent in 1993/94 as compared to what it was in 1991/92 while import volume was increased by 287 percent (short-run scenarios). In 1995 export volume was increased by 177 percent vis-a-vis 1991/92 while import volume increased by 433 percent (long-run scenario). Look! Our exports volume were increased by the insignificant quantity and the volume of our imports were increase by very significant volume which in combination exacerbate current account deficit. Cascading effect of second and last devaluation on export volume and import volume also exhibit the same trend as of 1992 devaluation. e.g. In 2011/12 export volumes and import volumes were increase by 17.5 percent and 28.6 percent respectively as compared to 2010/11 (short-run effect). While in 2013/14 export and import volumes were increased by 40.3 percent and 70 percent respectively in relation to 2010/11 (long-run effect). Finally, in 2017/18 export and import volumes shows an increment by 2.4 percent and 2.2 percent respectively in relation to what they were in 2016/17. In the

Ethiopian economy, the supply of export and demand for import is inelastic at all. As discussed in the previous sub-section, Ethiopia is one of the developing countries that importing very necessary products which of its demand could be decline only at greater opportunity cost. Reversely, Ethiopia exporting kind of products that are not enough to satisfy foreign demand (shortage) even under normal circumstance (without devaluation). This means, there is not enough availability of domestically produced goods, which both domestic and foreign consumers wish to buy. So, why devaluation? We doubt that the Ethiopian government simply count on what theory says about devaluation without a glimpse at its own economic situation. However, this theory does not consider the Ethiopian economy when it had written.

In nutshell, Since Ethiopia has no excess accumulated commodity to respond to extra demand resulting from exchange rate devaluation, the measure will largely ineffective at best. Therefore, for devaluation to be productive, the times, how long will it take both domestic and foreign consumers to adjust their preferences and switch towards Ethiopian-made goods matters. If they take a relatively larger time to change their preference from imported goods to domestically produced goods, the devaluation measure will be largely ineffective and vice versa. Intuitively this thesis claim that the capital mistake is not the acceptance of the initial large devaluation (1992) rather the second (2010/11) and last (2107/18) were mistaken. The results of the first devaluation would have been lesson before looking for the second devaluation. The outcomes of first and second devaluation would have been lessons before looking for the third devaluation. Nevertheless, the Ethiopian government did not seem to retrospect this fact rather trust in theory.

4.3 Value and Trends of Exports, Imports, and Trade Balance by Major Products

Having discussed the volume effects of devaluation, now it is very essential to figure out the positions of exports and imports in value terms so that we can grasp-out with the impacts of devaluation on the trade balance. The following table shows the value effect of devaluation over time.

Table 4.3 exports and imports by value, and trade balance in thousands of birr

Year	Exports value(in thousands of Birr)	Imports value(in thousands of Birr)	Trade balance (in thousands of Birr)
The first episodes of devaluation and its cascading effects (in 1992 by 142 percent)			
1991/92	1,404,172.72	4,739,967	-3,335,794.28
1992/93	2,737,233.72	6,546,274	-3,809,040.28
1993/94	15,217,752.86	84,677,193	-69,459,440.14
1994/95	26,115,305.87	108,956,272	-82,840,966.13
The second episodes of devaluation and its cascading effects (in 2010 by 16.7 percent)			
2010/11	44,525,565.04	129,693,362	-85,167,796.96
2011/12	54,494,767.31	191,587,139	-137,092,371.69
2012/13	59,860,381.12	330,794,233	-270,933,851.88
2013/14	59,725,752.81	353,013,856	-293,288,103.19
The last episodes of devaluation and its cascading effects (in 2017 by 15 percent)			
2016/17	63,685,744.1	354,271,135	-290,585,390.90
2017/18	72,712,994.65	397,115,468	-324,402,473.35

Source: National Bank of Ethiopia and author's computation

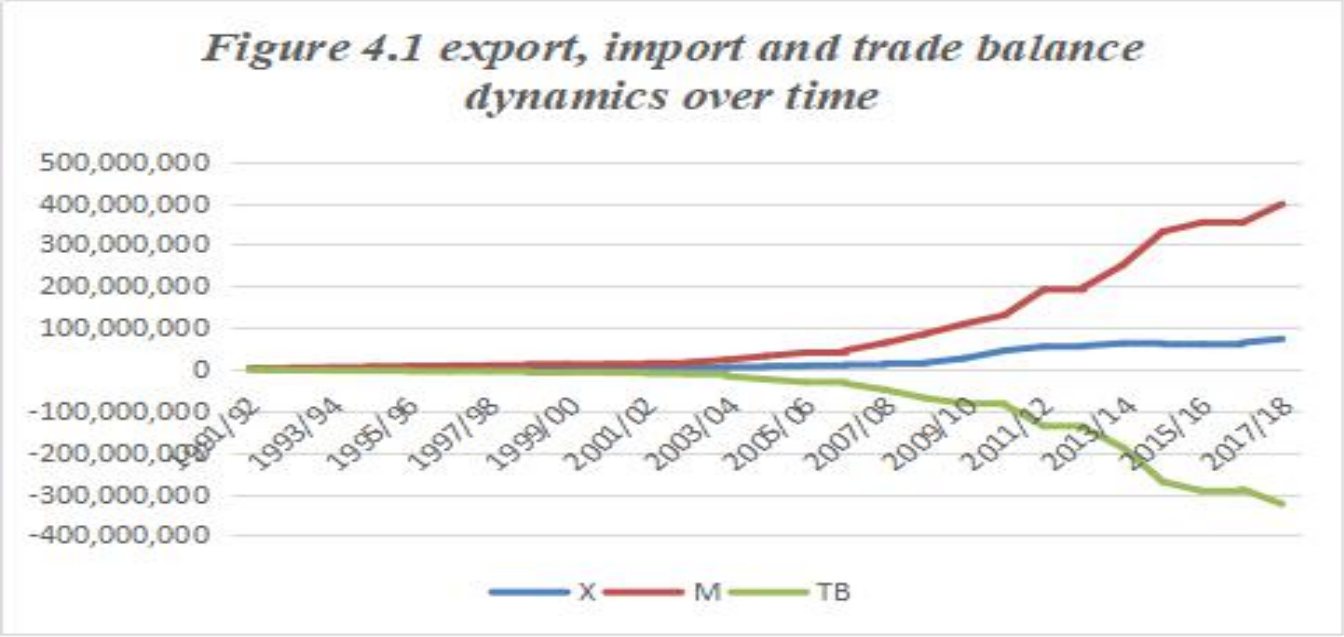
Did export earnings increased, import payment decreased and trade balance improved after devaluation?

From table 4.3 we can understand the impact of each devaluation on export earnings and import payment in Ethiopia. ***The outcomes of initial large devaluation:*** The result shows that after the application of policy export earning was increase by 95 percent in 1992/93 as compared to what it was in 1991/92 while import payment was increased by 38 percent but, it was expected to be decreased. After three years (long-run effect) of application of devaluation as a policy instrument, in 1994/95 export earnings surged by 18.6 folds of what it was in 1991/92 and import also surged by 23 folds of what it was in 1991/92.

The outcomes of second large devaluation: as shown in the above table export earnings and import payment in 2011/12 was increased by 22.38 percent and 47.72 percent respectively as compared to what they were in 2010/11 (short-run effect). Similarly, export earnings and import payment in 2013/14 increased by 34.13 percent and 172.19 percent respectively in relation to what they were in 2010/11 (long-run effect). ***The outcomes of final devaluation:*** the result of the last devaluation reveals that in 2018

export earning was increase by 14.17 percent and import payment was increased by 12.09 percent as compared to what they were in 2017. From these facts, this thesis able to found that marginal imports payment after devaluation exceeds marginal exports earning after devaluation both in short run and long run.

So, what happens to Ethiopian trade balance over time? The results of the initial large devaluation show that the trade deficit has surged over time. In 1992/93 it rose by 14.18 percent as compared to 1991/92 (short-run effect). Similarly, in 1994/95 it was raise by 25 folds of what it was in 1991/92 (long-run effect). The second large devaluation shows that the trade deficit was increased by 61 percent in 2011/12 as compared to 2010/11 (short-run effect) and it was raised by 244 percent in 2013/14 vis-a-vis what it was in 2010/11 (long-run effect). The last large devaluation also resulted in a huge trade deficit over time. It was increased by 11.63 percent in 2017/18 as compared to what it was in 2016/2017. In combination, all large devaluation in Ethiopia has resulted in a huge trade deficit over time. Therefore, this thesis argued that there were no chesty premises for the Ethiopian government to devalue its currency yet and devaluation was not a suitable policy tool for Ethiopian economic content at all. The trends of Ethiopian export, import, and trade balance ascertain this argument.



Source: National Bank of Ethiopia and author's computation

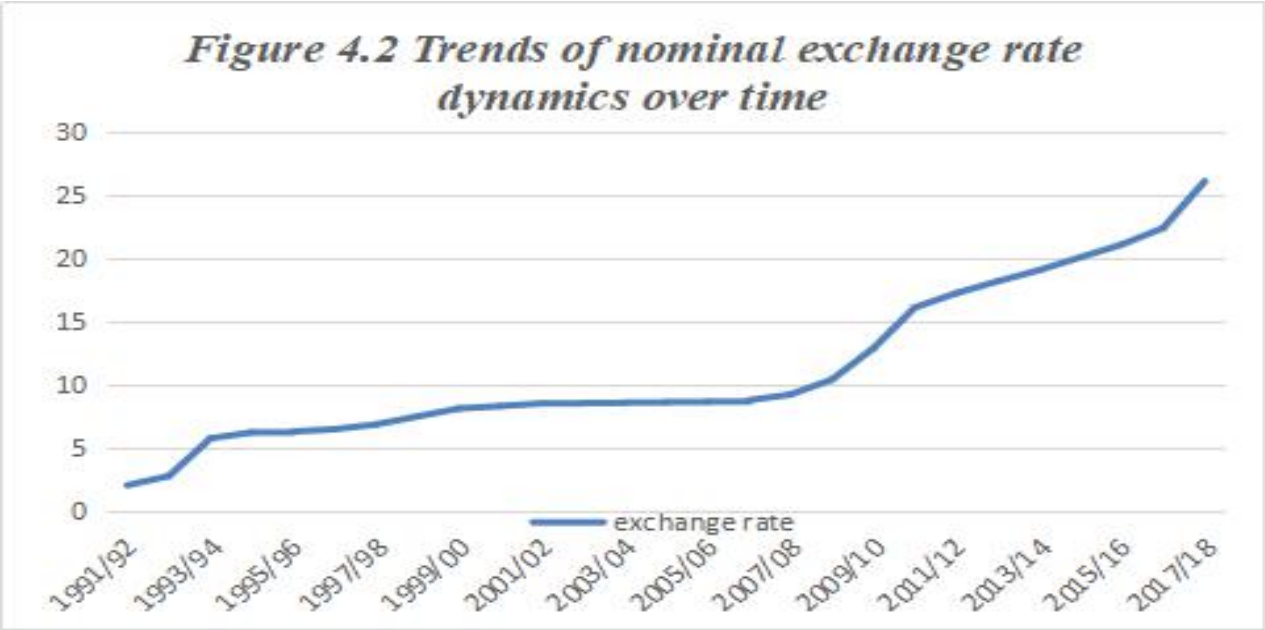
Figure (4.1) indicates the steady growth of both export and import following the 1992 devaluation. The growth rate of import was relatively lower from1992/93 through 2000/01. From 2001/02 through 2010/11, import grew moderately but, from 2010/11 through 2017/18, it grew at a high rate while export grew slowly; the growth of the former exceeds that of the latter. Although both export and import grew, the trade deficit has been widening because the base for import growth is relatively larger than the export growth. *By looking at these trends, does devaluation meets what theory of devaluation supposed? No!, Look at the following summary of fig 4.1.*

The propositions of devaluation	The truth happening in Ethiopian economy
➢ Devaluation encourages exporting and dramatically increase export earning ➢ Devaluation discourages importing and decrease import payment ➢ It narrowing the gap between export and import so that improve the trade balance	➢ Exports were increasing slowly not as dramatically as promised. ➢ Imports were increasing rampantly which is reverse to what devaluation expected to do. ➢ The gap between export and import get widen over time and trade deficit exacerbate over time too.

