COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF MANAGEMENT

THE REAL EFFECTIVE EXCHANGE RATE VOLATILITY ON INTERNATIONAL TRADE IN CASE OF ETHIOPIA: EXPORT-IMPORT VALUES PERSPECTIVE

A Thesis Report Submitted to Department of Management as a Partial Fulfilment of Award for MSc Degree in International Business

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ADDIS ABABA, ETHIOPIA

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DECLARATION

I, the undersigned, declare that this Master's thesis paper, entitled "***The Real Effective Exchange Rate Volatility on International Trade in Ethiopia***" is my original work, prepared under the guidance of Asres Abtie (PhD). All sources of materials used for the thesis paper has not been submitted either in part or in full to any other high learning institution for earning degree.

Declared By	Confirmed By
Name: Atinafu Asefa	Name: Asres Abitie (PhD)
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Date: _____	Date: _____

CERTIFICATION

This is to Certify that the thesis is prepared by *Atinafu Asefa*, entitled: *The Real Effective Exchange Rate Volatility on International Trade in Case of Ethiopia in terms of Export-Import Values* submitted as a partial fulfillment of the requirements for the Master in Science Degree in International Business that complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

Advisor: _____ Signature: _____ Date: _____

Internal Examiner: _____ Signature: _____ Date: _____

External Examiner: _____ Signature: _____ Date: _____

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ACRONYMS

ADF	: Augmented Dickey Fuller
ADRL	: Autoregressive Distributed Lag
COMESA	: Common Market for Eastern and Southern Africa
CUSUM	: Cumulative Sum (statistical quality control technique)
ETB	: Ethiopian Birr
EURO	: European Union Currency
GBP	: Great Britain's Pound Sterling
GDP	: Gross Domestic Product
I	: Index
IGAD	: Intergovernmental Authority on Development
IMF	: International Monetary Fund
M	: Import
NBE	: National Bank of Ethiopia
PPP	: Purchasing Power Parity
REERI	: Real Effective Exchange Rate Index
TOT	: Terms of Trade
TO	: Trade Openness
UNCTAD	: United Nations Conference on Trade and Development
UNDP	: United Nations Development Program
U.S.	: United States
USD	: United States Dollar
VAR	: Vector Autoregressive
VECM	: Vector Error Correction Model
WB	: World Bank
WDI	: World Development Indictor
WTO	: World Trade Organization
X	: Export

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Abstract

This study aimed to empirically investigate the volatility of real effective exchange rate (REER) on international trade performance in Ethiopia by using annual time series data from 1981 up to 2019. The Vector Error Correction Model (VECM) has been employed to capture both the short run and long run relationships among the variables and the findings show that there are significant relationships between REER and export value as well as between REER and import value. The Granger causality test have been checked to examine the causal effect of one variable on other variables; basing on the test results it is evidenced that real effective exchange rate and import value hold a bi-directional causality on one another while real effective exchange rate and export value hold a uni-directional causality i.e. real effective exchange rate influences export value from one side. The data collected has been analyzed by using Eviews Software 10. The result of the findings indicated that a unit change in real effective exchange rate will lead to decrease in import and export trade of the country. Therefore, policy makers are required to focus on alternative policy measures to boost export earnings of the country rather than relying on the domestic currency depreciation.

Keywords: Devaluation, Ethiopia, export value, foreign exchange reserve, import value, index, real effective exchange rate, Terms of Trade, Trade openness, VECM, Volatility.

CHAPTER ONE

1. Introduction

The real effective exchange rate plays a vital role in foreign trade and economic development. It is assumed apparent that changes or volatility in real exchange rates (either depreciation or appreciation) have wider and far reaching economic effects. Also, it is well known that exchange rate is a significant institutional factor affecting aggregate trade of any country. In reality, facing exchange rate movements, exporters and importers not only adjust their export volume and value, but also switch their products mix or even export-import market dynamics (entry or exit). Understanding the impact of exchange rate volatility on international trade is of special interest to both researchers and policy makers, especially in the wave of trade imbalance. It is also asserted that there is no doubt that the exchange rate has been ab economic issue of major concern, particularly in an open, integrated economy where trade conditions and competition levels are increasing (Do T. M. Huong, 2019). The argument has two folds: (1) the effect of exchange rates on economic growth can be demonstrated by transmission channel of trade and its volatility can also be demonstrated through investment for two special reasons, first by real effective exchange rate movements can cause change in domestic product competitiveness in the international market in the form of devaluation whereas, secondly it follows that if the elasticity of demand for exported goods can outweigh the declining impact of price, as a result value of exports will increase (Cakrani, 2014; Eichengreen, 2008; Do T. M. Huong, 2019).

A large and growing number of studies have shed light on the effect of foreign exchange rate fluctuations on export and import performance including export volume, export value, import volume and import value (the exchange rate elasticity of export import quantity) and export-import price (exchange rate pass-through, ERPT) for instance, (Shambaugh, 2008; Colacelli, 2009). In vast relevant literatures, it has also been discussed that there are even some evidences that link the effect of exchange rate movements on international trade in case of Ethiopia by (Marc Auboin & Michele Ruta, 2011). But little attention is paid to the reaction of export – import value due to the movements of real exchange rate in terms of international trade dynamics. It is therefore, very important to understand how exchange rate volatility affects foreign trade in Ethiopia following the consecutive devaluation of domestic currency (Birr), which one of the macroeconomic objectives was to achieve sustainable economic growth with

due belief that high economic growth helps to maintain an adequate foreign currency reserves and to create a sustainable, internationally competitive export sector that would arguably contribute to job creation and high incomes in the country, whereas reducing import trade.

The Ethiopian Birr (ETB) has been devalued frequently at different times due to chronic frequency shortage, slow economic growth, and pressure from the IMF and the World Bank according to early sources for instance, (Taye, 1999). It is evident that the largest devaluation took place in 1992 when the value of the ETB devalued by 141.50%, and the exchange rate jumped from 2.10 to 5 ETB per USD during Derg Regime, which the aforementioned period was, the standpoint that necessitated undertaking this study. Afterwards, the ETB was devalued in 2009 by 23.70% and the most recently in 2017 by 15%. To the most recent period (i.e. in October 2017), one USD is pegged to be at ETB 27 with minor fractional ups and downs (World Bank, 2018). However, the repeated devaluing of the ETB value in the past has not helped the country to improve the competitiveness of exports and trade balance since the trade deficit is still widening and shortage of foreign currency reserve is worsening. Controversial result has even been observed like; higher domestic inflation after devaluation which is eroding the positive effect of devaluation. Moreover, the World Bank also suggested that the Ethiopian exchange rate is overvalued, and it is one of the factors that triggered the chronic trade deficit of the country, which led the National Bank of Ethiopia to devalue the domestic currency by 15% in October, 2017.

Since from early 1990s, devaluation was more often used as a policy instrument by countries with large external trade imbalances and low economic growth. It is also assumed that, as the domestic currency is devalued, the competitiveness of exports in the international market is expected to increase as a result of the lower export prices. Net exports were therefore likely to grow as a result of increased export competitiveness see ((Reinhrt, 1995; Sweidan, 2013). More likely, the devaluation increases import prices and likely reduces the demand for foreign products. The decrease in imports would also mean to help improve one country's trade balance. That was and is why policy makers often go for devaluation as a means of encouraging exports and discouraging imports.

Most critically, it is evident that Ethiopian exports are dominated by primary agricultural products, according to National Bank's report (NBE, 2017; UNDP, 2017), and annual exports

earning is below 3.50 billion USD beyond the massive expansion of infrastructure. Contrarily, imports have on the other hand increased dramatically to more than USD 16 billion per year. The increasing gap between imports and exports indicates that Ethiopia's economy has a trade deficit (NBE, 2017; UNDP, 2017). More importantly, the scarcity of foreign currency is becoming severe as the gap between imports and exports is widening. As a result, the Ethiopian economy has become increasingly fragile in terms of trade balance and the country's foreign currency scarcity (World Bank, 2018).

Thus, this study was aimed to examine the impact of real effective exchange rate volatility on international trade performance in terms of export – import values for the period covering from 1981 to 2019 by using VECM model. The rest of this paper was organized by four chapters. The second chapters discusses about review of related literature whereas, the third deals with methodological parts of the study. The four chapter presents the results and findings of the study while the fifth deals with conclusion and possible recommendations.

1.1. Statement of the Problem

Historically in deficit, Ethiopia's trade imbalance continues to deepen due to the country's macroeconomic policy factors, which strongly encourages imports. Recently, in 2018, total exports of goods and services amounted to USD 2.83 billion, whereas total imports of goods and services amounted to USD 15.5 billion, resulting in a trade deficit of USD 11.02 billion (World Trade Organization). Ethiopia spent USD 6.69 billion in imports of services while the export of services generated USD 4.49 billion (IMF, 2020).

Due to the volatility of foreign exchange rate, exporters and importers often face unexpected movements of their own or their trading partners' currencies as a result of foreign exchange volatility. Especially, in developing countries including Ethiopia, due to credit constraints and lack of hedging opportunities, companies suffer more due to limited ability to handle the price changes that stem from foreign exchange movements (Andualem T. Mengistu, Eduardo Montero & Alexander Segura, 2017). As a result, the researchers suggested the country (Ethiopia) to focus on movements of foreign exchange – the movement against the major currency of invoicing along with movements against trading partners' currencies (Andualem, et. al., 2017).

According to other sources of evidences, Ethiopia's exports are low compared to other sub-Saharan African Countries (Anagaw & Demissie, 2001). Their argument is that high dependency

of country's exports on a few primary agricultural products is the fundamental cause for the lower export performance of the country (Sisay Menji, 2010). It was also posited that it is due to that Ethiopian major export items are agricultural products (coffee, oilseeds, cereals, khat, horticulture crops, hides and other livestock products) which account for around 70% of the country's total exports (UNDP, 2017). Export income of the country was unstable because of a few crops accounting for a large share of export earnings. In particular, the fluctuation of the coffee price on the world market creates a huge instability of export earnings (Debello & Gardebroek, 2007) whereas government of Ethiopia was working to improve the overall export performance by providing an incentive for exporters and by encouraging value-added export business (UNDP, 2017) in addition to the macroeconomic measures – devaluation of domestic currency of the country.

More likely, the country is relatively open to international trade, with a foreign trade-to-GDP ratio of 31.2% (World Bank, 2018) as compared to other East African countries and however, it has not enhanced its international trade performance in compliance with the macroeconomic policy (i.e. devaluation of its currency). Surprisingly, whereas the country's main imported products are petroleum oils, vehicles, medicines, fertilizers, palm oil, and aircraft from which the country mainly partners its trade with the rest of the world, specifically; China, the United States, Somalia, Kuwait, Switzerland, and Saudi Arabia (World Bank, 2018) which either majorly consumes the country's foreign currency reserve or not produced domestically. As such, it is also well known that exchange rate has a significant factor affecting aggregate trade and individual export and import behavior of international trade (Xiaobing Huang, 2017). Thus, understanding the influence of exchange rate fluctuations on the international trade performance is of special interests to both researchers and policy makers, especially in the wave of global imbalance.

Therefore, the current study was aimed to investigate the impact of real effective exchange rate volatility on international trade performance in Ethiopia for the period covering from 1981 to 2019 by using the Vector Error Correction (VECM) model to examine the statistical and significance relationship between real effective exchange rate and performance of international trade in country in terms of exports and imports prices. By doing so, the study considers the both export-import prices in domestic currency while the real effective exchange rate index is measured in average values the country recorded. The study consumed dependent and

independent variables; export – import values index and real effective exchange rate index respectively.