Having this fact, the Ethiopian government was incorrect when it perceived that Birr is overvalued in terms of USD and Ethiopian commodities are too expensive relative to foreign commodities so that took devaluation as corrective action.

4.4 Trends of Nominal Exchange Rate in Ethiopia

Since 1992, the Ethiopian government has been accepted three large exchange rate devaluation proposed by international institutions (IMF and CBE) as mentioned above. Before we look at the trends of macroeconomic variables of interest, it is better to glimpse at the trends of the nominal exchange rate, which supposed to affect these variables.

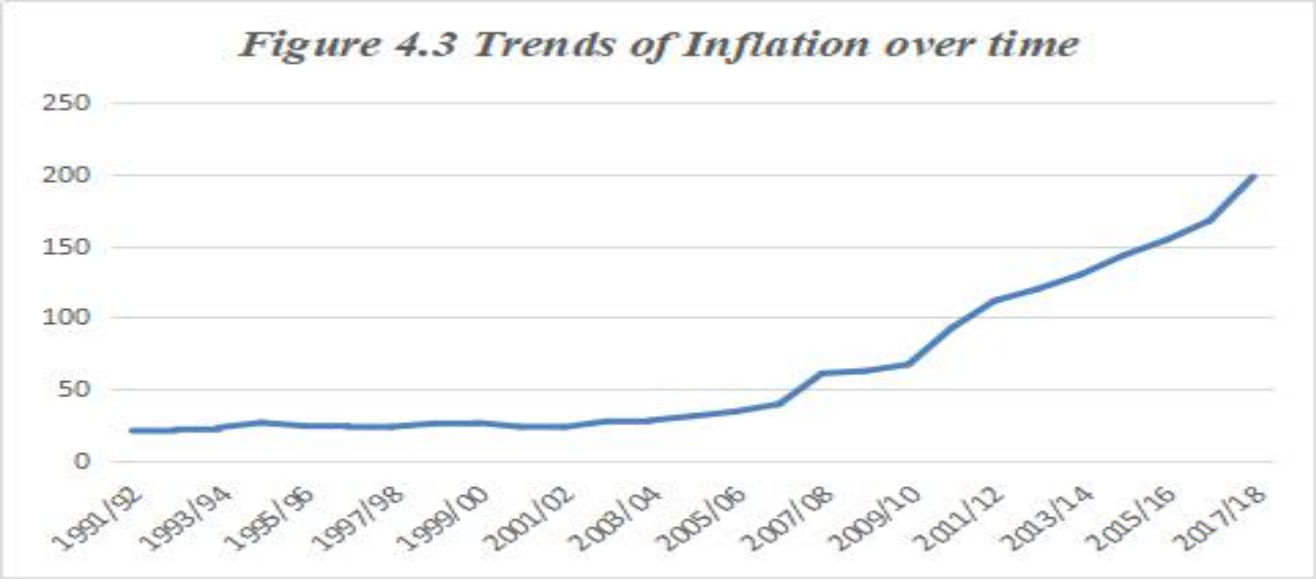


Source: National Bank of Ethiopia and author's computation

From figure 4.2 it clear that the trend of the exchange rate was moving upward since 1992. it was unevenly upward in 1992/93. In our case, this scene referred to as ***the initial large devaluation.*** Again, in 2010/11 the same trend comes out. This upward movement in the exchange rate in 2010/11 referred to as ***the second large devaluation***. Finally, exchange rate sloped up in 2016/17 again! This upward movement referred to as ***the last large devaluation*** according to this thesis point of view. For this study (at least), the kernel issue is not an upward or downward movement in the exchange rate, rather its impact on economy healthy is the core issue. An upward movement in the exchange rate (devaluation) may be helpful or harmful too. The same is true for downward movement in the exchange rate (appreciation). In order to be certain with the effect of exchange rate movement, we must look at the economic situation of the country under study and the sign of the relationship between exchange rate shocks and related macroeconomic variables (directly or indirectly). So that, we can decide whether an upward movement is wrong or right action. In the following sections, detail intuition shall be given to these issues.

4.6 Trends of Inflation in Ethiopia

Inflation refers to a situation in which the economy's overall price level is rising. The main objective of the government is to achieving stable macroeconomic condition so that maximize its social welfare. This objective requires that prices be kept to a reasonably stable level. Does this hold true in the Ethiopian economy? Look at the following figure.

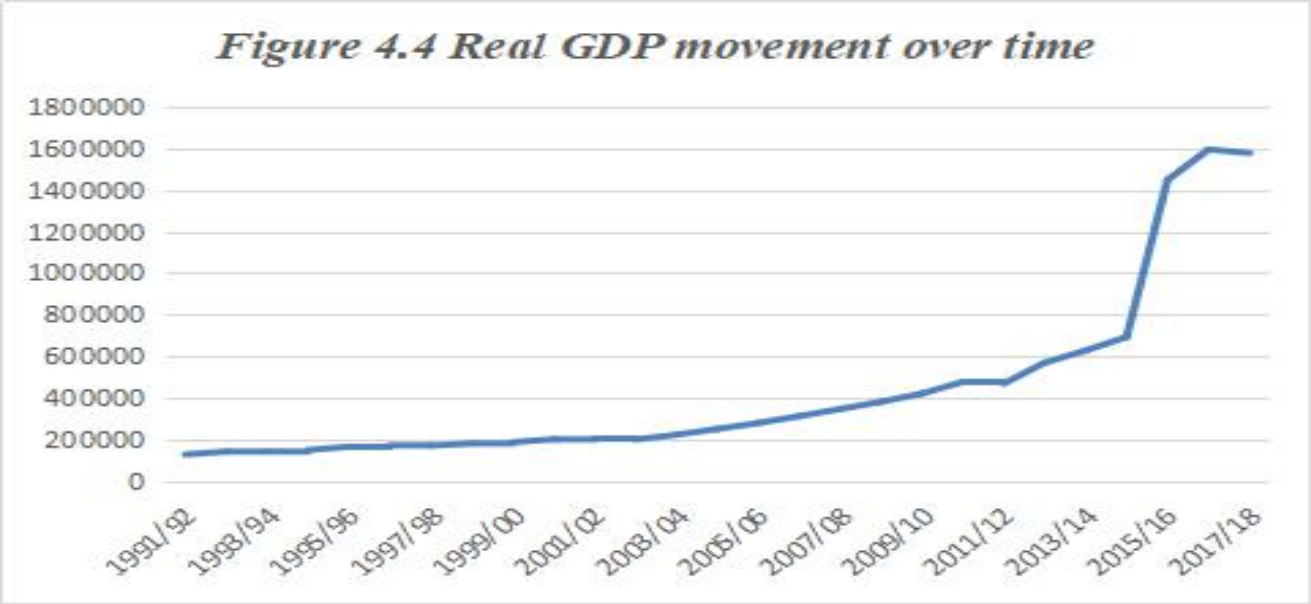


Source: National Bank of Ethiopia and author's computation

From this figure, we can see that the inflation rate in Ethiopia is not stable. It slowly rose since 1992/93 up to 2003/04. It unevenly rises from 2006 to 2007/08 and moderately raised from 2008/09 to 2009/10 due to the 2008 drought in the economy. In 2011/12, inflation was dramatically hiked up and does not comes down thereafter. Again, in 2017/18 Ethiopian inflation highly surged. Having this fact, let us link figure (4.2) and (4.3). The main implication of these two figures is that Ethiopian inflation mimic exchange rate movement over time. Meaning that Inflation has surged following each devaluation. Therefore devaluation is undoubtedly inflationary. In addition, it is only inflationary, if improvement in other variables unable to compensate for economic slowdown resulting from inflation. The important question here is that 'did Birr devaluations improve other variables so that the negative effect of inflation eaten up? Let us look at the trends of other relevant variables over time.

4.7 Trend of Real GDP in Ethiopia

Real gross domestic product is a macroeconomic measure of the value of economic output adjusted for price changes. RGDP is the representative measurement of economic growth since it transforms the money value measured in nominal GDP, into total quantity. The following figure shows the trend of RGDP over time.

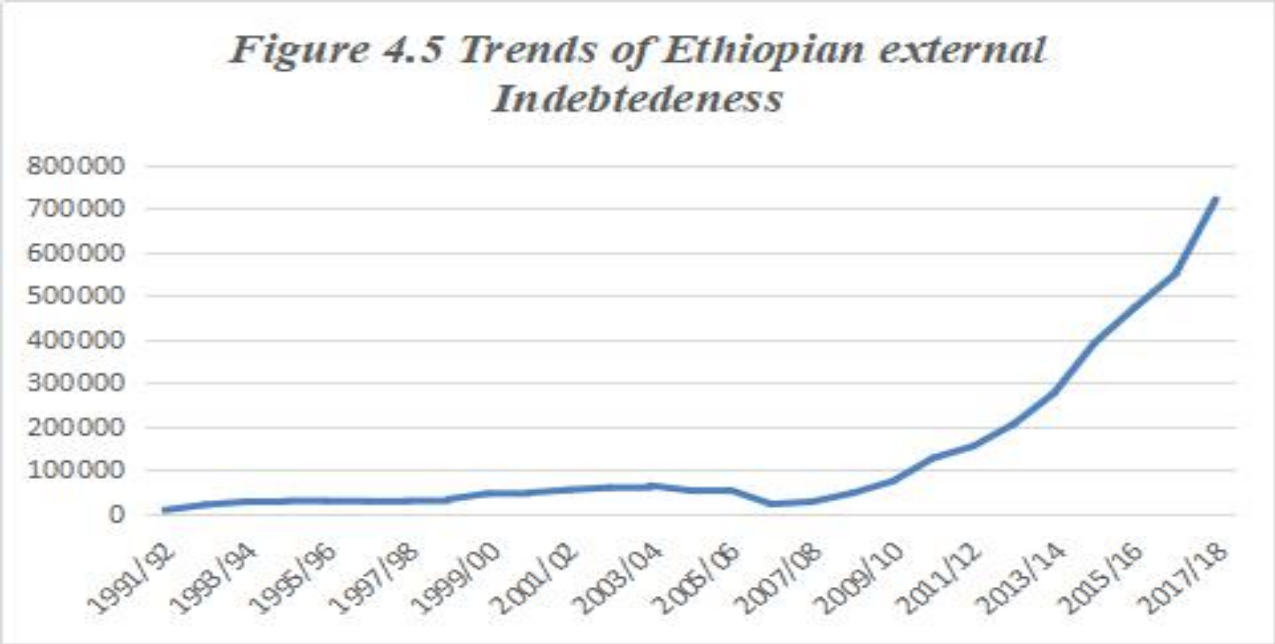


Source: National Bank of Ethiopia and author's computation

From this figure, we see that real GDP was increased by an insignificant amount since 1991/92 through 1996/97 and then move horizontally (stable) up to 2003/04 and continue to rise. After 2011/12 RGDP raised slowly but after 2016/17 start to decline. The Ethiopian economy growth which had shown 9.3 percent average annual growth during 2013/14 to 2016/17 fiscal years, recorded to 6.3 percent growth in 2017/18 fiscal year, which is lower than the growth rate registered in the previous year. Now, let's combine figure 4.2, 4.3 and 4.4. Flowing each scene of devaluation inflation was significantly mimic exchange rate devaluation. However, economic growth rose slowly following initial and second large devaluations however, declined by 3 percent following the last large devaluation. In combination devaluation insignificantly improve economic growth before 2017 and harm it in 2018 while, it rampant inflation in the Ethiopian economy. Therefore, an improvement in economic growth due to devaluation was not enough to compensate the negative impact that inflation levied on the economy. These trends tell us devaluation in Ethiopia is ineffective at best.

4.7 Trends of External Debt in Ethiopia

External debt (foreign debt) is the total debt a country owes to foreign creditors; its complement is the internal debt which is owed to domestic lenders. The debtors can be the government, firms or citizens of that country. The following figure shows the positions of Ethiopian external debt over time.



Source: National Bank of Ethiopia and author's computation

This figure grasps us with the position of external debt over time which was more or less stable up to 1998/99 and gradually raised since 1999/00 through 2006/07. In 2011/12 Ethiopian external debt was increased by 53,223.5 (73.29 percent) as compared to 2009/10. Again in 2017/18, it had increased by 248173.6 (52.54 percent) in relation to what it was in 2016/17. Now, let's put the trends of the exchange rate (fig 4.2) and external debt (fig 4.5) in the same inference. By linking both of these variables, we can infer that external indebtedness has increased as the exchange rate increase (devaluation). By accepting devaluation as a policy instrument, the Ethiopian government has just increased its indebtedness. Look! Ethiopia has huge accumulated external debts during each eve of devaluation, but it accepts weakening its currency as a panacea for the economic epidemic. Having this fact, Devaluation of Ethiopian Birr is not economically reasonable due to the potential risks of extremely high external debt denominated in foreign currency. Finally, this thesis claim that devaluation for Ethiopian economy should not be referred to as drug for its economic epidemic rather it's the source of economic pain. In order to ascertain the above descriptive analysis, empirical Econometric analysis shall be done in the following sections.

CHAPTER FIVE: ECONOMETRIC ANALYSIS

5.1 Stationarity Test

Stationary is an important concept that plays an important role when estimating time series analysis. Proper estimation of a time series model requires a stationary data. Conducting time series analysis on non-stationary data will result in what is called "spurious" or "nonsense" regression(Green, 2002, Veerbik, 2008, Gujarati, 2012). So the initial tasks we must undertake is testing for stationarity of data. In the following tables, the Augmented Dickey-Fuller (ADF) and Phillip-Perron(PP) test have used to check whether data at hand get stationary or not.

Table 5.1 Augmented Dickey-Fuller unit root test

Variables	***ADF test***						***Order of integration***
	At level			***At first difference***			
	T-test	***Critical value***	***P-value***	***T-test***	***Critical value***	***P-value***	
LOGTB	**-1.937334**	**-2.498439**	**0.314**	**-6.446339**	**-2.892200****	**0.0000**	I(1)
LOGRGDP	**0.851384**	**-2.890327**	**0.9945**	**-4.018629**	**-2.890327****	**0.0020**	I(1)
LOGCPI	**-1.352151**	**-2.890037**	**0.9988**	**-9.088310**	**-2.890322****	**0.0000**	I(1)
LOGEXDS	**0.302873**	**-2.890327**	**0.9774**	**-3.794702**	**-2.890322****	**0.0002**	I(1)
LOGNEER	**-1.779506**	**-2.890327**	**0.3887**	**-10.02697**	**-2.890322****	**0.0000**	I(1)

Sources: The results are calculated by the author using EViews 10.0 software

*Note: **represent significant at 5 percent level of significance.*

As we can see from Table 5.1 of the ADF results of LOGTB, LOGRGDP, LOGCPI, LOGEXDS, and LOGNEER, the absolute value of each of the t statistics is smaller than the absolute values of each of the critical value at a level. For instance, in the case of LOGTB, the t statistic is equals -1.937334 which is less than -2.498439, in addition, the p-value of the variable is not significant since its value is greater than 5 percent therefore, it is possible to reject the null hypothesis which was claiming the variables were stationary at level. The same is true for LOGRGDP, LOGCPI, LOGEDS AND LONEER as shown in left-hand side of above table, Since the variables (LOGTB, LOGRGDP, LOGCPI, LOGEDT, and LOGNEER) have unit root, it's impossible to estimate the model directly and we need to fix the problem by taking the first difference of the variables and check it again if they are stationary. The original data

need to be changed into its first difference and ADF test need to be checked once again. Hence, we continue the analysis by taking the first difference, so that we can determine in which order the variables become stationary. When we look at the results of ADF tests conducted on the difference of the variables (RHS of table 5.1), the null hypothesis of unit root is strongly rejected. Thus we can conclude that all the variables are stationary at first difference. The Phillip-Perron (PP) test indicated on table 5.2 below also shows that all variables are stationary at first order I(1).

Table 5.2 Phillip-Perron (PP) unit root test

Variables	PP test						***Order of integration***
	At level			***At first difference***			
	t-test	***Critical value***	***P-value***	***t-test***	***Critical value***	***P-value***	
LOGTB	-1.523126	-2.890037	0.8603	-16.59464	-2.8903274**	0.0002	I(1)
LOGRGDP	-2.102055	-2.890037	0.9999	-3.806011	-2.8903274**	0.0001	I(1)
LOGCPI	-1.150584	-2.890037	0.9977	-9.166403	-2.8903274**	0.0000	I(1)
LOGEDT	0.595999	-2.890037	0.9890	-3.775576	-2.8903274**	0.0043	I(1)
LOGNEER	-1.699802	-2.890037	0.4283	-9.785105	-2.8903274**	0.0000	I(1)

Sources: The results are calculated by the author using EViews 10.0 software

*Note: **represent significant at 5 percent level of significance.*

As shown in both table, the null hypothesis that there is unit root is rejected after the first difference at 5 percent significance level witnessing the existence of long-run or equilibrium relationship among economic variables presented in equation (26). However, it is of interest to determine the optimal lags to be included before going through the long-run relationship.

5.2 Determination of Optimal Lag Length

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 information ICs are the Akaike information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) and the Hannan-Quinn information criterion (HQIC). Practically the lag length which is selected by most of these criteria will be included in the VAR system.

Table 5.3 VAR optimal lag selection

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	416.3952	NA	1.19e-10	-8.660951	-8.526536	-8.606637
1	1127.765	1332.882	6.33e-17	-23.11084	-22.30435	-22.78496
2	1190.461	110.8739	**2.87e-17***	**-23.90445***	**-22.42589***	**-23.30700***
3	1202.191	19.50871	3.84e-17	-23.62508	-21.47445	-22.75606
4	1221.942	30.76934	4.38e-17	-23.51457	-20.69186	-22.37398
5	1246.082	35.06626	4.62e-17	-23.49646	-20.00168	-22.08430
6	1272.529	35.63403	4.72e-17	-23.52692	-19.36007	-21.84320
7	1292.962	25.38011	5.60e-17	-23.43078	-18.59185	-21.47549
8	1326.367	37.97587*	5.20e-17	-23.60772	-18.09672	-21.38086
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5 percent level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Sources: The results are calculated by the author using EViews 10.0 software

In order to test for co-integration, it is necessary to specify the number of lags to be included in the model. As stated above the optimal lag length must be determined by lag selected by most information criterion. According to Table 5.3, almost all criterion choose two lags and only LR chooses eight lags. Therefore, the optimal lag for the underlying VAR model is two.

5.3 Co-integration Test

After completion of unit root test and determination of optimal lags to be included in the model, the third step is testing for co-integration. If the variables are found to be cointegrated, that is there exists a linear, stable and long-run relationship among variables, such that the disequilibrium errors would tend to fluctuate around zero mean. In literature, Co-integration tests, e.g. Engle and Granger (1987), Johansen

(1988), Johansen and Juselius (1990), Pesaran et al (2001) are used to confirm the presence of potential long-run equilibrium relationship between two variables. The thesis used Johansen's technique in order to establish how many co-integrating equations exist between variables. Accordingly, the trace and maximum eigenvalue test statistics have rejected the null of no-co-integration among the series of interest: while confirming the existence of long-run relationships among them. The summary statistics of both tests have reflected in the tables below;

Table 5.4 Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.335722	83.62384	69.81889	0.0027
At most 1	0.189872	42.71834	47.85613	0.1396
At most 2	0.121277	21.66206	29.79707	0.3177
At most 3	0.082247	8.733466	15.49471	0.3906
At most 4	0.001506	0.150721	3.841466	0.6978

Sources: The results are calculated by the author using EViews 10.0software

*Trace test indicates 1 co-integrating equation at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level*

The Trace Test in Table 5.4 indicates the existence of 1 co-integrating equation at the 5 percent significance level. This co-integrating equation means that one linear combination exists between the variables that force these indices to have a relationship overtime period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, we also display the results of the Maximum Eigenvalue Test in table 5.5 below.

Table 5.5 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.335722	40.90550	33.87687	0.0062
At most 1	0.189872	21.05628	27.58434	0.2728
At most 2	0.121277	12.92859	21.13162	0.4588
At most 3	0.082247	8.582745	14.26460	0.3225
At most 4	0.001506	0.150721	3.841466	0.6978

Sources: The results are calculated by the author using EViews 10.0 software

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

** denotes rejection of the hypothesis at the 0.05 level*

The Maximum Eigenvalue Test also shows 1 co-integrating equation at the 5 percent level confirming the Trace Test. Therefore these two tests confirm a co-integrating relationship among Trade balance(TB), real gross domestic product(RGDP), inflation(CPI), external debt(EDs) and nominal effective exchange rate(NEER). since both trace and max-eigenvalue test statistics reveal one co-integrating equation we shall focus on the first equation of VAR equations specified in the methodology part. That model should be considered as the target model and the dependent variable of that model should be the target variable of this study.

5.4 Diagnostic test

Up to this point, we have just found out that variables are integrated of order one. Therefore, a suitable model is a Vector Error Correction model. However, one step which should be taken before the discussion of the VECM (short run and long run model) is checking the robustness of our model. Hence checking for normality of residuals, stability, Heteroscedasticity and serial correlation about the residual of the Vector error correction regression (VECM) Model is of interest. The results of the diagnostic tests (*See: step 9 of the appendix*) shows that all models are correctly specified and the parameters are correctly estimated. The graph of the root of the VAR proved the stability of the model given all the points appeared to be within the main circle and no unit root lies outside the unit circle and there is no structural breaks in the series. The Model does not suffer from serial correlation and Heteroscedasticity. Finally, we could reject the null hypothesis for the Jaque-Berra normality test which says that the residuals are normally distributed. According to Enders (1995), the existence of normality problem does not affect and distort the estimators' unbiasedness and consistency property, because the main purpose of normality tests is for inference (testing hypothesis about the population parameter) (Helen, 2012). Therefore the nonexistence of vector normality in this model doesn't affect our estimates. Having the post-estimation well, VECM models with one lag (k-1) lag, Granger causality, impulse response function, and Variance decomposition based on VECM can be used for interference in the following sections.