1.2. Research Hypothesis

H_{01}: The real effective exchange rate volatility has a significant positive effect on export values

$H0_2$: The real effective exchange rate volatility has a significant effect negative on import values

H_{03}: The Real GDP has a significant correlation between export – import values & REER

H_{04}: The Terms of Trade has a significant relationship between REER

H_{05}: The Trade openness has a significant linkage between REER & export – import values

H_{06}: The Foreign Exchange Reserve has a significant linkage between values of export – import & REER

H_{07}: There is a short and long – run significant relationship between REER and values of import – export.

1.3. Objective of the Study

1.3.1. General Objectives

The main objective of this study was to investigate the impact of real effective exchange rate volatility on Ethiopian international trade performance, specifically in terms of exports and imports values.

1.3.2. Specific Objectives

Specifically, the purpose of this study was to:

- Examine the effect of real effective exchange rate volatility on values of export trade of Ethiopia;
- Examine the effect of real effective exchange rate volatility on values of import trade;
- Investigate the linkage between Real GDP & REER as well as Export and import values;
- Investigate the linkage between Terms of Trade and REER index;
- Examine the relationship between the Trade Openness, REER index, and Export – Import
- Examine the correlation between the Foreign Exchange Rate and REER and Export – Import values

- Determine the long and short-run relationship between exchange rate and values of export and import of the country.

1.4. Significance of the Study

The study has provided basic information on the significant impact of real effective exchange rate volatility on Ethiopian international trade in determining the positive and negative impacts it attributed. The result of the study would be also important in providing insights for economist, international trade partners in this case; exporters and importers, and policy makers as well. The most beneficiaries from the output of the study are among the others, the exporters, importers and stakeholders with the due fact that findings would bring with. The study would confirm them that how real effective exchange rate volatility has affected the foreign trade performance of the country and helps them to be flexible with a changing macroeconomic environment. Finally it would be of use as a central and initial point for further research in the same areas of interest.

1.5. Scope of the Study

The impact of real effective exchange rate volatility is not only the case for Ethiopian international trade performance but also the case for every developing country which locate at Sub-Saharan Africa. But, for simplifying, the study selected Ethiopia as one of developing country which suffers from trade imbalances in the continent especially in Sub-Saharan Africa. Also the thematic area specifically, international trade and real effective exchange rate volatility is selected to assess the factors that affect the performance of international trade of the country. The study purposely delimited to cover the period from 1981 to 2019, where Ethiopia's foreign exchange started to fluctuate due to different policies frameworks in three different political reforms for consecutive twenty (39) years and exchange rate movement has shown a dynamic change since the start of Ethiopian Birr devaluation against the US Dollar. Specifically, the research mainly focuses on the impact of foreign exchange volatility on Ethiopian international trade through the eyes of export import prices (values).

1.6. Conceptual and Operations Definition of Terms

- Export value is the aggregate prices of goods or services exported (FOB) to other country which as a value converted to U.S. dollars and expressed as a percentage of the average for the base period.

- Import value is the aggregate prices of goods and/or services imported into the country (FOB) from other trading partners which has a value converted to U.S. dollars and expressed as a percentage of the average for the base year.
- Devaluation is an action of depreciating a domestic currency towards with the currency of trade partner(s).
- Real effective exchange rate is relative price of the goods of two countries. That is, the real exchange rate tells us the rate at which we can trade the goods of one country for the goods of another country.
- International trade is exchange of goods or service across a boundary for a monetary value.
- Index is a statistical measure or indicator that links the value of (prices, wages, or other payments) automatically to have the value of a price index.
- Time series is a sequential set of data points, measured typically over successive times. It is mathematically defined as set of vectors x(t), t = 0, 1, 2, … where t represents the time elapsed.
- Stationarity is the stochastic process which can be visualized as a form of statistical equilibrium.

1.7. Organization of the Paper

This paper encompasses five chapters. The first chapter deals with introductory part of the study. In this chapter, it discusses about abstract, introduction, statement of problem, significance, research objectives, scope of the study, and operational terms. The second chapter deeply discusses about the related literature which is reviewed from scholarly sources in order to show previous related works for the statement of the problem. The third chapter discusses about the research methodology which was the heart of the project. The fourth chapter discusses about the results and finding with appropriate theory and empirical evidences, whereas chapter deals about conclusion and possible recommendations based on the result of findings. Finally, references and appendices have been added as part of this paper.

CHAPTER TWO

2. Review of Literature

2.1. Meaning of Exchange Rate

The exchange rate between two countries is the price at which residents of those countries trade with each other (Gregory Mankiw, 2009). Economists distinguish between two exchange rates: the nominal exchange rate and the real exchange rate. Since the breakdown of the Bretton Woods system of fixed exchange rates, both real and nominal exchange rates have fluctuated widely. This volatility has often been cited by the proponents of managed and fixed exchange rates as detrimental, since in their view exchange rate uncertainty will inevitably depress the volume of international trade increasing the riskiness of trading activity and negatively affecting the optimal allocation of resources (Ether, 1973; Clark, 1973; Baron, 1976, Cushman, 1986, Peree and Steinherr, 1989). It can simply be defined as the current market price of the home currency exchanged for foreign currency. In other terms, it is a rate at which one country's currency is exchanged for another (Obstfeld & Rogoff, 1995). The nominal exchange rate between two currencies, X and Y, can be expressed as E(x/y). This expression refers to the price of one unit of currency Y in terms of currency X (the number of units of x per one unit of y). This exchange rate is nominal because it is not adjusted for changes in price. It is bilateral because it is an expression of two currencies in terms of one another (Moosa, 2005).

2.1.1. Types of Exchange Rate Regimes

According to (Klein & Shambaugh, 2009), there are three main types of exchange rate regimes such as free floating or flexible exchange rate regime, pegged or fixed exchange rate regime and pegged floating or managed floating exchange rate regime. In free floating system, exchange rates are set purely by private market forces (the supply of and demand for currencies) with no government involvement. In pegged or managed floating system, currency values are allowed to change, but governments participate in currency markets in an effort to influence those values. Finally, government may seek to fix the values of their currencies, either through participation in the market or through regulatory policy; therefore fixed/pegged exchange rate regime.

1) Free Floating (Flexible) Exchange Rate System

It is type of exchange rate in which the value of the nation's currency is allowed to fluctuate based on the demand and supply of the foreign exchange market. The price is determined by market forces of the demand and supply of the foreign currency without any intervention by the government. Therefore, there is a probability of getting different prices for one currency in terms of the other currency within specific time interval, following fluctuations in demand and supply of foreign currency. These fluctuations will lead us to say that there is either depreciation or appreciation of domestic currency (Klein & Shambaugh, 2009).

According to (Pettinger, 2017), currency depreciation is the loss of value of a country's currency with respect to one or more foreign reference currencies, typically in a floating exchange rate system in which no official currency value is maintained. On the other hand, currency appreciation is an increase in the value of the currency. In a floating exchange rate system, a currency's value goes up (or down) if the demand for it goes up more or less than the supply does. In the short run, this can happen unpredictably for a variety of reasons, having to do with trade flows, speculation, or other factors in the international capital market. For instance, a surge in purchase of foreign goods by home country residents will cause a surge in demand for foreign currency with which to pay for those goods, causing a depreciation of the home country. A long-run trend of appreciation (or depreciation) is likely to be caused by home country inflation being lower (higher) on average than inflation in other countries, according to the principle of long-run purchasing power parity (Pettinger, 2017). The concept of a completely free-floating exchange rate system is a theoretical by its nature. In practice, all governments or central banks intervene in currency markets in an effort to influence exchange rates. Some countries, like United States, intervene to only a small degree, so that the notion of a free floating exchange rate system comes close to what actually exists in the United States (University of Minnesota, 2016).

According to (Frankel, 2003), floating exchange rate regime has its own advantages for the practicing nations especially if both the domestic and international markets for currency are well-developed. First, the system automatically ensures the BOPs equilibrium. In a floating regime, the exchange rate automatically adjusts to ensure continuous equilibrium between the demand for and supply of the currency. The purchasing power parity theory assumes that floating exchange rates adjust until a unit of currency can buy the same basket of goods and services as a

unit of another currency. Second, floating exchange rates insulate the domestic economy from foreign price shocks. If there is an increase in foreign prices, provided the exchange rate moves roughly in line with purchasing power parity and the domestic currency would merely appreciate so that prevents the country from importing foreign inflation. Third, the system, ensures monetary autonomy – it gives independence to the monetary policy. Therefore, is the nation faces some shocks from the demand side, the monetary authority will be flexible to employ any kind of monetary policies to alleviate the ongoing demand deterioration problem (Pilbeam, 2006).

Despite these advantages, it is not far from criticism and hence it has its own three disadvantages such as uncertainty, high volatility and unpredictability. Since there is no guarantee for both importers and exporters in floating exchange rate regime where the values of exchange rate is changing as the demand and supply of foreign currency changes, investors are not also certain about the real earnings from exports and the real costs of imports. This makes investors not to fully employ their resources and produce what they are potentially able to produce. Moreover, due to the existence of speculators and the increase in the supply of Dollar, free floating exchange rate regime increases the volatility of foreign exchange. Lastly, the unpredictability of the system may hinder international investors from going to invest in different sectors of the nation. Since the system is highly vulnerable for shocks, both local and international businessmen should take the risk when they are planning to invest in the nation's economic sectors. This is due to the nature of high dynamism of exchange rate in the floating regime (Moosa, 2005).

2) Fixed (Pegged) Exchange Rate Regime

In a fixed exchange or pegged rate system, the exchange rate between two currencies is set by government policy. It is a system in which government plays a significant role in deciding the worth of its currency in terms of either a fixed weight of gold, or a fixed amount of another currency. In other words, Conventional fixed peg arrangements are exchange rate regimes where a country formally pegs its currency at a fixed rate to another currency or a basket of currencies (University of Minnesota, 2016).

The main arguments advanced in favor of the system of fixed or stable exchange rates are as follows. First, fixed exchange regime provides the best environment for the conduct of international trade and investment. This is because of the fact that if the nation uses fixed exchange rate system, it could be easy for merchants and investors to predict about the nation‘s economy and the outcome of their business as well. Secondly, fixed exchange rates eliminate the speculative activities in the international transactions. Hence, there is no possibility of panic flight of capital from one country to another in the system of fixed exchange rates. Third, fixed exchanges rates are necessary and desirable for the developing countries for carrying out planned development efforts since fluctuating rates disturb the smooth process of economic development and restrict the inflow of foreign capital. Fourth, uncertainty is no longer a problem in fixed exchange rate system since exchange rate is predictable and non-volatile. Therefore, fixed exchange rates ensure certainty about the foreign payments and inspire confidence among the importers and exporters.

This helps to promote international trade. Fourth, fixed foreign exchange rate ensures internal economic stabilization and checks unwarranted changes in the prices within the economy. Lastly, fixed exchange rate system is anti-inflationary in character. If exchange rate is allowed to decline in value, import goods tend to become dearer. High cost import goods then fuels inflation.
Such a situation can be prevented by making the exchange rate fixed (Calvo & Mishkin,
2003; Pilbeam, 2006). Though, fixed exchange rate system has many advantages, it has been criticized on the following grounds. First, the system cannot automatically adjust itself. Fixed exchange rate mainly aims to adjust the balance of trade but when a trade deficit occurs, there will be more demand for the hard (foreign) currency which will lead the price of the foreign currency to increase in terms of the domestic currency. Second, in order to keep the exchange rate stable, central bank has to withdraw hard currencies from its reserves since appreciation or depreciation is not allowed in the system. This may create some financial inconveniences especially in the case of LDCs. Third; the system cannot function in the places where the financial and the banking system are not well developed. The absence of strong financial, monetary and banking institutions may make pegged exchange rate system difficult for emerging countries. Since the system needs much more hard currency reserve in order to adjust and maintain the exchange rates stable, the central bank needs to hold stocks of both foreign and domestic currencies at all times. However, developing countries find it difficult to maintain an

adequate volume of foreign exchange reserves. Lastly, pegged exchange rate mostly narrows the scope of the flexibility of the monetary policy. Under the fixed exchange rate system, the monetary authority is deprived of its monetary independence (Calvo & Mishkin, 2003).