5.5 VECTOR ERROR CORRECTION MODEL RESULTS AND ANALYSIS

After understanding that the variables are co-integrated, the fourth step is to estimate the Vector Error Correction Model. If a set of variables are found to have one or more co-integrating vectors then a suitable estimation technique is a VECM (Vector Error Correction Model) which adjusts to both short-run changes in variables and deviations from equilibrium(Maria, 2014). Therefore, in the following section, VECM shall be estimated and, hence both the short and long run elasticities can be captured simultaneously.

5.5.1 The Long run Model

Given the finding that LOGTB, LOGRGDP, LOGCPI, LOGED and LOGNEER are co-integrated in the long run, we utilize the co-integrating vector to construct the vector error correction model (VECM). It should be noted that the cointegrating vector is obtained from the Johansen Maximum-likelihood Estimates (Normalized). As aforementioned, we have only one co-integrating equation. Hence, only Trade balance is of interest to us, Table 5.6 shows the Vector Error Correction Estimates of trade balance as an endogenous variable. Long run elasticities were exactly identified and the Johnson normalization restrictions were imposed too.

Table 5.6 long run relationship of cointegrated vector

Cointegrating Eq:	**CointEq1**
LOGTB(-1)	1.000000
LOGRGDP(-1)	-18.499603* (3.23270) [-5.72264]
LOGCPI(-1)	17.95146* (4.36685) [4.11085]
LOGEDS(-1)	2.740365* (0.97304) [2.81629]
LOGNEER(-1)	-8.44816 (8.65851) [-0.9757]
C	-1.866819

Sources: The results are calculated by the author using EViews 10.0 software.

The long-run error correction models for a co-integrated equation which is drawn from table 5.6 is estimated as:

$$ETC_{t-1} = -1.867 + LOGTB_{t-1} - 18.49LOGRGDP_{t-1} + 17.95LOGCPI_{t-1} + 2.74EDS_{t-1} - 8.44LOGNEER_{t-1} \text{ --------(39)}$$

In the long run, error correction term is assumed to be zero and eq (39) can be rewritten as:

$$LOGTB_{t-1} = 18.499603LOGRGDP_{t-1} - 2.740365LOGEDS_{t-1} - 17.95146LOGCPI_{t-1} + 8.44816LOGNEER_{t-1} \text{----------(40)}$$

Along with The goal of this thesis, enormous attention would be given to the long run effect of NEER on the trade balance. Having this in mind, From equation (40) we can draw two main findings.

First, the result revealed that, in the long run, real gross domestic product (RGDP) and nominal effective exchange rate (NEER) have a positive impact on trade balance (TB). Meaning that under the ceteris paribus condition when the real gross domestic product (RGDP) increased by 1 percent, trade balance would be improved by 18.49 percent and 1 percent increased in exchange rate (devaluation) lead about 8.44 percent improvement in the trade balance. However, the long-run impact of the nominal effective exchange rate (NEER) on the trade balance is statistically insignificant (small t-value) while the impact of real gross domestic product (RGDP) on trade balance (TB) is statistically significant. Therefore, even if there is an improvement in the trade balance, it was not exchange rate that helps toward improvement in the trade balance in long run instead real gross domestic product(quantity of domestic output) do that. High real gross domestic product means the country has enough product to export abroad so that export earning would be increased. When export earning improved trade balance could explicitly improve (Bonsa, 2014).

On the contrary, the trade balance doesn't improve due to recursive exchange rate devaluation. The main reason behind this scene is, the Ethiopian economy depends more or less on agricultural products and industries in this country relying on imported capital good. Look! When this country accepts devaluation as a policy measure, it just increases the domestic price of capital good that it can import from the rest of the word to run domestic industries those depend on imported inputs. This in general means that import payment would increase since Ethiopia has no such import substitute products and its dependence on the agricultural sector. On the other way round, even though the value of Birr decreased in terms of foreign currencies so that motivate foreigners to buy Ethiopia's product, Ethiopia has no enough product to satisfy increased demand due to devaluation. Therefore, exchange rate devaluation in the Ethiopian case is just simply increasing import payment and leave export earning as it were or even decreasing it.

Second, external debt servicing (EDs) and inflation which was proxied by Consumer price index (CPI) have a negative impact on the trade balance of Ethiopia in the long run. Other variables being constant, a one percent increase in inflation rate deteriorate trade balance by about 17.95 percent. According to Helen (2012), Gudina (2018), Sisay (2008), Alamayehu (2014), Mekesha and Molla (2015), the main factor that leads inflation in Ethiopian economy is Exchange rate devaluation. An increment in domestic price level deteriorate trade balance of nations by motivating domestic consumers to substitute imported product for domestic product, this scene, in turn, discourages domestic industries to produce more. In combination, Less domestic production and more import payment automatically push trade balance to a huge trade deficit. Therefore, exchange rate devaluation cause domestic inflation and domestic inflation negatively affect trade balance in a significant path and amount.

In a similar way, a one percent rise in external debt servicing will cause trade balance to deteriorate by 2.74 percent. According to Zakaree (2015) and Palic et al (2017) when domestic currency loses its value(devaluation/depreciation) the amount of external debt repayment that this country must pay during the due date will be increased and the ratio's of external debt repayment to export earning would increase. Therefore devaluation of currency increase the ratio's, then an increment in ratios of external debt service to export earning negatively significantly deteriorate the trade balance of Ethiopia. In nutshell, inflation and external debt negatively and significantly affect the Ethiopian trade balance. In contrary, RGDP has a positive significant impact while the exchange rate has a positive insignificant impact on the trade balance of Ethiopia in the long run.

5.5.2 The Short run Dynamics for Vector Error Correction Model

The short-run relationship between the exchange rate devaluation, the balance of trade, economic growth, inflation, and external debt servicing can be shown by the Vector error correction model. Error correction term which measures the speed of adjustments towards equilibrium should have a negative sign (at least for co-integrated equation) for convergence of a determined co-integrating equation (in our case, Trade balance equation).

Table 5.7 The Short run relationships of cointegrated variables under VECM model

Error Correction:	D(LOGTB)	D(LOGRGDP)	D(LOGCPI)	D(LOGEDT)	D(LOGNEER)
CointEq1	-0.0858004	-0.021391	-0.018468	-0.018998	0.020509
	(0.012563)	(0.01227)	(0.02320)	(0.05388)	(0.00923)
	[-6.82936]	[-1.74304]	[-0.79614]	[-0.35260]	[2.22321]
D(LOGTB(-1))	1.229925	0.002176	0.064619	-0.066884	-0.021624
	(0.10255)	(0.01002)	(0.01893)	(0.04398)	(0.00753)
	[3.24218]	[0.21726]	[3.41297]	[-1.52084]	[-2.87184]
D(LOGRGDP(-1))	-1.115739	0.683191	0.076583	0.050786	-0.043712
	(0.74033)	(0.07232)	(0.13669)	(0.31750)	(0.05436)
	[-1.50709]	[9.44742]	[0.56027]	[0.15996]	[-0.80411]
D(LOGCPI(-1))	-0.518957	0.028533	0.072722	0.127794	-0.022314
	(0.52037)	(0.05083)	(0.09608)	(0.22317)	(0.03821)
	[-0.99728]	[0.56134]	[0.75690]	[0.57263]	[-0.58400]
D(LOGEDT(-1))	-0.127070	-0.000180	0.020749	0.631309	0.040511
	(0.19496)	(0.01904)	(0.03600)	(0.08361)	(0.01432)
	[-0.65177]	[-0.00946]	[0.57640]	[7.55049]	[2.82985]
D(LOGNEER(-1))	-2.543452	-0.093792	0.071306	0.238303	0.012430
	(1.36439)	(0.13327)	(0.25191)	(0.58514)	(0.10019)
	[-2.13124]	[-0.70375]	[0.28306]	[0.40726]	[0.12407]
	0.021436	0.003509	0.007862	0.002613	0.002488
C	(0.01465)	(0.00143)	(0.00271)	(0.00628)	(0.00108)

Sources: The results are calculated by the author using EViews 10.0 software

From table 5.8 we can observe that the error correction term has the right sign (negative sign). This indicates convergence towards equilibrium level. However, we need to pay more attention to our target variable (the trade balance) as identified by the co-integration result. The coefficients of the error correction term of LOGCPI, LOGED and LOGRGDP are all insignificant, but the coefficient of LOGTB is negative and significant. This result shows that if there is a disturbance occurred in the whole system, the change of trade balance (TB) will have significant conservative force tending to bring the model back into equilibrium whenever it moves too far. Accordingly, the previous quarter's deviation from long-run equilibrium is corrected in the current quarter at an adjustment speed of 8.5 percent. However, the coefficient of LOGNEER is positive and significant. This result shows that if there is a disturbance occurred in the whole system, the change of NEER will have a significant hidebound force to moving the model far from equilibrium. As the result indicates, the previous quarter's deviation from long-run equilibrium is continued in the current quarter at a speed of 2 percent.

5.6 Granger Causality Test

Granger causality test is a statistical hypothesis test for determining the usefulness of one time series in forecasting another time series. The causality test is used to measure the ability to predict the future values of a time series on the basis of the previous values of another time series. By looking at result from pairwise Granger causality test in Appendix step 5 we can grasp with a causal relationship between included variables. The result shows that the nominal effective exchange rate Granger causes consumer price index, external debt servicing, and trade balance. probability value for these variables is less than 0.05 percent Therefore, we can reject the null hypothesis(H_0) that state nominal effective exchange rate does not Granger cause these variable and accept alternative hypothesis(H_1). However, the nominal effective exchange rate does not Granger cause real gross domestic product meaning, probability value for this variable is greater than 0.05 percent hence, we can accept H0 and reject H1.

5.7 Impulse Response Function

As it can be seen from the Appendix (step 8), the CPI and EDS are response positively to a shock in the nominal effective exchange rate and the magnitude of the response increase up to the fourth quarter. But after the fourth quarter, it decreases up to the 8th quarter and remained nearly steady for the following quarters. This implies that a shock to nominal effective exchange rate instantly leads to Inflationary and high external debt servicing. However, RGDP responds negatively to a shock in the nominal effective exchange rate over the whole period and the magnitude of the response increase up to the 10th quarter. But after the 10th quarter, it responds to shocks at a decreasing rate. This implies that the exchange rate devaluation decreases Ethiopian economic performance over time. Similarly, trade balance negatively and highly responsive to innovation in nominal effective exchange rate up to the 3rd quarter and it responds positively from 3rd quarter to the 4th quarter of which is too small to bring trade balance into its initial point. After the 4th quarter, it continues to respond negatively but at a decreasing rate. This in general implies, the nonexistence of J-curve assumptions in Ethiopian economy yet.