3) Managed Floating Exchange Rate Regime

According to (MacDonald, 2007), managed floating exchange rate system is a system which combines (in between) both fixed and floating exchange rates. On one hand, it allows the market to adjust the exchange rate and arrives at its equilibrium level. On the other hand it allows the government to intervene in to the exchange market whenever intervention is needed so as to protect the domestic currency, trade balance and nation‘s economy from external shocks. Hence, a managed float is halfway between a fixed exchange rate and a flexible one.

The managed float is basically a flexible exchange rate system in which rates are permitted to float, but the central bank intervenes on a regular basis to keep the rate within some agreed upon limits. Government can influence exchange rates, usually through the Central Bank buying and selling both domestic and foreign currency. In an increasingly integrated world economy, the currency rates impact any given country's economy through the trade balance. In this aspect, almost all currencies are managed since central banks or governments intervene to influence the value of their currencies. However, because most floating currencies manage their regimes with occasional central bank involvement, the term applies mainly to frequent or dramatic interventions (MacDonald, 2007).

Most nations of the world currently use a managed floating exchange rate policy. With this alternative an exchange rate is free to rise and fall, but it is subject to government control if it moves too high or too low. The Ethiopian government is also one of the countries following this system since 1990‘s. Like floating exchange rate regime where fluctuations in the demand for and supply of foreign currency lead to depreciation and appreciation of domestic currency, there are official changes in the price of a currency in a fixed and managed floating exchange rate systems. When the price of the domestic currency in terms of foreign currency is officially decreased, the exchange rate is said to be devalued. Revaluation in the same context is an official increase in the value of the domestic currency within a fixed or managed floating exchange rate system (Salvatore, 2013).

As a system, managed floating has its own advantages and drawbacks. The main advantage of managed floating exchange rate system is that, it assures some sort of stability both in the financial market and in the economy as a whole since the government occasionally intervenes in to the foreign exchange market. Therefore, the regime is able to avoid a dramatic currency fluctuations and financial speculations in domestic market. Moreover, it assures some sort of exchange market independence therefore the regime promotes better allocation of resources and improvement of the BOP account (Bofinger & Wollmershäuser, 2001).

There are also some drawbacks of managed floats. Primarily, whenever the central bank does not pre-announce the exchange rate path, the private sectors wouldn‘t predict about the future economic situations by using current exchange rate specially when there is disinflation in the economy. This creates uncertainty and discourages investment. Secondly, if the control over the exchange rate is asymmetric or mismatch with the needed rate of exchange, and huge amount of capital out flow taken place following the misalignment, the central bank may lose its control over the macroeconomic situation. Third, as long as the central bank or the government is able to decide autonomously over the exchange rate, there is a serious risk that managed floating is misused for a **beggar-my-neighbor policy**- a kind of policy that makes countries to promote their economy at the expense of their neighbors, which undermine the aims of the WTO (Bofinger & Wollmershäuser, 2001). Even though the above mentioned ones are basic types of exchange rate regimes, there are also other exchange rate regimes such as **dollarization**- a situation where a country, either officially or unofficially, uses a different country's currency as legal tender for conducting transactions; which usually occurs in developing countries with a weak central government or an unstable economic environment (Plate & Herrero, 2008). The best example is Zimbabwe.

However, the main concern of this paper was on the volatility of real effective exchange rate index in Ethiopia and Ethiopian exchange rate regime is among the basic exchange rate regimes discussed so far it is not required to go in to more details. Due to this, nations are forced into devaluation or appreciation of their home currency. This really leads economists to come up with three different approaches of devaluation namely, elasticity approach, absorption approach and the monetary approach.

2.1.2. Types of Exchange Rate

2.1.2.1. The Nominal Exchange Rate

The Nominal exchange rate is the relative price of the currencies of two countries. For example, if the exchange rate between U.S. dollar and Ethiopian Birr is 120 birr per dollar, then you can exchange one dollar for 120 birr in world markets for foreign currency. An Ethiopian who wants to obtain dollars would pay 120 birr for each dollar he/she bought. And American who wants to obtain Birr would get 120 birr for each dollar he/she paid. When people refer to "the exchange rate" between two countries, they usually mean the nominal exchange rate (Gregor M., 2009).

Notice that an exchange rate can be reported in two ways: if one dollar buys 120 birr, then one birr buys 0.00833 dollar. We can say the exchange rate is 120 birr per dollar, or we can say the exchange rate is 0.00833 dollar per birr, for instance. Because, 0.00833 equals 1/120, these two ways of expressing the exchange rate are equivalent. The book also posited that the exchange rate in units of foreign currency per dollar. With this convention, a rise in the exchange rate – say, from 120 to 125 birr per dollar – is called appreciation of dollar; a fall in the exchange rate is called depreciation. When the domestic currency appreciates, it buys more of the foreign currency; when it depreciates, it buys less. An appreciation is sometimes called a strengthening of the currency, and depreciation is sometimes called a weakening of the currency.

2.1.2.2. The Real Exchange Rate

The real exchange rate is the relative price of the goods of two countries. That is, the real exchange rate tells us the rate at which we can trade the goods of one country for the goods of another country. The real exchange rate is sometimes called the terms of trade (Gregor M., 2009). The book also suggested an example to see the relationship between the real and nominal exchange rates, considered a single good produced in many countries; cars. According to the explanation of the relationship between the two exchange rates, it was supposed that an American car costs $10,000 and a similar Japanese car costs 2,400,000 yen. In comparing these, the prices of the two cars, must be converted into a common currency. If a dollar is worth 120 yen, then the American car costs 1,200,000 yen. Comparing the price of the American car (1,200,000 yen) and the prices of the Japanese car (2,400,000), it can be concluded that the

American car costs one-half of what the Japanese car costs. In other words, at current prices, it can be exchanged of 2 American cars for 1 Japanese car (Gregor M., 2009).

According to the author, it can be summarized by calculating real exchange rate as follows.

$$Real\ exhcnage\ rate = \frac{(120\ ¥/\$)x(10{,}000\ \$/American\ car}{(2{,}400{,}000¥/Japanese\ car}$$
$$= 0.5\ \frac{Japanese\ Car}{American\ Car}$$

As these prices and this exchange rate, we can obtain one-half of a Japanese car per American car. More generally, the calculation can be written as;

$$\text{Real Exchange Rate} = \frac{\text{Nominal Exchange Rate x Prices of Domestic Gp}}{Price\ of\ Foreign\ Good}$$

The rate at which we exchange foreign and domestic goods depends on the prices of the goods in the local currencies and on the rate at which the currencies are exchanged. This calculation of the real exchange rate for a single food suggests how we should define the real exchange rate for a broader basket of goods. Let ^{e} be the nominal exchange rate (the number of yen per dollar), ρ be the price level in the United States (measured in dollars), and ρ* be the price level in Ethiopia (measured in Birr). Then the real exchange rate ^{e} is:

$$Real\ \ exchange\ rate = Nominal\ Exchange\ Rate\ x\ Ratio\ of\ Price\ Levels$$

$$e = c\ x \quad (p/p^{*}\ ) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eq.(2.1.)$$

The real exchange rate between two countries is computed from the nominal exchange rate and the price levels in the two countries. If the real exchange rate is high, foreign goods are cheap, and domestic goods are relatively expensive. If the real exchange rate is low, foreign goods are relatively expensive, and domestic goods are relatively cheap.

2.1.3. Meaning of International Trade

International trade (foreign trade) could be defined as the exchange of goods and services across international borders. In its purest form, it is the exchange of capital goods and services between countries on trade across international borders or territories (Wikipedia, 2020). According to Encylopedia Britanica, “international trade is the sale and purchase of consumer or capital goods

and services, raw materials, securities or gold across national borders. Such transactions may be accomplished by barter or more typically through the exchange of national currencies." The Encylopedia American defined international trade as "commercial exchange between residents of different sovereign political units. It becomes clearly distinguished from local or domestic trade only as nations emerge and begin to formulate national commercial policies, then it becomes international trade."

The Grolier Family Encylopedia described international trade as "the exchange of goods and services among countries." This definition implies that countries tend to specialize in the production and export of those goods and services which they can produce relatively cheaply and import things that are produced more efficiently elsewhere. Thus, the main bases of international trade are exports and imports. These are briefly described below:

2.1.3.1. Exports

One major function of international trade is to see that goods produced in one country are shipped to another state for future sale or trade. The sale of each good adds to the producing nations gross output. Exports are therefore goods and services one country sells to others. Exports are one of the oldest forms of economic transfer and occur on a large scale between nations that have fewer restrictions on international trade, such as tariffs or subside. According to (Lequiller & Blades, 2006), "the term export derives from the goods and services out of the port of a country. According to the authors, the sellers of such goods and services is referred to as an exporter, whereas the overseas based buyer is referred to as an importer. According to national accounts, exports consist of transactions in goods and services (sales, barter, gifts or grants) from residents to non – residents. The smuggled goods must be included in the export measurement. As per (Kanu Success Ikech & Nwadiubu Anthony, 2020), in national accounts, any direct purchases by non – residents in the country's economic territory are recorded as service exports; therefore all expenditures by foreign tourists in the country's economic region are considered part of the export services of that country. Also international flows of illegal services must be included. Exports also include the distribution of information that can be sent in the form of an e-mail, fax or can be shared during a telephone conversation (Kanu Success I., et. al., 2020). Thus, in economics, an export refers to any goods or commodity transported from one country to another in a legitimate fashion, typically for use in trade.

2.1.3.2. Imports

The word import is derived from the word port since goods are often shipped via boat to foreign countries (Kanu Success I., et. al., 2020). According to the authors, the import is therefore, derived from conceptual meaning as transportation of products and services from one state into the port of another country. The buyer of such goods and services is referred to as an importer while the overseas based seller is referred to as an exporter (Mohan, 2009). Thus, an import refers to any good or service bought in from another country for sale ((Kanu Success I., et. al., 2020). Imported products and services are provided to domestic consumers by foreign producers. Therefore, an import in the receiving country is considered export in the sending state.

2.2. Theoretical Review

As one of widely used macroeconomic policy indicators, real effective exchange rate can be simply defined as the nominal exchange rate that takes adjustment differentials among countries in to account (Al Ezze, 2011, pp. 155). As such, in international trade, its importance stems from the evidence which reflects on trade competitiveness of one country (Heun & Shlink, 2004; Dhakir A. Ali, Fuadah J, & Mohammed H. Alias, 2014). Unlikely, it is still widely used in different fields of economics for different reasons other than international trade performance.

Real effective exchange rate volatility affects many economic variables; where other studies covered its relationship with foreign direct investment and some others focused on service trade like tourism while others still focused more generally on economic growth without positing the effect of exchange rate volatility on international trade performance (Klein & Rosengren, 1994; Schiff & Becken, 2011; Miao & Berg, 2010). The exchange rate theories have been discussed by different scholars throughout academic and professional fields. To simplify the case, the current study discussed the following major exchange rate theories which are believed to be the root cause for the volatility of exchange rate.