5.8 Variance Decomposition(VD)

The variance decomposition provides information about the relative importance of each orthogonalized random innovation in affecting the variation of the variables in each forecast error. The forecast error variance decomposition for each variable reveals the proportion of the movement in these variables due to their own shocks versus the shocks in other variables. Hence, the linkages between exchange rate

devaluation and all selected macroeconomic variables can be obtained from variance decomposition, which measure the proportion of forecast error variance in a variable that is explained by innovations (impulses) in itself and the other variables. In other words, variance decomposition give the proportion of the movements in the dependent variables that are due to their 'own' shocks (innovations), versus shocks to the other variables (Brooks, 2002). for this thesis, since the impact of NEER on, TB, RGDP, CPI, and EDS is of interest, the discussion below focus on analyzing its variance decomposition over a period of 16 quarters. According to this thesis point of view, the long-run is after the 14th quarter. That is the reason why we took 16 quarters(4-years) during estimation of forecast error variance decomposition. As we know from the descriptive analysis section, Ethiopian export takes too may time (at least 3-years) to arrive for sale (e.g coffee, chat, lives animals, cotton and etc). the main intuition of this thesis is to figure out the impact of devaluation on selected macroeconomic variables. In order to capture the objectives of the thesis, I prefer to use 16 quarters forecast in the future. having this,

Table I Variance Decomposition of Trade balance

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.107708	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.118044	96.45142	2.474427	0.862186	0.021488	0.190479
3	0.122659	89.39973	6.969207	0.999945	0.052658	2.578456
4	0.127655	82.55905	10.49323	0.924775	0.674239	5.348705
5	0.133397	77.30086	12.96422	0.867393	1.924257	6.943265
6	0.139588	73.03429	15.04924	0.801066	3.238045	7.877363
7	0.145452	69.05093	17.07040	0.743492	4.428412	8.706766
8	0.151104	65.36429	18.91376	0.697627	5.523675	9.500645
9	0.156683	62.12022	20.49458	0.660619	6.537787	10.18680
10	0.162184	59.31447	21.84737	0.628727	7.457229	10.75220
11	0.167554	56.85720	23.03442	0.600382	8.277026	11.23097
12	0.172772	54.67433	24.09214	0.575293	9.006505	11.65173
13	0.177847	52.72484	25.03712	0.553141	9.658646	12.02626
14	0.182793	50.97982	25.88260	0.533431	10.24428	12.35986
15	0.187617	49.41145	26.64274	0.515717	10.77206	12.65804
16	0.192325	47.99410	27.33028	0.499689	11.24944	12.92649

Sources: The results are calculated by the author using EViews 10.0 software

Accessing Table I, it is possible to verify that, in the 16-quarters (4-years) forecasting horizon, the Trade balance shocks account for 100 percent of own variation in the first period or in short run. This implies that trade balance is strongly endogenous (strong influence from own variable) about its own shocks in the

short run. In contrary, the contributions of other variables (LOGRGDP, LOGCPI, LOGEDS, and LOGNEER) for the variation of trade balance in the very short run is zero. Therefore, the predominant source of variation in the logarithm of the trade balance is its own shock while other included variables are strongly exogenous about variation in trade balance (their influence on the trade balance is too weak) in short run. As we go further into the future variation in a real gross domestic product is the popular variable for the variation in the trade balance, it contributes about 27.33 percent variation in the trade balance. Hence, economic growth reveals the least exogeneity about variation in the trade balance of Ethiopia. Nominal effective exchange rate and external debt servicing are the second and third responsible variables about variation in the trade balance in the long run (about 12.92 percent and 11.24 percent respectively). Surprisingly, the variation in trade balance due to the shocks in the consumer price index is too small. Therefore inflation rate shows strong exogeneity about variation in trade balance as we go further in the future. This thesis claims that even though there is an improvement in the trade balance of Ethiopia its nonsensical to believe that improvement comes from shocks in the exchange rate(devaluation) instead other variables like real GDP do that.

Table II.Variance Decomposition of real gross domestic product

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.010521	4.656948	95.34305	0.000000	0.000000	0.000000
2	0.020950	8.822385	91.07885	0.074243	0.002858	0.021659
3	0.031690	11.97490	87.81373	0.188217	0.011808	0.011342
4	0.042221	13.98026	85.67773	0.300976	0.034443	0.006591
5	0.052271	15.13482	84.39074	0.399730	0.069342	0.005377
6	0.061755	15.82369	83.58019	0.480770	0.110163	0.005183
7	0.070676	16.28555	83.01119	0.546235	0.151672	0.005351
8	0.079068	16.62357	82.57981	0.599695	0.191221	0.005707
9	0.086973	16.87858	82.24363	0.643933	0.227726	0.006133
10	0.094432	17.07324	81.97864	0.680812	0.260756	0.006550
11	0.101489	17.22458	81.76658	0.711703	0.290211	0.006925
12	0.108186	17.34506	81.59373	0.737721	0.316233	0.007255
13	0.114560	17.44298	81.45059	0.759780	0.339110	0.007546
14	0.120644	17.52378	81.33062	0.778614	0.359187	0.007800
15	0.126468	17.59132	81.22904	0.794799	0.376812	0.008022
16	0.132058	17.64845	81.14223	0.808797	0.392308	0.008217

Sources: The results are calculated by the author using EViews 10.0 software

In the short run, the variation in RGDP strongly comes from its own shocks and weakly from variation in trade balance(95.34% and 4.7% respectively). Meaning that RGDP shows strong endogeneity about its

own shocks in the short run while trade balance shows strongly exogeneity about variation in economic growth(RGDP). As time go further contribution from RGDP variation toward its own variation decrease while the contribution from trade balance increase over time. The remaining variables (CPI, EDS, and NEER) weakly influence RGDP both in short run and long run. Inline with the goals of this thesis it is of interest to look at the variation of RGDP (economic growth) as a result of variation in the exchange rate. Exchange rate shocks contribute very weakly about variation in economic growth in Ethiopia (both in short run and long run). This finding rejects the theory of devaluation which states that devaluation evokes domestic industries to produce more so that boost economic growth.

Table III.Variance Decomposition of Consumer Price Index

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.007909	1.237959	0.103732	98.65831	0.000000	0.000000
2	0.011047	6.321585	0.238788	93.23840	0.086614	0.114617
3	0.013569	4.560008	0.203532	94.65300	0.224362	0.359096
4	0.015781	3.388067	0.185728	95.18583	0.478428	0.761946
5	0.017720	2.651037	0.213900	95.20177	0.644505	1.288792
6	0.019480	2.159825	0.267860	95.05212	0.709084	1.811114
7	0.021118	1.823191	0.321058	94.86312	0.736723	2.255905
8	0.022656	1.572977	0.366943	94.68024	0.757979	2.621865
9	0.024103	1.381038	0.407909	94.50685	0.776800	2.927408
10	0.025470	1.229925	0.445511	94.34725	0.791436	3.185881
11	0.026769	1.108202	0.479610	94.20491	0.802180	3.405094
12	0.028010	1.008191	0.509967	94.08003	0.810486	3.591329
13	0.029200	0.924607	0.536824	93.97070	0.817361	3.750508
14	0.030343	0.853740	0.560640	93.87470	0.823198	3.887724
15	0.031445	0.792916	0.581834	93.79010	0.828171	4.006982
16	0.032510	0.740155	0.600737	93.71530	0.832435	4.111377

Sources: The results are calculated by the author using EViews 10.0 software

Table III shows the variation of consumer price index due to its own shocks and shocks in other variables both in short-run and long-run. The result indicates that about 98.65 percent short-run variation of consumer price index comes from its own shocks, but long run variation due to its own shocks attenuate. This implies that the nearest-past shocks in inflation rate are strongly endogenous and the distant shocks are moderately endogenous about its own shocks in the current period. The second variables contributed toward immediate variation in the consumer price index is trade balance. It shows about 1.23 percent variation in the inflation rate, but in the long run, its contribution is eaten out. In another way round, the

immediate effect of the nominal effective exchange rate is strongly exogenous about variation in the consumer price index. But As we go further into the future contribution of nominal effective exchange rate variation toward variation in inflation rate is growing up. In the long-run, about 4.11 percent variation in inflation rate comes from shocks in the exchange rate. Real gross domestic product and external debt servicing show strong exogeneity about variation in inflation of Ethiopia both in the short and long run. The contribution of exchange rate shocks about the variation of the inflation rate is the objective of this thesis among these findings. Ergo, it is decisive to remind that exchange rate shocks rampant inflationary over time in the Ethiopian economy.

Table IV.Variance Decomposition of External debt servicing

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.007909	0.026921	0.043318	0.022484	99.90728	0.000000
2	0.011047	0.020957	0.176077	0.017688	97.36947	2.415806
3	0.013569	2.235244	0.208753	0.090543	92.15948	5.305976
4	0.015781	5.183097	0.270420	0.119512	86.93443	7.492543
5	0.017720	6.709061	0.386634	0.128533	83.74203	9.033741
6	0.019480	7.388140	0.517851	0.139519	81.76625	10.18824
7	0.021118	7.863200	0.632328	0.153494	80.25179	11.09919
8	0.022656	8.306804	0.727250	0.165998	78.97262	11.82732
9	0.024103	8.693215	0.808787	0.175470	77.91266	12.40987
10	0.025470	9.002647	0.880367	0.182725	77.05392	12.88034
11	0.026769	9.251065	0.942906	0.188655	76.35092	13.26645
12	0.028010	9.459199	0.997175	0.193636	75.76170	13.58829
13	0.029200	9.638293	1.044365	0.197813	75.25955	13.85998
14	0.030343	9.793341	1.085680	0.201320	74.82783	14.09183
15	0.031445	9.927975	1.122082	0.204300	74.45392	14.29173
16	0.032510	10.04575	1.154309	0.206869	74.12734	14.46574

Sources: The results are calculated by the author using EViews 10.0 software

Variation in external debt servicing due to its own innovation and innovation to other variables displayed in table IV. The main aim of this thesis is to clutch up the variation in external debt servicing due to socks in exchange rate devaluation. For better understanding variation in this variable due to shocks in all included variables shall be discussed by paying more attention to the variable of interest as before. The above result shows, in the short run (let's say in quarter 4) innovation or impulse or shocks to external debt servicing account for 86.93 percent comes from its own shocks. The second and third candidate variables about variation in external debt servicing are NEER and TB (account for about 7.49 percent and 5.18 percent respectively). this result implies that external debt servicing is strongly endogenous while other variables are weakly endogenous(strongly exogenous) about short-run variation in external debt

servicing. However, as time goes, the variation of the target variable (EDS) due to its own innovation gradually decline. In quarter 16 quarter EDS variation due to its own shocks is 74.12 percent which is smaller than short-run contribution around its own variation. In contrary, the contributions of innovation in TB and NEER toward variation in EDS is get growing over time (long-run effect). long run variation in EDS due to shocks in NEER and TB account for 14.47 percent and 10 percent respectively. The contribution of shocks in RGDP is almost zero in the short run and too small in the long run. Inline, with the target of this thesis, exchange rate devaluation increase external debt servicing that the country must pay during a payment period (due date) both in short run and long run.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Currency devaluation has been used as a tool for boosting economic growth in the world. It was proposed by the IMF as a strategy for growth, especially in developing countries. Ethiopia is one of the developing countries that have followed this strategy since 1992.