2.2.1. Theories of Exchange rate

2.2.2.1. Elasticity Approach to Devaluation

The elasticity approach to devaluation provides an analysis of what happens to the current account balance when a country devalues its currency. The approach is associated with the Marshall-Lerner condition which was worked out independently by these two economists. It studies the conditions under which exchange rate changes restore equilibrium in BOP by devaluing a country‘s currency. This approach is related to the price effect of devaluation.

The elasticity approach to devaluation based on the Marshall-Lerner condition (Alfred Marshal & Abba Lerner, 1905) rests on several restrictive assumptions. First, the analysis is founded upon partial equilibrium in the sense that it considers only the effect of exchange-rate variations in the market for exports and imports, and everything else is held constant. But, in practice everything else will not remain constant. Exchange rate changes will have price effects elsewhere in the system which will shift the demand curves for exports and imports. Likewise, income will also change, affecting the demand curves for exports and imports. A second restrictive assumption is that all relevant elasticities of supply of output are assumed to be infinite so that the price of exports in the home currency does not rise as demand increases, the price of foreign goods that compete with exports does not fall as demand for them falls, the price of imports in foreign currency does not fall as the demand for imports falls, and the price of domestic goods competing with imports does not rise as the demand for import substitutes increases. Third, the elasticity approach ignores the monetary effects of exchange-rate changes. Finally, it is assumed that trade is initially balanced and that the change in the exchange rate is a small one.

Given these assumptions, when a country devalues its currency, the domestic prices of its imports are raised and the foreign prices of its exports are reduced. Thus, devaluation is expected to help improve BOP deficit of a country by increasing its exports and reducing its imports. But the extent to which it will succeed depends on the country‘s price elasticities of domestic demand for imports and foreign demand for exports. This is what the Marshall-Lerner condition states: when the sum of price elasticities of demand for exports and imports in absolute terms is greater than unity, devaluation will improve the country‘s balance of payments, i.e. $e_x + e_m > 1$, where e_x is the demand elasticity of exports and e_m is the demand elasticity for imports.

On the contrary, if the sum of price elasticities of demand for exports and imports in absolute terms is less unity, $e_x+e_m < 1$, devaluation will worsen (increase the deficit) the BOP. If the sum of these elasticities in absolute terms is equal to unity, em ex + em = 1, devaluation has no effect on the BOP situation which will remain unchanged (Pilbeam, 2006). The central message of the elasticity approach is that there are two direct effects of a devaluation on the current balance, one of which works to reduce a deficit, whilst the other actually contributes to making the deficit worse than before. Let us consider these two effects in detail.

The current account balance when expressed in terms of the domestic currency is given by:

$$CA = PXv - E.(P * Mv) \quad \text{---------- Equation (2.2.)}$$

Where P is the domestic price level, Xv is the volume of domestic exports, E is the exchange rate (domestic currency units per unit of foreign currency), P* is the foreign price level and Mv is the volume of imports. Setting the domestic and foreign price levels at unity; the value of domestic exports (PXv) is given by X; while the foreign currency value of imports (P*M) is given by M. Using these simplifications equation (1) becomes:

$$CA = X - E.M \quad \text{---------- Equation (2.3.)}$$

Differencing equation (2) with respect to E, we obtain:

$$\frac{dCA}{dE} = d\frac{dx}{dE} - E\frac{dM}{dE} - M\frac{dE}{dE} \quad \text{..... Equation (2.4.)}$$

Recall that the price elasticity of demand for exports ηx, is defined as the percentage change in exports over the percentage change in price as represented by the percentage change in the exchange rate, giving: $nx = \frac{dx/x}{dE/E}$

So that,

$$dx = \frac{\eta x\, dE\, X}{E} \quad \text{..... Equation (2.5.)}$$

Likewise, the price elasticity of imports ηm, is defined as the percentage change in imports over the percentage change in their price as represented by the percentage change in the exchange rate (we place a negative as we wish to express elasticity as a positive number):

$$\eta m = \frac{dM/M}{dE/E}$$

So that, d M = −, $dM = \frac{\eta m\, dE\, M}{E}$ ……Equation(2.6.)

Substituting equations (2.5.) and (2.6.) in to equation (2.4.) we obtain:

$$\frac{dCA}{dE} = \frac{\eta x\, X}{E} + \eta m\, M - M \quad Equation(2.7.)$$

Dividing equation (5) by M, we obtain,

$$\frac{dCA}{dE}\,\frac{1}{M} = \frac{\eta x\, X}{E\, M} + \eta m - 1 \quad Equation\ (2.8.)$$

Assuming that we initially have a balanced trade, X/EM = 1, and rearranging equation (2.8.) we obtain:

$$\frac{dCA}{dE} = M(\eta x + \eta m - 1) \quad \text{Equation}(2.9.)$$

Equation (2.9.) is known as the Marshall- Lerner condition and says that starting from a position of equilibrium in the current account, devaluation will improve the current account that is dCA/dE > 0 only if the sum of the foreign elasticity of demand for exports and the home country elasticity of for imports is greater than unity; that is, ηx + ηm > 1. If the sum of these two elasticities is less than unity, then devaluation will lead to a deterioration of the current account (Pilbeam, 2006).

It was argued that devaluation may work better for industrialized countries than for developing countries. The main reason is that, many developing countries are heavily dependent up on imports, and their price elasticity of demand for imports was likely to be very low. However, for industrialized countries that have to face competitive export markets the price elasticity of demand for their exports is more likely to be elastic. The implication of the Marshall-Lerner condition was that devaluation may be a cure for some countries balance of payments deficits but not for others (Pilbeam, 2006).

A general consensus accepted by most economists is that elasticities are lower in the short run than in the long run, in which case the Marshall- Lerner conditions may not hold in the short run but may hold in medium to long run. In simple terms, the short run elasticities generally fail to sum to unity, while the long run elasticities almost always sum to greater than unity (Pilbeam, 2006). This possibility that the Marshall- Lerner condition may not be fulfilled in the short run although it generally holds over the long run leads to the phenomenon of what is popularly

known as the J-curve effect of devaluation. The explanation is that when a country's trade balance is plotted on the vertical axis, the response of the trade balance to devaluation looks like letter J (Petrović and Gligorić, 2010). The idea underlying the J-curve effect is that in the short run export volumes and import volumes do not change much so that the country receives less export revenue and spends more on imports leading to deterioration in the current balance. However, after a time lag export volumes start to increase and import volumes start to decline, and consequently the current deficit starts to improve and eventually moves in to surplus (Pilbeam, 2006).

2.2.1.2. Absorption Approach to Devaluation

This approach was developed by (Sidney Alexander, 1952) in his paper ―Effects of devaluation on a trade balance, published in IMF Staff Papers. This approach relaxes the assumption taken by elasticity approach and laid emphasizes on the macroeconomics (income) effects of devaluation. The paper stressed on the fact that a current account imbalance can be viewed as the difference between domestic output and domestic absorption.

The term, absorption in economics means that the total demand for all consumer goods and services by all the economic agents' residing in an economy, nevertheless of the creation of all the goods and services themselves (Kaur, 2012). Alexander (1952) began with the identity that national income (Y) is sum of consumption (C), domestic investment (Private investment-I and Government spending-G) and foreign investment or trade balance (Export minus Import):

Hence, $Y = C + I + G + (X - M)$ $-----------------------(1)$
Taking the national income equation Y = C + I + G + X - M, and labelling domestic absorption A, we have: A= C+I+G,
Equation (1) can be rearranged as follows:

$$CA = X - M = Y - (C + I + G) = Y - A \quad ----------(2)$$

Equation (2) says that current account balance represents the difference between domestic output and domestic absorption. A current account surplus means that domestic output exceeds domestic spending, while a current account deficit means that domestic output is less than domestic spending.

Differencing equation (2) yields:

$$dCA = dY - dA \quad ---------- (3)$$

This equation implies that the effects of devaluation on the current balance will depend up on how it affects national income relative to how it affects domestic absorption which is the central issue of absorption approach to devaluation. If devaluation raises domestic income relative to domestic spending (absorption) current account improves. On the other hand, if devaluation raises domestic absorption relative to domestic income, the current account deteriorates (Pilbeam, 2006). The condition for a devaluation to improve the current account is $(1 - \alpha)\, dY > dAd$, that is, any change in income not spent on absorption must exceed any change in direct absorption. These factors, in turn, are influenced by the existence of unemployed or idle resources and fully employed resources in the devaluing country (Pilbeam, 2006).

2.2.1.3. Monetary Approach to Devaluation

The Monetary approach to devaluation was started toward the end of the 1960s by (Robert Mundell & Harry Johnson, 1960) and became fully developed during the 1970s. The monetary approach represents an extension of domestic monetarism (stemming from the Chicago school) to the international economy in that it views the balance of payments as a monetary phenomenon. That is, money plays the crucial role in the long run both as a disturbance and as an adjustment in the nation‘s balance of payments (Salvatore, 2013).

The focus of the monetary approach to devaluation is on the balance of payments as a whole (the current and the capital account) so that balance of payments disequilibrium is equivalent to a change in the level of international reserves. Accordingly, the balance of payments disequilibrium is the outcome of stock disequilibrium between the supply of and demand for money. According to this approach, ―a balance of payments deficit is always and everywhere a monetary phenomenon. Therefore, it can only be corrected by monetary measures (Thirlwall, 1982).

2.2.1.4. Monetary Approach under Flexible Exchange Rates

Under a flexible exchange rate system, balance-of-payments disequilibria are immediately corrected by automatic changes in exchange rates without any international flow of money or reserves. Thus, under a flexible exchange rate system, the nation retains dominant control over its money supply and monetary policy. Adjustment takes place as a result of the change in domestic prices that accompanies the change in the exchange rate. A deficit in the balance of payments resulting from an excess money supply leads to an automatic depreciation of the nation‘s currency, which causes prices and therefore the demand for money to rise sufficiently to absorb the excess supply of money and automatically eliminate the balance of payments deficit. Likewise, a surplus in the balance of payments resulting from an excess demand for money automatically leads to an appreciation of the nation‘s currency, which tends to reduce domestic prices, thus eliminating the excess demand for money and the balance-of-payments surplus (Salvatore, 2013).

The actual exchange value of a nation‘s currency in terms of the currencies of other nations is determined by the rate of growth of the money supply and real income in the nation relative to the growth of the money supply and real income in the other nations. Thus, according to the monetary approach, currency depreciation results from excessive money growth in the nation over time, while a currency appreciation results from inadequate money growth in the nation (Salvatore, 2013). Under a managed floating exchange rate system of the type in operation today, the nation‘s monetary authorities intervene in foreign exchange markets and either lose or accumulate international reserves to prevent an ―excessive depreciation or appreciation of the nation‘s currency, respectively. Under such a system, part of a balance of payments deficit is automatically corrected by a depreciation of the nation‘s currency, and part is corrected by a loss of international reserves. As a result, the nation‘s money supply is affected by the balance of payments deficit, and domestic monetary policy loses some of its effectiveness (Salvatore, 2013).

2.2.1.5. Marshall Lerner Condition

This refers to the proposition that the devaluation of a country's currency will lead to an improvement in its balance of trade with the rest of the world only if the sum of the price elasticities of its exports and imports is greater than one. For instance, if total export revenue falls due to inelastic demand for a country's exports and total import expense rises due to inelastic demand for its imports, this will lead to a further worsening of the country's trade deficit. So devaluing its currency may not always be the best way forward for a country looking to reduce its trade deficit. The Marshall-Lerner condition is named after British economist Alfred Marshall (1842-1924) and Russian economist Abba P. Lerner (1905 – 1985). It was then developed to Marshall-Lerner Condition in 1941.