The objective of this study has been to boost our understanding of the effectiveness of devaluation in the Ethiopian economy. Accordingly, detail literature review and empirical examination on some variables of interest (nominal effective exchange rate, trade balance, inflation, external debt servicing, and economic growth) have been done. The study was mainly based on secondary data from NBE. In order to concrete the objectives, the study has used the Johansen co-integration, Vector Error Correction Model (VECM), Granger causality test based on VECM and variance decomposition. The models were estimated using quarterly data ranging from 1992Q2 to 2017Q4.

The result obtained from Johansson test of cointegration indicates the existence of one co-integrating equation, confirming the long run relationship between the variables. The regression result of normalized Johansen co-integration indicates that real gross domestic product (RGDP) and nominal effective exchange rate (NEER) positively affect trade balance in the long run. since the coefficient of the nominal effective exchange rate is not statistically significant it can be said that the exchange rate is not one of the determinant factors of the trade balance for the Ethiopian economy. Descriptive analyses section of this study shows that Ethiopian exports have shown an increasing trend following the devaluations of Birr. This could be due to; first, the amount of money the country receives from a given quantity of exports has increased in terms of the domestic currency. Second, the domestic consumption of exports may have declined due to the rise in the price of export commodities. Similarly, Ethiopian imports also showed an increasing trend following devaluations of Birr. This could be due to Ethiopia is importing strategic (essential/necessity) commodities which can not be easily substituted by domestic commodities and cannot be discouraged even though the Birr loses its value. In Ethiopian case even though exports earning have increased, an increase in export earning fall to cover an increase in import payment following each devaluation. For this reason, Ethiopian trade balance deficit exacerbates after each devaluation of Birr.

The estimation result from VECM indicated that; The coefficients of the error correction term of LOGTB and LOGNEER are statistically significant however, the former is negative while the latter is positive.

These results show that if there is a disturbance occurred in the whole system, the change of trade balance will have significant conservative force tending to bring the model back into equilibrium whenever it moves too far. On the contrary, if there is a disturbance occurred in the whole system, the change of nominal effective exchange rate will have a significant force to moving the model far from the equilibrium. Depending on the signs of each variable estimated by VECM, the result of the Granger causality test revealed that the nominal effective exchange rate Granger causes consumer price index, external debt servicing and trade balance (unidirectional causality) while NEER does not Granger cause RGDP and RGDP does not Granger cause NEER (no causality).

The forecast error variance decomposition of trade balance, consumer price index and external debt servicing reveal that the proportion of the movement in each variable emanates from its own shocks in short run (in the first quarter). but forecast error variance decomposition of real gross domestic product reveals that trade balance is the predominant source of variation in RGDP in short run next to its own shocks. In the long run (say after 15^{th} quarter) the enormous variation in trade balance came from its own shocks and shocks in RGDP. Similarly, ample variations in the real gross domestic product came from innovation in trade balance and RGDP. These results prove that relative ineffectiveness of the nominal effective exchange rate in affecting trade balance and economic growth in Ethiopia. However, variation in the consumer price index and external debt servicing have emanated from shocks in nominal effective exchange rate next to their own innovations. This finding confirms that relative effectiveness of nominal effective exchange rate in affecting external debt servicing and inflation.

- ***Lessons:*** *from the findings of this study and most of the former empirical research we can get a clear lesson that each large devaluation in Ethiopia did not achieve what it supposed to achieve. So, the Ethiopian government has been unreasonable and didn't glimpse at its own economic situation before accepting the proposed series of large devaluation. Thus, it must be a robust lesson for the Ethiopian government that the IMF and WB have been offering unreasonable advice yet.*

The future can be easily predicted in retrospect.

6.2 RECOMMENDATIONS

Devaluation appears to be effective when the country has a huge surplus. However, in Ethiopian case, there is no such surplus rather Ethiopia is not enough in providing its demand in the international market.

- ***Up to now***, the Ethiopian government should have been argued that devaluation as a policy instrument is antagonistic with the welfare of the Ethiopian people and Ethiopian national interest at best. Thus, it would have been the right decision for the Ethiopian government to adjusting internal economy before accepting each scene of the past devaluation.

- ***In the future, if devaluation will be proposed as a policy instrument, the Ethiopian government should take the following tasks before devalue its currency:-***
  - Ascertain whether the country's economic content need exchange rate policy or not.
  - diversifying export sectors and improving the quality of the existing export products
  - Encourage domestic productivity and boosting the supply of exports
  - Encourage the production of import substitutes and consider an appropriate quality substitute.

- ***Even if the above criterion will be satisfied and devaluation might be applied as a policy instrument, after its application the government should take adequate action on the following issues:-***
  - Properly managing the domestic market in order to secure societies welfare and avoid inflation at best.
  - Boost awareness in favor of the home Produced substitutes in order to cut the large import bill
  - Encourage and subsidize infant industries of the countries in terms of education especially, R & D.
  - Improve the quality of exports and advertise new products in the international market.

6.3 LIMITATION OF THIS THESIS AND FUTURE RESEARCH

The major limitation of this paper is the difficulty of finding quarterly data for real gross domestic product and generate it by interpolating annual data using Eviews 10. Future research can minimize this limitation by searching for more appropriate methods of transforming annual data of Ethiopian RGDP into Quarterly data. The reason why this method of data conversion considered as a limitation of this paper and need further study is that Ethiopian RGDP is very staggering through quarters. For instance, Ethiopian RGDP during Q3 (January, February, and March) is very high since this quarter is harvest time and RGDP during Q1 (July, August, and September) is very low. Therefore, Eviews 10 is not well-adjusted for the conversion of Ethiopian annual RGDP into quarterly data.

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APPENDIX

Step 1: Augmented Dickey-Fuller Test of Unit Root(Stationarity test)

I. LOGTB in level form

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.937334	0.3141
Test critical values:	1% level	-3.498439	
	5% level	-2.891234	
	10% level	-2.582678	

*MacKinnon (1996) one-sided p-values.

II.LOGTB after first difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.446339	0.0000
Test critical values:	1% level	-3.500669	
	5% level	-2.892200	
	10% level	-2.583192	

III.LORGDP in level form

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.851384	0.9945
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

IV.LOGRGDP after first difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.018629	0.0020
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

V. LOGCPI in level form

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.172999	0.9978
Test critical values:	1% level	-3.495677	
	5% level	-2.890037	
	10% level	-2.582041	

VI. LOGCPI after first difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.482259	0.0000
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

VII.LOGEDS in level form

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.256690	0.9263
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

VIII.LOGEDT after first difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.727243	0.0002
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

IX.LOGNEER in level form

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.285864	0.6339
Test critical values:	1% level	-3.495677	
	5% level	-2.890037	
	10% level	-2.582041	

X.LOGNEER after first difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.839120	0.0000
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

step2. VAR Optimal lag selection

VAR Lag Order Selection Criteria
Endogenous variables: LOGTB LOGRGDP LOGCPI LOGEDT LOGNEER
Exogenous variables: C
Date: 04/21/19 Time: 20:35
Sample: 1992Q2 2017Q4
Included observations: 95

Lag	LogL	LR	FPE	AIC	SC	HQ
0	416.3952	NA	1.19e-10	-8.660951	-8.526536	-8.606637
1	1127.765	1332.882	6.33e-17	-23.11084	-22.30435	-22.78496
2	1190.461	110.8739	2.87e-17*	-23.90445*	-22.42589*	-23.30700*
3	1202.191	19.50871	3.84e-17	-23.62508	-21.47445	-22.75606
4	1221.942	30.76934	4.38e-17	-23.51457	-20.69186	-22.37398
5	1246.082	35.06626	4.62e-17	-23.49646	-20.00168	-22.08430
6	1272.529	35.63403	4.72e-17	-23.52692	-19.36007	-21.84320
7	1292.962	25.38011	5.60e-17	-23.43078	-18.59185	-21.47549
8	1326.367	37.97587*	5.20e-17	-23.60772	-18.09672	-21.38086

* 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

Step 3. Co-integration test

Date: 04/21/19 Time: 20:36
Sample (adjusted): 1993Q1 2017Q4
Included observations: 100 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGTB LOGRGDP LOGCPI LOGEDT LOGNEER
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 *	0.335722	83.62384	69.81889	0.0027
At most 1	0.189872	42.71834	47.85613	0.1396
At most 2	0.121277	21.66206	29.79707	0.3177
At most 3	0.082247	8.733466	15.49471	0.3906
At most 4	0.001506	0.150721	3.841466	0.6978

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 *	0.335722	40.90550	33.87687	0.0062
At most 1	0.189872	21.05628	27.58434	0.2728
At most 2	0.121277	12.92859	21.13162	0.4588
At most 3	0.082247	8.582745	14.26460	0.3225
At most 4	0.001506	0.150721	3.841466	0.6978

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

Step 4: Johansen co-integration Normalization

1 Cointegrating Equation(s): Log likelihood 1201.180

Normalized cointegrating coefficients (standard error in parentheses)

LOGTB	LOGRGDP	LOGCPI	LOGEDT	LOGNEER
1.000000	-1.849966	17.95146	2.740365	-8.44816
	(3.23270)	(4.36685)	(0.97304)	(8.65851)

Step: 5 Granger causality test

Pairwise Granger Causality Tests
Date: 05/03/19 Time: 21:42
Sample: 1992Q2 2017Q4
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGRGDP does not Granger Cause LOGTB	102	11.2044	0.0012
LOGTB does not Granger Cause LOGRGDP		1.86202	0.1755
LOGCPI does not Granger Cause LOGTB	102	8.03162	0.0056
LOGTB does not Granger Cause LOGCPI		0.04267	0.8368
LOGEDS does not Granger Cause LOGTB	102	1.97821	0.1627
LOGTB does not Granger Cause LOGEDS		5.20583	0.0247
LOGNEER does not Granger Cause LOGTB	102	4.28652	0.0410
LOGTB does not Granger Cause LOGNEER		1.65087	0.2018
LOGCPI does not Granger Cause LOGRGDP	102	2.08911	0.1515
LOGRGDP does not Granger Cause LOGCPI		0.52614	0.4699
LOGEDS does not Granger Cause LOGRGDP	102	0.65208	0.4213
LOGRGDP does not Granger Cause LOGEDS		3.53704	0.0630
LOGNEER does not Granger Cause LOGRGDP	102	1.84056	0.1780
LOGRGDP does not Granger Cause LOGNEER		6.08185	0.0154
LOGEDS does not Granger Cause LOGCPI	102	5.83762	0.0175
LOGCPI does not Granger Cause LOGEDS		11.6327	0.0009
LOGNEER does not Granger Cause LOGCPI	102	12.5281	0.0008
LOGCPI does not Granger Cause LOGNEER		19.8272	2.E-05
LOGNEER does not Granger Cause LOGEDS	102	5.66009	0.0193
LOGEDS does not Granger Cause LOGNEER		1.59374	0.2098

Step. 6 VECM model estimation

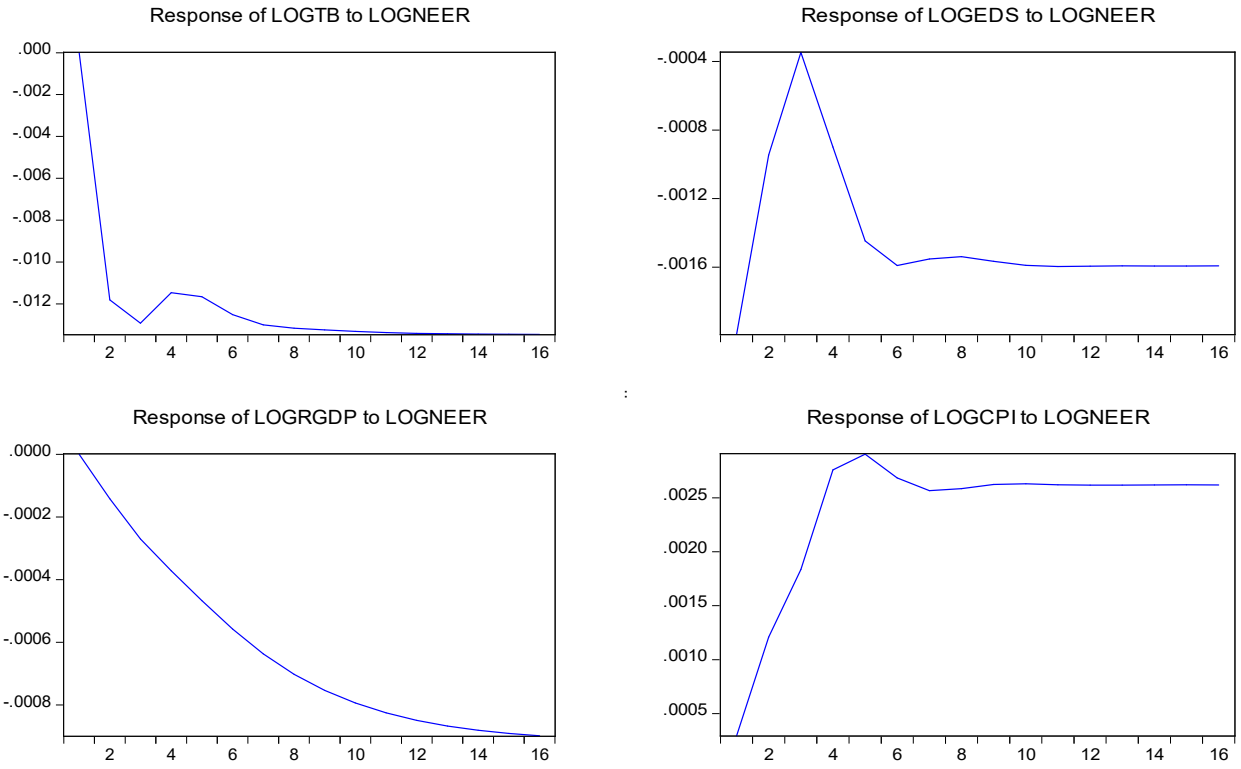
Vector Error Correction Estimates
Date: 05/05/19 Time: 12:04
Sample (adjusted): 1993Q1 2017Q4
Included observations: 100 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOGTB(-1)	1.000000
LOGRGDP(-1)	-18.499655 (3.23270) [-5.57227]
LOGCPI(-1)	17.95146 (4.36685) [4.11085]
LOGEDS(-1)	2.740365 (0.97304) [2.81628]
LOGNEER(-1)	-8.44816 8.65851 [-0.9757]
C	34.70570

Error Correction:	D(LOGTB)	D(LOGRGDP)	D(LOGCPI)	D(LOGEDS)	D(LOGNEER)
CointEq1	-0.085804	-0.021391	-0.018468	-0.018998	0.020509
	(0.01256)	(0.01227)	(0.02320)	(0.05388)	(0.00923)
	[-6.82936]	[-1.74304]	[-0.79614]	[-0.35260]	[2.22321]
D(LOGTB(-1))	0.229926	0.002176	0.064619	-0.066884	-0.021624
	(0.10255)	(0.01002)	(0.01893)	(0.04398)	(0.00753)
	[2.24218]	[0.21726]	[3.41297]	[-1.52084]	[-2.87184]
D(LOGRGDP(-1))	-1.115739	0.683191	0.076583	0.050786	-0.043712
	(0.74033)	(0.07232)	(0.13669)	(0.31750)	(0.05436)
	[-1.50709]	[9.44742]	[0.56027]	[0.15996]	[-0.80411]
D(LOGCPI(-1))	-0.518957	0.028533	0.072722	0.127794	-0.022314
	(0.52037)	(0.05083)	(0.09608)	(0.22317)	(0.03821)
	[-0.99728]	[0.56134]	[0.75690]	[0.57263]	[-0.58400]
D(LOGEDS(-1))	-0.127070	-0.000180	0.020749	0.631309	0.040511
	(0.19496)	(0.01904)	(0.03600)	(0.08361)	(0.01432)
	[-0.65177]	[-0.00946]	[0.57640]	[7.55049]	[2.82985]
D(LOGNEER(-1))	-2.543452	-0.093792	0.071306	0.238303	0.012430
	(1.36439)	(0.13327)	(0.25191)	(0.58514)	(0.10019)
	[-2.13124]	[-0.70375]	[0.28306]	[0.40726]	[0.12407]
C	0.021436	0.003509	0.007862	0.002613	0.002488
	(0.01465)	(0.00143)	(0.00271)	(0.00628)	(0.00108)
	[1.46310]	[2.45176]	[2.90649]	[0.41593]	[2.31246]
R-squared	0.595177	0.545109	0.156737	0.437692	0.130316
Adj. R-squared	0.556571	0.516073	0.102911	0.401800	0.074804
Sum sq. resids	1.090504	0.010405	0.037175	0.200570	0.005880
S.E. equation	0.107708	0.010521	0.019887	0.046192	0.007909
F-statistic	10.23623	18.77378	2.911949	12.19469	2.347543
Log likelihood	85.37549	320.3072	256.0025	170.8837	349.1316
Akaike AIC	-1.551990	-6.204104	-4.930742	-3.245222	-6.774883
Schwarz SC	-1.370744	-6.022858	-4.749496	-3.063976	-6.593637
Mean dependent	-0.001131	0.011027	0.009826	0.013983	0.002419
S.D. dependent	0.134276	0.015124	0.020996	0.059724	0.008222

step 7: Impulse response

Response to Cholesky One S.D. (d.f. adjusted) Innovations



Step 8 Variance decomposition

I.Variance Decomposition of Trade balance

Variance Decomposition of LOGTB:

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.107708	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.118044	96.45142	2.474427	0.862186	0.021488	0.190479
3	0.122659	89.39973	6.969207	0.999945	0.052658	2.578456
4	0.127655	82.55905	10.49323	0.924775	0.674239	5.348705
5	0.133397	77.30086	12.96422	0.867393	1.924257	6.943265
6	0.139588	73.03429	15.04924	0.801066	3.238045	7.877363
7	0.145452	69.05093	17.07040	0.743492	4.428412	8.706766
8	0.151104	65.36429	18.91376	0.697627	5.523675	9.500645
9	0.156683	62.12022	20.49458	0.660619	6.537787	10.18680
10	0.162184	59.31447	21.84737	0.628727	7.457229	10.75220
11	0.167554	56.85720	23.03442	0.600382	8.277026	11.23097
12	0.172772	54.67433	24.09214	0.575293	9.006505	11.65173
13	0.177847	52.72484	25.03712	0.553141	9.658646	12.02626
14	0.182793	50.97982	25.88260	0.533431	10.24428	12.35986
15	0.187617	49.41145	26.64274	0.515717	10.77206	12.65804
16	0.192325	47.99410	27.33028	0.499689	11.24944	12.92649

II. Variance Decomposition of real gross domestic product

Variance Decomposition of LOGRGDP:

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.010521	4.656948	95.34305	0.000000	0.000000	0.000000
2	0.020950	8.822385	91.07885	0.074243	0.002858	0.021659
3	0.031690	11.97490	87.81373	0.188217	0.011808	0.011342
4	0.042221	13.98026	85.67773	0.300976	0.034443	0.006591
5	0.052271	15.13482	84.39074	0.399730	0.069342	0.005377
6	0.061755	15.82369	83.58019	0.480770	0.110163	0.005183
7	0.070676	16.28555	83.01119	0.546235	0.151672	0.005351
8	0.079068	16.62357	82.57981	0.599695	0.191221	0.005707
9	0.086973	16.87858	82.24363	0.643933	0.227726	0.006133
10	0.094432	17.07324	81.97864	0.680812	0.260756	0.006550
11	0.101489	17.22458	81.76658	0.711703	0.290211	0.006925
12	0.108186	17.34506	81.59373	0.737721	0.316233	0.007255
13	0.114560	17.44298	81.45059	0.759780	0.339110	0.007546
14	0.120644	17.52378	81.33062	0.778614	0.359187	0.007800
15	0.126468	17.59132	81.22904	0.794799	0.376812	0.008022
16	0.132058	17.64845	81.14223	0.808797	0.392308	0.008217

III.Variance Decomposition of Consumer Price Index

Variance Decomposition of LOGCPI:

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.019887	1.237959	0.103732	98.65831	0.000000	0.000000
2	0.030186	6.321585	0.238788	93.23840	0.086614	0.114617
3	0.037112	4.560008	0.203532	94.65300	0.224362	0.359096
4	0.043346	3.388067	0.185728	95.18583	0.478428	0.761946
5	0.049156	2.651037	0.213900	95.20177	0.644505	1.288792
6	0.054494	2.159825	0.267860	95.05212	0.709084	1.811114
7	0.059403	1.823191	0.321058	94.86312	0.736723	2.255905
8	0.063973	1.572977	0.366943	94.68024	0.757979	2.621865
9	0.068274	1.381038	0.407909	94.50685	0.776800	2.927408
10	0.072347	1.229925	0.445511	94.34725	0.791436	3.185881
11	0.076217	1.108202	0.479610	94.20491	0.802180	3.405094
12	0.079909	1.008191	0.509967	94.08003	0.810486	3.591329
13	0.083442	0.924607	0.536824	93.97070	0.817361	3.750508
14	0.086836	0.853740	0.560640	93.87470	0.823198	3.887724
15	0.090106	0.792916	0.581834	93.79010	0.828171	4.006982
16	0.093262	0.740155	0.600737	93.71530	0.832435	4.111377

IV.Variance Decomposition of external debt

Variance Decomposition of LOGEDS:

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.007909	0.026921	0.043318	0.022484	99.90728	0.000000
2	0.011047	0.020957	0.176077	0.017688	97.36947	2.415806
3	0.013569	2.235244	0.208753	0.090543	92.15948	5.305976
4	0.015781	5.183097	0.270420	0.119512	86.93443	7.492543
5	0.017720	6.709061	0.386634	0.128533	83.74203	9.033741
6	0.019480	7.388140	0.517851	0.139519	81.76625	10.18824
7	0.021118	7.863200	0.632328	0.153494	80.25179	11.09919
8	0.022656	8.306804	0.727250	0.165998	78.97262	11.82732
9	0.024103	8.693215	0.808787	0.175470	77.91266	12.40987
10	0.025470	9.002647	0.880367	0.182725	77.05392	12.88034
11	0.026769	9.251065	0.942906	0.188655	76.35092	13.26645
12	0.028010	9.459199	0.997175	0.193636	75.76170	13.58829
13	0.029200	9.638293	1.044365	0.197813	75.25955	13.85998
14	0.030343	9.793341	1.085680	0.201320	74.82783	14.09183
15	0.031445	9.927975	1.122082	0.204300	74.45392	14.29173
16	0.032510	10.04575	1.154309	0.206869	74.12734	14.46574