2.2.2. Theories of International Trade

The international trade theory provides answers for the questions like – why do nations trade and what do they do? The answers are both convincing and elegant, hence the vast majority of economists agree about the desirability of liberal trade. So many economists and theorists have been explained their respective theory on the basis of nation's international trade practices.

According to Feenstra (2003), comparative advantage means the comparison of relative price differences between nations to explain the pattern of trade. It is with the aim of notice that the focus on relative prices tends to cancel out forces (exchange rate manipulation, environmental, or labor standards) which cause national differences in level of non-traded factor (or goods) prices. On the other hand, the author posited that for example, the relative price of wheat in terms of cheese at home to the same relative price in the foreign economy in a hypothetical equilibrium with no trade (autarky) or with restricted trade.

2.2.2.1. Comparative Advantage Theory

According to (David Ricardo, 1817), comparative advantage is the differences made between nations are which is comparatively explained by exogenous differences in national characteristics. He also posited that comparative advantage would occur due to difference in labor productivity. For instance, labor differs in its productivity internationally and also different goods have different labor requirements, so comparative labor productive advantage was

Ricardo's predictor of trade. Ricardian trade theory is useful in its simplicity and even rather loosely confirmed by many empirical evidences. Ricardo (1817) has asserted that the world trade equilibrium would result in the home country export of goods and the foreign country export of other goods. This is because in the absence of trade, a value of goods worth monetary value in the home country whiles a value of other goods in the foreign country. According to him, the labor market equilibrium which accompanies such a trade equilibrium must have a foreign wage of at most one – half of the home wage (since with a foreign wage equal to one – half of home wage, a bushed of wheat costs the same amount in each country allowing production in both). Also he explained that considering a low wage foreign economy, the labor market equilibrium accompanying the trade equilibrium could have a foreign wage no lower than three – eighths of the home wage (since this case a value of cheese costs the same amount in each country). The main point here is that the numbers chosen make no difference to the logic of trade theory, what is essential for that comparative labor productivities differ. It is also subsequent that development of trade theory here is generalized the production mode. However, the essence of comparative advantage theory remains: trade is due to differences in relative prices that would obtain in the absence of trade, and an average of each country's citizens gain from such trade.

2.2.2.2. The Heckscher – Ohlin Trade Theory

This is a theory developed by two Swedish economists (Eli Heckscher and Bertil Ohlin, 1919) at the University Of Stockholm School Of Economics. It is the Heckscher –Ohlin model (H – O) model which is a general equilibrium mathematical model of international trade. It builds David Ricardo (1817) theory of comparative advantage by predicting patterns of commerce and production based on the factor endowments of a trade region. The model essentially says that countries export products that use their abundant and cheap factors of product, and import products that use the countries' scarce factors (Eli H., & Bertil O., 1919). For instance, two identical countries A and B have different initial factor endowments. Autrky equilibrium (A^A, A^B): no trade, individual production equals consumption. According to them, the trade equilibrium would result in when both countries consume the same ($C^A = C^B$), especially beyond their own production and production – possibility frontier; production and consumption points are divergent. The authors posited that the model is assumed to be useful to evaluate trade and, more specifically, the equilibrium of trade between two countries that have varying specialists

and natural resources. Also the model emphasizes the export of goods that require factors of production that a country has in abundance (Heckscher, et al., 1919). Similarly, the model also emphasizes the import of goods that a nation cannot produce as efficiently. It strictly takes the position that countries should ideally export materials and resources of which they have an excess, while proportionately importing those resources they need (Heckscher et al., 1919).

2.2.2.3. Absolute Advantage Theory

Absolute advantage theory is developed by (Adam Smith, 1776), who is recognized as the founder of modern economics and as one of the first and most famous thinkers who argued in favor of tree trade. However, his theory of international trade is rather poorly known or appreciated. Nowadays, most text books of economics in general and of international trade in particular – start their introduction to trade theory with a short chapter on Adam Smith and the theory of absolute advantage, a theory allegedly invented by him. The theory swiftly discards the absolute advantage theory in favor of a comparative advantage theory of David Ricardo (1817). He (Adam Smith) argued that unrestricted trade and free international competition are more beneficial to a nation than the mercantilist economic policy that existed in many parts of Europe during the 18th century. For Smith (1776), international trade has the same underlying cause as all kinds of trade. In *The Wealth of Nations*, trade is the consequence of the human propensity to truck, barter, and exchange one thing for another. To him, that doesn't mean that trade has no selfish motive. On the contrary, whenever, people trade with each other they pursue their own interests, not some altruistic ones. Therefore, they must benefit from trade otherwise they would not pursue it. Thus, merchants carry on commerce internationally because they earn profits by it. However, Smith endeavors to show that not only single merchants but also the society as a whole benefits from international trade (Adam Smith, 1776).

2.2.2.4. Standard Theory of International Trade

During the sixteen and eighteenth centuries, mercantilism was the dominant economic system of most industrial countries. The mercantilist approach to international trade assumed that the wealth of a nation depends chiefly on its ability to possess precious metals such as gold and silver. The possession of such metals took place through supporting exports and encouraging metal discoveries in the America and, on the other hand suppressing imports through imposing

excessive tariffs on trade (Peuker H., 2012). Later on, after instability and economic failure, Mercantilism was strongly criticized by what became to be known later as the Standard Theory of International Trade (Wilson C., 1959; Peukert H., 2012).

In 1976 and 1817, the publications of Adam Smith's Wealth of Nations and David Ricardo's on the principle of Political Economy and Taxation traces back the evolution of Standard Trade Theory (Adam Smith, 1976; David Ricardo, 1817). These books had heralded the formulation of a theory of free trade, based on the unprecedented success of trade in England in the respective fields of industry and trade (Sen S., 2010).

2.2.3. Determinants of Real Effective Exchange Rate

2.2.3.1. The Relationship Between Real Effective Exchange Rate and Trade

Exchange rate has a direct influence on net exports. However, the effect of exchange rate on the net export is uncertain and the elasticity of demand for imports plays a crucial factor (Paul R. Krugman & Maurice Obstfeld, 2011). In international finance, for exports side, when domestic exchange rate becomes higher (domestic currency depreciation), domestic country can export more because their goods become relatively cheaper. Depreciation of home country's currency has two effects for home country (1) a rise in the home currency prices of a foreign currency and (2) it makes goods cheaper for foreigner and foreign goods more expensive for domestic residents (Paul R., et. al., 2011). For instance, the depreciations of Ethiopian Birr make Ethiopian goods looks very cheap and more goods are expected to export to US. So the depreciation of home country currency will increase the volume of exports normally. Mathematically, (EX = P*Q) where EX is the exports, P is the price of exports and Q is the quantity (in this case volume) of exports which were exported in the time period.

For side of imports, because the exchange rate goes up, the price of imports rise, (domestic currency depreciation) but the quantity also decreases. Those two factors which one is bigger are unsure and it depends on the elasticity of the product.

2.2.4. The Real Exchange Rate and The Trade Performance

Just as the relative price of hamburgers and pizza determines which you choose for lunch, the relative price of domestic and foreign goods affect the demand for these goods (Gregor M., 2009). Supposedly, if the real exchange rate is low, and hence domestic goods are relatively cheap, domestic residents would want to purchase fewer imported goods: they would buy Fords rather than Toyota, drink Coors rather than Heinken, and vacation in Florida rather than Italy. For the same reason, foreigners will want to buy many our goods. As a result of both of these actions, the quantity of our net exports demanded will be high. The opposite is true if the real exchange rate is high because domestic goods are expensive relative to foreign goods, and domestic residents will want to buy many imported goods, as well as foreigners will want to buy few of our goods. Therefore, the quantity of our net exports demanded will be low. This relationship – the relationship between real exchange rate and net exports explained as; NX = NX (e)

2.2.5. The Relationship between Trade Openness and International Trade

According to World Bank (2001), trade openness or trade liberalization is defined as (i) the removal of or reduction in the trade practices that thwart a free flow of goods and services from one nation to another. It includes dismantling of tariff (such as duties, surcharges, and export subsidies) as well as non-tariff barriers (such as licensing regulations, quotas and arbitrary standards); (ii) the removal of government incentives and restrictions from trade between nations; (iii) any act that would make the trade regime more neutral (nearer to a trade system free of government intervention).

Since the 1980 trade liberalization or trade openness, has become an increasingly common feature of economic policy in developing countries. They have liberalized their trade regime with hope of gaining static and dynamic gains from trade, and that the liberalization will increase both growth of export and imports, and consequently improve welfare (Santos-Paulino and Thirlwall, 2004). At the global level, multilateral trade negotiations under auspices of the world trade organization (WTO) are pushing for free trade in response to the demands of globalization. Thus, it has been strongly supported by the multilateral institutions, both financially through studies of the effects of trade liberalization (World Bank, 2001). An important plank in the advocacy of

trade liberalization is the belief that a more liberal trade regime will lead to increased exports which in turn will have a favorable effect on economic growth and employment generation (World Bank, 2001). Empirical literatures show that trade openness (liberalization) affects output growth in the era of globalization (a phenomenon, whose economic dimension involves increases in the flows of trade, capital and information, as well as the mobility of people across borders (Rodrick, 2006).

2.2.6. Real Effective Exchange Rate and Real GDP Growth

There is a relatively large body of both theoretical and empirical literature suggesting a correlation between the real exchange rate and GDP growth. As long as productivity is higher in the traded goods sector, countries have an incentive to maintain the relative price of traded goods high enough to make it attractive to shift resources into their production (Levy-Yeyati & Sturzengger, 2002). Other empirical sources (Aizenman & Lee, 2010; McLeod & Mileva, 2011) argued that there are learning by doing effects external to the individual firm in the traded goods sector, and therefore a weak real effective exchange rate is need to support production of tradables. As such, in these models, an exchange rate undervaluation acts like a subsidy to the (more efficient) tradeable sector. Arguably, (Rodrik, 2008), posited that a weak real exchange rate compensates for institutional weakness and market failures (e.g. knowledge spillovers, credit market imperfections, etc.) which lead to underinvestment in the traded goods sector in developing countries. Anguire and Calderon (2005), on the other hand reflected that large over – and under valuation hurt growth, while modest undervaluation enhances growth and rapid accelerations on exchange rate are often correlated with real exchange rate depreciations (Ricardo Housemann, Lant Pritchet & Dani Rodrik, 2005). The real effective exchange rate does matter for growth in developing economies, but substantially less so in advanced ones (Rodrick, 2008). Also exchange rate and the choice of the exchange rate regime retain a center stage in the post crisis environments especially for emerging economies (Klein & Shambugh, 2010; Rose, 2011). Based on a measure of undervaluation where real exchange rates are adjusted for the Balassa-Samuelson effect, Rodrik (2008) found that at least for developing countries, an undervalued real exchange rate predicts stronger growth. Empirical result, by (Woodford, 2008) also found that economic growth and real exchange rate has a positive linkage between them by using OLS regression. As such, positive link has been observed between growth and real

exchange rate appreciation, plays against finding negative and significant coefficients for the impact of exchange rates on growth. The former result of a positive correlation between growth and real exchange rate appreciation may result in from the Balassa-Samuelson effect, but the opposite correlation holds after monetary policy and technology shocks in standard open economy. Di Nino, Barry Eichengreen & Massimo Sbracia (2011) also concluded that there is a positive relationship between undervaluation – exchange rate movement, and economic growth for his panel data set covering the period 1981 – 2011 in Italy. Similarly, the authors show that currency undervaluation supported growth by increasing exports, especially from high – productivity sectors. Farrant and Peersman (2006) have concluded that more at a business cycle frequency show that pure real exchange rate shocks (i.e. separated from the effect of monetary policy) have a substantial contemporaneous impact on output (exchange rate shocks are identical through sign restrictions in a VAR setting). Finally, (Edwards & Garlick, 2007) asserted that real depreciation enhances export competitiveness, encourages export diversification, protects domestic industries from imports and ultimately improves the trade balance; this in turn promotes economic growth.

2.2.7. Relationship Between Terms of Trade and Real Effective Exchange Rate

In late 1990s, large and recurrent fluctuations in the terms of trade are widely viewed as an important driving force for business cycles (Enrique G, Mendoza, 1995). It has asserted that sharp fluctuations in economic activity affects industrial and developing countries since the large oil-price increase in 1970s and such case subsequently declined the decades. Its conclusion has argued that terms of trade shocks cause real appreciations and positive interest differentials, although productivity shocks have positive effects (Enriqu G., 1995).

It is clearly defined that terms of trade are ratio of export prices to import prices and thus measures how much can be obtained in imports per unit of exports. It is generally presented as index based on a given year and therefore shows the proportional change in the price of export and imports (World Bank; IMF, OECD, 2020). The real effective exchange rate on the other hand, measures domestic costs as a proportion of foreign costs in the same currency. Thus, it is most common to measure the real exchange rate based on consumer goods prices (World Bank, et. al., 2020). If prices of exported goods were same as price of the consumer goods, and if the

price of imports were same prices of consumer goods in one country's main trading partner countries, developments in terms of trade would be expected exactly as the developments in the real effective exchange rates (World Bank, et. al., 2020). It is also believed to be, to some extent there is a tendency for these variables to move together but there are forces that pull them in different directions (World Bank, et. a., 2020).

2.2.8. The Relationship Between Trade Openness and Real Effective Exchange Rate

Small developing and open economies typically are faced with large fluctuations in price of gods they import and export (Boniface Aipi, 2012). He asserted that given the openness of the economies, the country is expected to further confront with volatile prices of financial assets. Volatilities in the financial assets and goods market are unwelcome in developing countries as it has adverse effects on output growth (GDP) (World Bank, et. al., 2020). It is in this content that made it imperative to examine the volatility of exchange rate on traded commodities (price of exports relative to price of imports, referred to as terms of trade) and the impact it have on macroeconomic variables.

The relationship between trade openness and REER is that when the real effective exchange rate appreciates, domestic products become more expensive for the rest of the world and therefore demand for the goods and/or service decreases. On the other hand, an over appreciated exchange rate makes foreign tradable goods become cheaper than domestic ones, which increases imports unless the government raises their cost through tariffs or restrict their entrance by other means (i.e., quotas) (World Bank, 2019, IMF, 2020, OECD, 2019, WDI, 2019). Thus, protectionism through tariff barriers, quotas, or other forms restricts imports and consolidates a situation of REER appreciation. Therefore, it is believed that trade liberalization (i.e. trade openness) has a negative effect – depreciation effect on the REER. Early sources (Dornbusch, 1974; Balassa, 1975) were also supports this hypothesis this that the logic is straightforward: once a reduction in imports tariffs is expected to be implemented, there is an imbalance in the current accounts as a result of the increasing demand for imports. As a result, this induces the need to generate depreciations in the real effective exchange rate see (Ernesto R. Gantman, & Marcelo P. Dabos, 2017). The empirical evidences of (Ernesto R. Gantman & Marcelo P. Dabos, 2017) revealed this that an increase in trade openness produces a depreciation of the REER, in the long run.

2.2.9. The Linkage Between Foreign Exchange Reserve and Real Effective Exchange Rate

The collapse of Bretton Woods fixed exchange rate system in the early 1970s initiated the flexible exchange rate system. Most countries have chosen a pure flexible exchange rate system, in their monetary policies which the authorities do not intervene at all in their foreign exchange market (Yeonjeong Lee & Seong-Min Yoon, 2020). It is believed that pure flexible exchange rate system means that the exchange rate is determined autonomously by market forces such as the inflow and outflow of foreign exchange is balanced (World Bank, 2019; IMF, 2018, OECD, 2019). More interestingly, however, the rate at which a country accumulates foreign exchange reserves to defend fixed exchange rate has not changed even after the adoption of a flexible exchange rate system (Yeonjeong, et al., 2020, World Bank, 2019). The flexible exchange rate system unfortunately faced problems of high exchange rate volatility and that weakening the competitiveness in the major developing countries (Yeonjeong, et. al., 2020).

On the theoretical side, the motive for stockpiling foreign exchange reserves can be explained for two perspectives. The first point is based on mercantilist perspective – explaining that the hoarding of international reserves is a part of deliberate development strategy, i.e., an outward – oriented growth strategy, which facilitates growth by maintaining the undervalued real exchange rate to maintain a country's export competitiveness see (Yeonjenong, et al., 2020; Aizenman, J., 2007, 2008 & 2010; Delatte A. L., 2012; Dooley M. P., 2004; Srinivasan, N.; Kumar, S. Zone, 2012; Srinivasan, N.; Mahambare, V.; Ramachandran, M., 2009).

The second motive of holding foreign exchange reserve is explained as self-assurance or precautionary motive, which outlines as output stabilizers, international reserves can reduce sovereign risk (Yeonjeong, et. al., 2020). It is also believed that international reserves can bring down the probability of an output drop induced by capital flight and or can decrease the depth of the output collapse when the sudden stop happens see (Yeonjeong, et al., 2020; Ben-Bassat, A.; Gottlieb, D., 1992). These two motives are the major causes claiming that the increasing supply of financial assets and financial integrations are motivations for stockpiling of foreign exchange reserves. Therefore, its sign is expected to be either positive or negative depending on the two major motives of holding foreign exchange reserves.

2.3. The Empirical Review

The study on the impact of exchange rates on international trade has been given much attention by different scholars because of the important role it may exert on the macroeconomic policies of any economy. Hence, real effective exchange rate is registered as one of macroeconomic variables that affect different aspects on country.

According to a study conducted in Rwanda, by Gervais Twamugize, Zhang Xuegong, and Abeid Ahmed Rmdhani, (2017), there is insignificant relationship between exchange rate and export as well as between exchange rate and import using a ganger causality test. But by testing other variables, like GDP to export and exchange rate to export-hold bi-directional cause to each other. On the other hand, they found that only GDP to import hold bi-directional causation between them. And the finding revealed that exchange rate fluctuation is the main factor that affects the level of international trade measure in terms of export and import flows in the country the study delimited.

As argued by (Marc Auboin & Michele Ruta, 2012), "it is customarily presumed that the adverse effect of exchange rate volatility (on trade flows), if it exists, is certainly not large". As aptly summarized by (Marc Auboin & Michele Ruta, 2012), "on average, exchange rate variability exerts negative effect on international trade. On the issue of currency misalignment, theoretical and empirical studies over the years show that relationship between the level of the exchange rate and trade is so multi-faceted and complex that it is hard to take a firm line in any particular direction ((Marc Auboin, et. al, 2012).

A study conducted in Turkey by using two years quarterly data revealed that exchange rate uncertainty affects export volume negatively in long run and doesn't have any kind of impacts in the short run (Adnan Kasman & Saadet Kasman, 2005). Similarly, another study conducted in Kenya found that exchange rate is associated to export trade in Kenya with a Pearson Correlation of 73%. This means that the movements in foreign exchange rates affect largely export trade in Kenya (Pauline Rhodah Akwabi, 2015).

A study related with exchange rate volatility and international trade in Nigeria (Kanu Success Ikechi & Nwadiubu Anthony, 2020) revealed that in a VAR model test estimates an inverse relationship between export, import and real effective exchange rate existed in the periods the study delimited. A unit increase in export and import in a particular year leads to about 0.9% and

0.4% decrease in real effective exchange rate (REER) respectively. On the other hand, variance decomposition analysis of the study suggested that the shocks partially explain fluctuations in REER as well as exports and imports. Moreover, the impulse response analysis indicates a negative association between export and real effective exchange rate while it was majorly positive for imports throughout the ten study years. The casual effect reveals that import causes exports but that exports do not granger cause imports. Results show evidence of volatility of REER clustering on import and export trading activities in Nigeria. This could have serious implications for growth in Nigeria, as a reduction in the growth of exports could reduce the foreign exchange earnings available for the financing of development projects. At the same time, a decline in imports could affect domestic production and consumption. It could also impinge negatively on the balance of payment positions for Nigeria. In line with these observations, monetary and fiscal interventions are required to mitigate the adverse effects since financial shocks often exacerbate exchange rate volatilities (Kanu Success Ikechi&Nwadiubu Anthony, 2020).

According to Glory G., Maembe (2015), a study conducted to assess the impact of exchange rate fluctuations on the revaluation of foreign currency in Tanzania, revealed that all the revaluations obtained were negative which implied that as time goes business people in the country required more local money in order to get equivalent USD, EURO and GPB currencies to buy the required goods and services. The study hence, recommended that the government under the guidance of the Bank of Tanzania put in place appropriate policies and guidelines for managing risks resulting from fluctuation of exchange rates.

On the other hand, a study conducted early in 2000, (A.C. Arize and S. S. Shwiff, 1998), revealed that exchange rate volatility has a significant effect on the volume of imports of most Group 7 (G-7) countries whereas for Canada, it is positive and significant. These findings are reasonably robust in terms of measures of exchange rate volatility and different estimations methods. A study conducted in Egypt, to test the J-curve hypothesis on the effect of exchange rate movements on trade balance performance concludes that J-curve hypothesis does not hold in case of Egypt, especially in the long run. This is consistent with most of the previous studies tested the same hypothesis in developing countries (Ahmed Mohamed Ezzar, 2018).

Exchange rate stability has a significant effect on real export volume both in the short run and in the long run. A 1% increase in exchange rate volatility led to a 0.63% decrease in real export volume in the long run, and the effect is statistically significant at the 1% level, in accordance with expectations. A 1% increase in foreign income let to a 2.6% increase in real export volume in the long-run, and the effect is statistically significant at 10% level, in accordance with expectations. As for the relative price, it has a positive but insignificant effect on export volume, as opposed to expectations (Erdal Demirhan & Banu Demirhan, 2015).

A study conducted in Turkey (Nergiz Dincer and Magda Kandil, 2009) revealed that an anticipated exchange rate appreciation has significand adverse effect, contracting export growth across many sectors. Random fluctuations in the exchange rate have asymmetric effects of sectoral export growth. Also the evidence indicates higher sensitivity of export demand to currency appreciation over time. In contrast, the effect of depreciation in stimulating export growth has lost momentum over time. Anticipated exchange rate guides export plans, signaling the importance of managing fundamentals to anchor rational forecasts. Moreover, less variability of the exchange rate is likely to improve sectoral export growth in Turkey over time (Nergiz Dincer and Magda Kandil, 2009).

According to a study conducted in Pakistan to investigate the impact of exchange rate fluctuation on imports and exports of Pakistan, it concluded that exchange rate fluctuation significantly and positively related to export and import of Pakistan. Similarly, it argued and underlined that exchange rate fluctuation is problem of many economic systems, which can be made better through different policies analysis. Exchange rate fluctuation is significantly and positively associated with inputs, which can be controlled if favored export and import policies be encouraged that is logically justified in this research (Faheel-ul Hussen I. A., Channa M. A., 2017).