V. Variance Decomposition of Nominal Effective Exchange Rate

Variance Decomposition of LOGNEER:

Period	S.E.	LOGTB	LOGRGDP	LOGCPI	LOGEDS	LOGNEER
1	0.007909	0.026921	0.043318	0.022484	0.228615	99.67866
2	0.011047	0.020957	0.176077	0.017688	1.623882	98.16140
3	0.013569	2.235244	0.208753	0.090543	3.869174	93.59629
4	0.015781	5.183097	0.270420	0.119512	5.682280	88.74469
5	0.017720	6.709061	0.386634	0.128533	6.978532	85.79724
6	0.019480	7.388140	0.517851	0.139519	7.954070	84.00042
7	0.021118	7.863200	0.632328	0.153494	8.730232	82.62075
8	0.022656	8.306804	0.727250	0.165998	9.355823	81.44413
9	0.024103	8.693215	0.808787	0.175470	9.858701	80.46383
10	0.025470	9.002647	0.880367	0.182725	10.26555	79.66871
11	0.026769	9.251065	0.942906	0.188655	10.59971	79.01766
12	0.028010	9.459199	0.997175	0.193636	10.87849	78.47150
13	0.029200	9.638293	1.044365	0.197813	11.11399	78.00554
14	0.030343	9.793341	1.085680	0.201320	11.31504	77.60462
15	0.031445	9.927975	1.122082	0.204300	11.48841	77.25723
16	0.032510	10.04575	1.154309	0.206869	11.63935	76.95372

Cholesky Ordering: LOGTB LOGRGDP LOGCPI LOGEDS LOGNEER

step 9: Diagnostic Tests

Stability and Structural Break test

Structural break test for each devaluation period and 1997 crisis

Chow Breakpoint Test: 1993Q1
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1992Q2 2017Q4

F-statistic	0.386295	Prob. F(7,87)	0.9081
Log likelihood ratio	3.091401	Prob. Chi-Square(7)	0.8764
Wald Statistic	2.704062	Prob. Chi-Square(7)	0.9110

Chow Breakpoint Test: 1997Q2
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1992Q4 2017Q4

F-statistic	0.099978	Prob. F(7,87)	0.9982
Log likelihood ratio	0.809213	Prob. Chi-Square(7)	0.9973
Wald Statistic	0.699844	Prob. Chi-Square(7)	0.9983

Chow Breakpoint Test: 2010Q1
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1992Q2 2017Q4

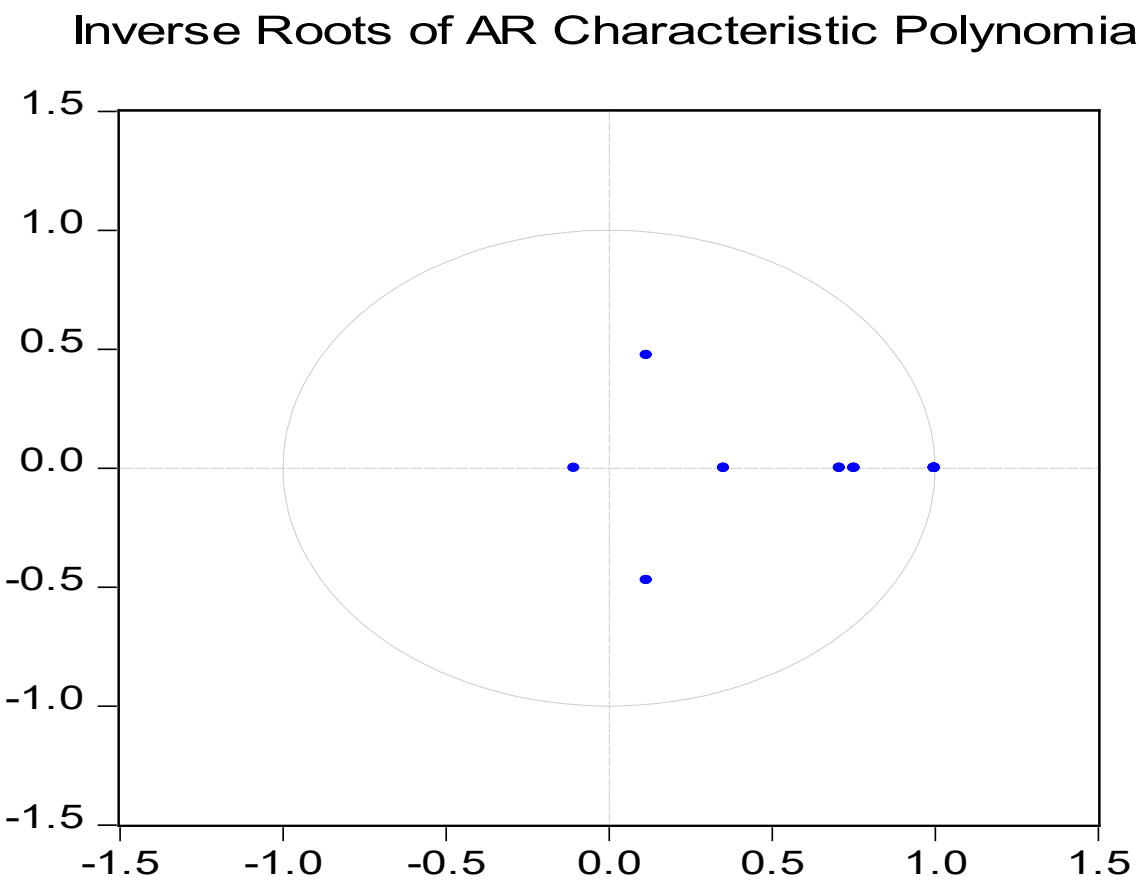
F-statistic	1.127655	Prob. F(7,87)	0.3534
Log likelihood ratio	8.771643	Prob. Chi-Square(7)	0.2695
Wald Statistic	7.893582	Prob. Chi-Square(7)	0.3421

Chow Breakpoint Test: 2017Q2
Null Hypothesis: No breaks at specified breakpoints

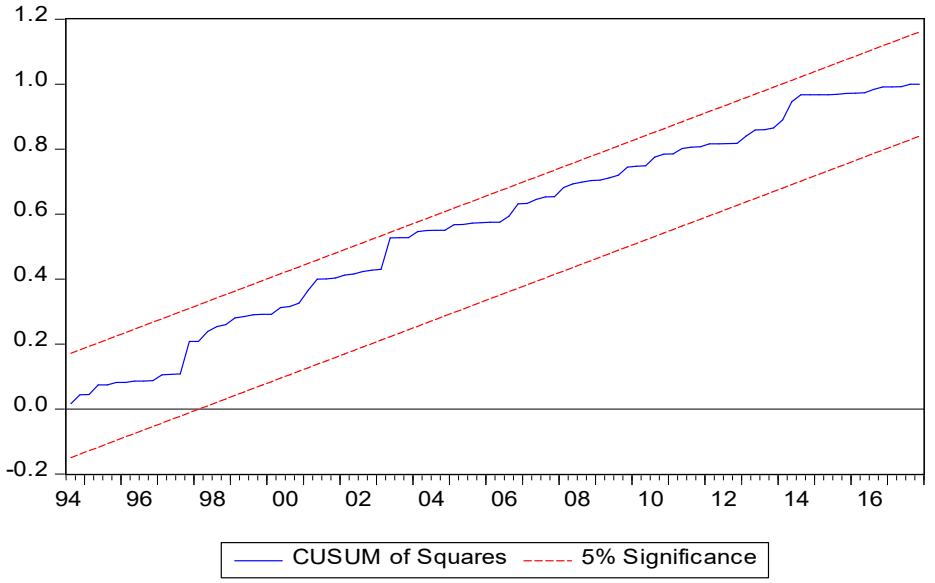
Equation Sample: 1992Q2 2017Q4

F-statistic	0.353336	Prob. F(7,87)	0.9265
Log likelihood ratio	2.831306	Prob. Chi-Square(7)	0.9002

Stability test



Stability test For co-integrating equation



III.Test for residual auto-correlation

Breusch-Godfrey Serial Correlation LM Test:

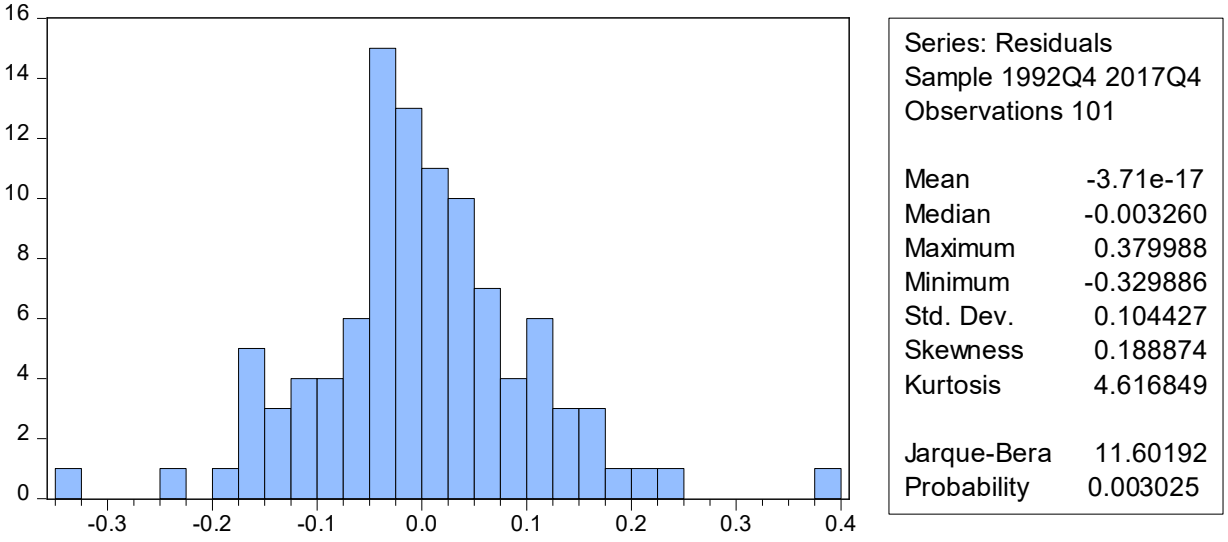
F-statistic	2.879225	Prob. F(2,92)	0.0613
Obs*R-squared	5.949394	Prob. Chi-Square(2)	0.0511

IV.Test for Residual Heteroscedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.804585	Prob. F(10,90)	0.6247
Obs*R-squared	8.288274	Prob. Chi-Square(10)	0.6007
Scaled explained SS	12.98307	Prob. Chi-Square(10)	0.2246

V.Test for Residual Normality



Declaration

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

The examiners‟ comments have been duly incorporated.

Declared by:

Name: Jiffara Abdisa Labata

Signature: _____

Date: _____

Confirmed by Advisor:

Name: Professor Befekadu Degefe

Signature: _____

Date: _____

Place: College of Business and Economics, Addis Ababa University, Addis Ababa June 2019