Empirical results, conducted on Ethiopia and Tanzania (Kifle Wondimu & David Potts, 2016) to assess the impact of real exchange rate changes on export performance revealed that the growth impact of export is much stronger when the export basket is vertically and horizontally diversified. Again it suggested that while overvaluation is harmful to exports, undervaluation of the real exchange rate boosts export supply as well as export diversification. According to them,

a high rate of growth in exports is associated with the periods of undervalued currencies. They also posited that solely, when the undervaluation dummy is interacted with the country dummy and included as an additional variable in the model, the interaction term is highly significant (Kifle W. et al,, 2016). According to their empirical result, it implies that, ceteris paribus, undervaluing the real currency in Ethiopia would have a significant impact on increasing manufactured export, hence; the significance of the interaction dummy may also suggest that there are relatively sever institutional weakness and market failures in Ethiopia. And they concluded that exports in both countries (Ethiopia and Tanzania) are highly responsive to changes in the real exchange rate Kifle W., et al., 2016).

2.4. Research Gap

The literature is awash with studies on the effect of real effective exchange rate volatility on the international trade performance in developing countries, but it appears to be scarce with regard to African countries, especially in Ethiopia. The few studies on African countries were based on annual data in relation with macroeconomic policy towards appreciation or devaluation of one's currency against others. There is still a need for more subject and country specific case studies as opposed to cross country regression analysis that will yield more robust conclusions by using international trade in terms of export-import value.

Also different studies have been conducted in similar fashion to the current study. For instance, (Eris Simbi, 2015) conducted the effect of real effective exchange rate in Rwanda for the period covers (2000-2015) by using quarterly data. Nevertheless, the study didn't assess the exchange rate volatility in respect of either annual basis or involving intervening variables which were most critically to be considered in the international trade performance. Also a study conducted in Bangladesh (Nasir Hossain & Hasan Hasan, 2020) to examine the impact of exchange rate volatility on export and import performance. However, they did not cover the values of export – import – thus make the study more general in conclusion. Nevertheless the study covered data on annual basis, and it covers only (2013 – 2019) which is insufficient to conclude the findings as important as expected.

In addition, (Ibrahim A. Elbadawi & Raimundo Soto, 2005) examined the theory and empirics of real effective exchange rate in Sub-Saharan Africa and Developing countries. However, their findings covered the period of (1980 – 2003) 23 years, which was very shallow as compared to

the current study – it covers 39 years annual data – and since then different policy measures and economic shocks have been occurred to the countries macroeconomic factors.

Given the inadequate amount of studies in the context of export – import values in Ethiopia, and other corners of the world, the present study intends to fill the following gap by employing vector error correction model (VECM) using Eviews Software version 10.

1) The macroeconomic environment has been dynamically changed since the Dergue Regime, which was the pioneer of the currency devaluation has taken place.
2) Other empirical studies have not covered international trade performance in terms of export and import values index in case of Ethiopia.
3) The real effective exchange rate index versus export import value, in case of Ethiopia, has not been used throughout those vast researches so that it is very important to take the average of the foreign exchange rate.
4) The values of export and import have not been included in those empirical studies by employing the intervening variables which were carefully considered in the current study with the VECM model.

2.5. Conceptual Framework

So many studies have been conducted regarding exchange rate movement, currency devaluation or appreciation and other related macro and microeconomic variables. Thus, the studies have reached different conclusions based on the result of their findings. To this end, this paper tried to design a conceptual framework based on the theories and empirical evidences discussed hereinabove. The conceptual framework of the study was designed upon dependent and independent variables that is real effective exchange rate versus international trade in terms of values of export and import respectively.

The conceptual framework is developed based on Marshall-Lerner Condition **(**Alfred Marshall and Abba Lerner, 1905) with two critical assumptions. The first is that trade was initially balanced when exchange rate depreciation took place, so that the foreign currency value of exports equals the foreign currency value of imports. Second and most importantly, prices are assumed to be fixed in sellers currencies; thus, the supplies of elasticities are infinite. The effect can be explained as depicted in figure below.

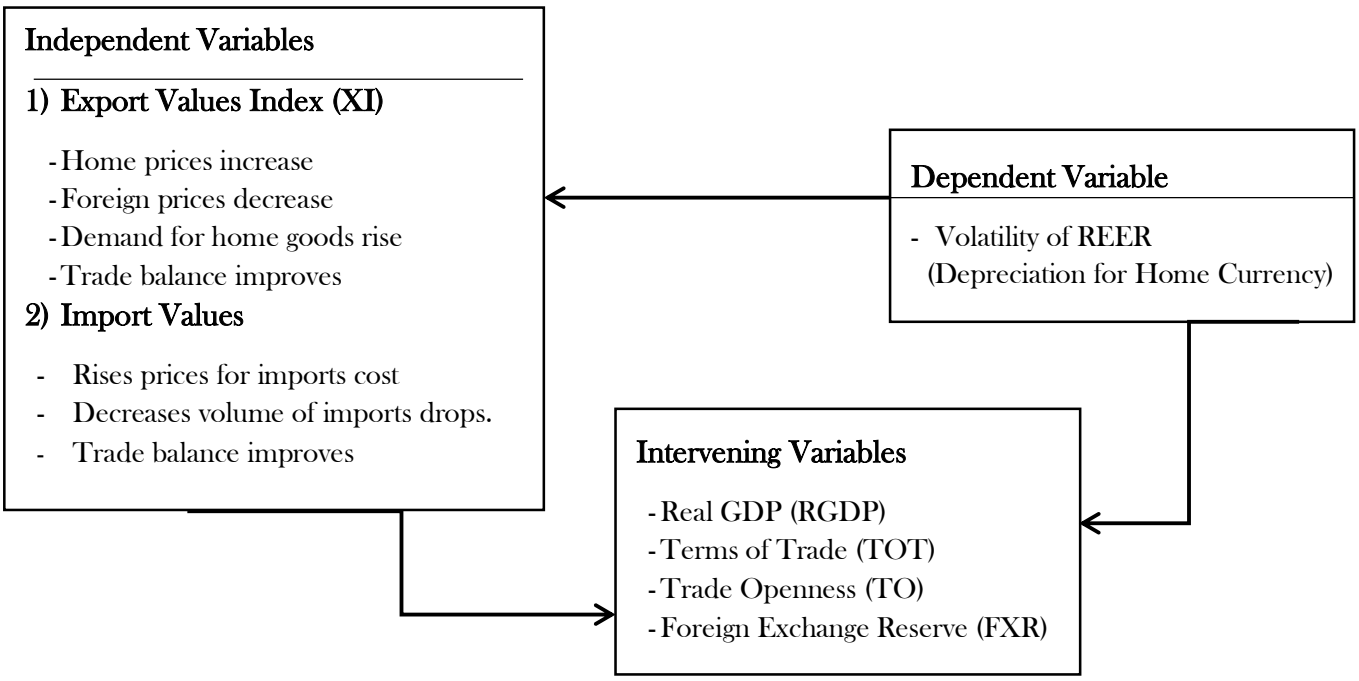

Figure1: Marshall-Lerner Condition (Marshall-Lerner, 1905)

CHAPTER THREE

3. Research Methodology

3.2. Research Design

For the purpose of this study, explanatory research design was chosen to investigate the significant impact and relationship between real effective exchange rate movement in terms of foreign currency appreciation and dependent variables as the prices of import - export (as international trade flows). And a time series design was employed to examine the effects of exchange rate movement on the export and import trade flows. The outcomes at different time points have compared to assess the impact of exchange rate changes.

3.3. Research Approach

Quantitative research approach is employed in this research in the process of collecting and analyzing numerical and time series data for both dependent and independent variables of which currently undertaken. Quantitative research method is important to emphasize objective measurements and the statistical, mathematical or numerical analysis of data collected through different techniques. It is also important in manipulating pre-existing statistical data by using computational techniques (Eviews). Thus, it is believed to get objective result from quantitative viewpoints, data collection, analysis, inference techniques for the broad purpose of breadth and depth of understanding and corroboration (Johnson, 2007, p. 123).

3.4. Data Collection and Analysis

3.4.2. Data Collection

A quantitative time series data from 1981 to 2019 has been collected from National Bank of Ethiopia (NBE) and World Bank Development Indicator (WDI). The data obtained the following variables real effective exchange rate (REERI), export value Index (X), import value index (M), real gross domestic product (RGDP), foreign exchange reserve (FXR), terms of trade (TOT), and trade openness (TO). Data for values of export index (X), values of import index (M) and RGDP have been collected from WDI and the remaining data i.e. REERI, Terms of Trade, Trade openness have been collected from NBE. Data for real effective exchange rate index, terms of trade and trade openness are only maintained by NBE because it recorded at national level. These data sources purposely selected due to the nature and availability of data. Econometric analysis has employed by using econometric software (Eviews Version 10).

3.5. Definition of Variables

In accordance with theoretical and empirical observations from above, and previous studies, like Ahmed Mohamed Ezzar (2018), Kifle W., et al., (2016), Nergiz Dincer & Magida Kandil (2009), Erdal Demirhan & Banu Demirhan, (2015), the researcher considered terms of trade, real GDP growth rates, and trade openness of a country as structural determinants of the REER index. Real GDP growth rates are intended to proxy the existence of the Harrod-Balassa-Samuelson propositions that rapid productivity growth raises the price of non-tradeable goods, which in turn appreciates the REER. The country specific commodity terms of trade represents a net export price index for the overall export trades that are weighted by the ratio of net exports to total commodity trade. A rise or decline in commodity price leads to a rise or decline in the commodity terms of trade of commodity or service exports of the country, whereas it leads to a decline (rise) of commodity (services) terms of trade of commodity (services) imports that is mainly considered as sample.

Next to these, "structural determinants", the researcher also consider the following variables: (i) trade openness, (ii) export volume index and (iii) import volume index. In line with the discussions from the above, the respective variables are supposed to proxy potential to the real effective exchange rate index impacts on international trade. Finally, the following table summarizes the variables used and their respective data sources while the other section presents the descriptive statistics of these variables.

3.6. Source of Data

The researcher used only secondary sources of data. Second data sources are mainly collected from World Bank Database and National Bank of Ethiopia and the detail is explained in the variables definition section (see Table 1 of page 38).

Table 1: Definitions of variables used and their respective sources

Variable name	Definition	Details of calculation	Data sources
lnREER	Real effective exchange rate (Index, 100 =2000 & 100 = 2010) in form of logarithm	Averages of annual data	NBE (2019)
lnRGDP	Real GDP growth (in %) in yearly basis on millions of dollars in logged form	Accumulated GDP and growth rates are calculated	WDI (2019)
lnTOT	Terms of trade is expressed as a ratio that reflects the number of units of exports that are needed to buy a single unit of imports in logged form.	Dividing the unit price of exports by the price of the imports and multiplied by 100 in yearly basis	NBE (2019)
lnTO	The trade openness is the sum of imports and exports to divided by total GDP of the country in logged form	X+M/total GDP in annual basis	NBE (2019) & WDI (2019)
lnXI	Export value index are derived from UNCTAD's value index series and are the ratio of the export value indexes to the corresponding unit value indexes (2000 = 100) in form of logarithm	Qli,t = 100 (VI/UVIi,t)	WDI (2019)
lnMI	Import valuee index are derived from UNCTAD's value index series and are ratio of the import value indexes to the corresponding unit value indexes (2000 = 100) in form of logarithm	Qli,t = 100 (VI/UVIi,t)	WDI (2019)
lnFXR	Foreign currency reserve is a total reserve comprise of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and other holdings of foreign exchange under the control of monetary authorities in current U.S. dollars.	FXR = (Gold + SDR+USD)	WDI (2019)

3.7. Justification of Model Selection

To understand the nature of the series and for future forecasting, a time series economic model was used. Recent development in econometrics have however, revealed that often times, most time series are not stationary. Therefore, the estimation of variables with this relationship most times gives misleading inferences or spurious regression. To overcome this problem of non-stationarity and prior restrictions on the lag structure of a model, econometric analysis of time series data has increasingly moved towards the issue of co-integration. The reason being that, co-integration is a powerful way of detecting the presence of steady state equilibrium between variables (Nkoro, 2016). The researcher has selected the production function formula of (Charle Cobb & Paul Douglas, 1927-1941) that is Cobb-Douglass production function. As such, it is assumed important for the current study by considering the notion that "the production function is central to the marginalist focus of neoclassical economics, its definition of efficiency as allocative efficiency, its analysis of how market prices can govern the achievement of the allocative efficiency in decentralized economy and an analysis of the distribution of income, which attributes factor income to the marginal product of factor input. The (Cobb-Douglass 1941) function was developed by focusing on output (Quantity):

$$Q = f(X1, X2, X3, \dots Xn)$$

Where Q is quantity of output and X1, X2, X3… Xn are factor of inputs such as (labor, capital, land or raw materials). Therefore, the current study examines the impact of real effective exchange rate on export and import prices in addition to other related variables as a factor of inputs. The following model is derived from Cobb-Douglas (Cobb & Douglas, 1941) production function:

$$X = f(REER, RGDP, FXR, TOT, TO)$$

Where X is the export prices in terms of export value in local currency indexes

REER; Real effective exchange rate index

RGDP; Real Gross Domestic Product

FXR; Foreign exchange reserves of the country in terms of birr

TOT; Terms of Trade

TO; Trade openness of the country

$$M = f(REER, RDGP, FXR, TOT, TO)$$

Where M is the import prices in terms of import value index and (REER, RDGP, FXR, TOT and TO) are described above. The study examines the genuine of the following hypothesis according to the theoretical arguments presented above;

Hypothesis 1: The real effective exchange rate has significant positive effect on values of export

Hypothesis 2: The real effective exchange rate has significant negative effect on values of import

Hypothesis 3: There is a short and long – run relationship between real effective exchange rate and values of export – import.

3.7.2. Model Specification

The components of international trade are regressed against real effective exchange rate volatility or changes and other explanatory variables for the corresponding period. These variables are captured in equation 1 below.

$$Trade\ value = \alpha 0 + \alpha 1 Reer \ldots\ldots\ldots\ldots\ldots Eq.(1)$$

Trade value could further be decomposed into export and import trades, thus:

$X = \alpha 0 + \alpha 1 Reer + et$ …… Eq. (2)

$M = \alpha 0 + \alpha 1 Reeri + et$ …… Eq. (3)

Where:

X = Value or growth rate of export trade index

M = Value or growth rate of import trade index

Reeri = Real effective exchange rate index in terms of US Dollar

$\alpha 0$ = the intercept, while α1 is the coefficient or parameters attached to the explanatory variable i.e. real effective exchange rate volatility

e= the error term assumed to be normally and independently distributed with zero mean and constant variance. The addition of the term error or stochastic term in the model is to capture the effect of other variables not included in the model. In order to estimate the effect of real effective exchange rate on exports and imports in Ethiopia, the researcher employed Vector Error Correction Model (VECM). By considering the theoretical approach, the functional form of the model to be employed in this study is specified as follows;

$$X = \beta 0 + \beta 1 Reer + \beta 2 RGDP + \beta 3 FXR + \beta 4 TO + \beta 5 TOT + \varepsilon i \ \ldots\ldots\ldots\ldots\ldots\ Eq.(3.1.)$$

$$M = \beta 0 + \beta 1 Reer + \beta 2 RGDP + \beta 3 FXR + \beta 4 TO + \beta 5 TOT + \varepsilon i \ \ldots\ldots\ldots\ldots\ldots\ldots Eq.(3.2.)$$

Where X: Export

M: Import

Reer: Real effective exchange rate index in the t times

RGDP: Real Gross Domestic Product in the t times

FXR: Foreign Exchange Reserve

TO: Trade openness in the t times

TOT: Terms of Trade in the t times

Ui and Vi are error terms in t times

Economic time series are often analyzed after computing their logarithms or the change in their logarithms. The purpose of the log-linear (L) is because of the value of some variables such as export and import is in millions of dollars, the real effective exchange rate is in hundreds while some others like terms of trade and trade openness are in percentage. There was therefore, the use of logarithm in the model to bring the variables to the same base since the variables were measured in different ways. Secondary, many economic series such as real gross domestic product (RGDP) exhibit growth that is approximately exponential, that is over the long run the series tend to grow by a certain percentage per year on average. If so, the logarithm of the series grows approximately linearly. Thirdly, the standard deviation of many economic series approximately proportional to its level. If so, then the standard deviation of the logarithm of the series is approximately constant. In either case, it is useful to transform the series so that the

changes in transformed series are proportional (or percentage) changes in the original series, and this is achieved by taking the logarithm of the series. Therefore, the equation is developed as follows;

The following model is developed for this research;

a) For the REERI versus export trade of the country

$X = \beta 0 + \beta 1 lnREERI + \beta 2 lnRGDP + \beta 3 lnFXR + \beta 4 lnTOT + \beta 5 lnTO + \acute{\varepsilon} \ldots\ldots\ldots\ldots\ldots\ldots Eq$ (1)

Where; β_0 is the slope of the y-intercept

β1, β2, β3 and β4; are the repressors

X: is the export value index of the country recorded in the period of the study

lnREERI; is the logarithm of real effective exchange rate index during the period of the study

lnRGDP; is the logarithm of real gross domestic products recorded during the period of time

lnTT: is the log of terms of trade during the period

lnTO: is the logarithm of trade openness of the country during the study period

ɛi; is the error term of i's observation

b) For the REERI versus import trade of the country

$M = \beta 0 + \beta 1 lnREERI + \beta 2 lnRGDP + \beta 3 lnFXR + \beta 4 lnTT + \beta 5 lnTO +$

$\acute{\varepsilon} i \ldots\ldots\ldots\ldots\ldots\ldots\ldots Eq$ (2)

Where; β0, is the y-intercept (constant term)

M: is the import value index of the country

lnREERI; is the logarithm of real effective exchange rate index during the period of the study;

lnRGDP; is the logarithm of real gross domestic products recorded during the period of time;

lnFXR: is the foreign exchange reserve during the time in a logarithm

lnTOT: is the log of terms of trade during the period

lnTO: is the logarithm of trade openness of the country during the study period

ɛi; is the error term of i's observation

3.8. Method of Analysis

In order to avoid non stationary problem in time series data, the researcher employed the Augmented Dickey-Fuller (ADF) test to test the stationary status of the variables used in the equation above. The presence of unit root in the series means that the variable is not stationary, hence the degree or order of integration is one or higher. While the absence of unit root means that the time series under consideration is stationary. To study the absence of random walk in the time series under consideration, a unit root is performed. This is done in order to find out the nature of the stationary of the data and in order to avoid spurious regression model.

Step1: Conducting Unit Root Test: The unit root test has applied by using Augmented Dickey-Fuller Test (ADF). The result of the test on the time series data has been compiled in fourth chapter.

Step 2: Johansen and Juselius Co – integration test

Sometimes, two or more series have the same stochastic trend in common. In this special case, referred to as co integration, regression analysis can reveal long run relationship among time series variables. According to (Soren Johansen, 1991; Katarina Juselius, 1990), co – integration can be used to confirm whether there exists a linear long run economic relationship among variables. For time series that are individually I (1), that is, contain a unit root. The co – integration of the series is an important condition for the existence of long run relationship. Therefore, this step is used to find out to whether two or more variables are co-integrated or not. The test is useful for establishing a long run relationship between time series macroeconomic variables, as most of the macroeconomic variables are non-stationary in their levels, trend over time and seem to follow random walk. Co-integration technique provides a means to avoid the non-stationary time series generated spurious regressions.

Step 3: Vector Error Correction (VEC)

The VECM was developed to observe and estimate both long run and short run effect of one time series on another, and to test the stability of the long run. According to (Engle & Granger, 1991), it is posited that when the variables are co – integrated, the dynamic relationship can be specified by an error correction representation in which an error term (ECT) calculated from long run equation has to be added in order to capture both short and long run relationships. Co-

integration is concerned with restoration of equilibrium of the variable in the long run if there is deviation in the short run. The error correction model is specified below;

$$lnREERI = \alpha 0 + \alpha 1ect + ui$$

In this study, the researcher used time series data for 39 years (i.e. 1981 to 2019). The researcher has chosen to source some data from World Bank Development Indicators (WDI) because it has reputation of providing accurate country data for many countries around the world. And some other data have been collected from National Bank of Ethiopia due to data availability and relevant at national level. The variables regressed are as follows;

Export Value Index: exports indicate the aggregate prices of goods and or services exported or traded to the rest of the world. For example, the value of merchandize, freight, insurance, services, etc. They do not include compensations of the employees and investment income (formerly called factor services) and transfer of payments.

Imports Value Index: imports show the aggregate prices of all goods and or services imported from the rest of the world to Ethiopia. For example; merchandize, freight, transportation, equipment, etc. They do not include the compensation of employees and investment income (formerly called factor services) and transfer of payments.

Real effective exchange rate Index: The real exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs (World Bank, 2010). It is also weighted average of a country's currency in relation to an index or basket of other major currencies. The weights are determined by comparing the relative trade balance of a country's currency against that of each country in the index (World Bank, 2010). It is calculated by base year 2010 =100 which means it is modified by every ten years. It is sometimes called the country's terms of trade.

Real GDP: It is an inflation adjusted measure that reflects the value of all goods and service produced by an economy in a given year (expressed in base-year prices) and is often referred to as constant price, inflation corrected or constant dollar GDP (WDI, 2019).

Terms of Trade: International terms of trade (TOT): represents the ratio between a country's export prices and its import prices (WDI, 2019). It measures that how many units of exports are required to purchase a single unit of exports and the ratio is calculated by dividing the price of the exports by the prices of exports and the result is multiplied by 100.

Trade Openness: is one of the most important external real exchange rate fundamentals and is often included as one of the major determinants of REER in the literature since foreign price shocks have accounted for large fluctuations in REERs (Mamta B., Chowdhyry, 1999) of both the developed and developing countries. It is the measures of an economy's level of integration of bilateral trade relative to other countries. In other words, it measures a country's level of liberalization related to trade with the rest of the world. Trade openness is computed as the sum of exports and imports to GDP and represents "TO" (WDI, 2019). It is expected to have a positive impact on international trade inflow in contributing to economic growth. It is also exports plus exports as percentage to GDP. The terms of trade for Ethiopia are calculated as the value of its exports as percent of the value of its imports. An increase in the terms of trade means that the value of exports is increasing relative to the value of imports. The country can afford to buy more imports with the revenue from its exports. For example, an increase in the price of oil increases (improves) the terms of trade for the oil-exporting countries and lowers it for the other countries (WDI, 2019).

Foreign Exchange Reserve: Foreign currency reserve is total reserves (includes gold, current US Dollar) in Ethiopia. The total reserves comprise holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and other holdings of foreign exchange under the control of monetary authorities. The gold component of these reserves is valued at year end-December 31) London prices. Data are in current U.S. dollars (WDI, 2019; World Bank, 2019).

3.9. Diagnostic Tests

Economic techniques are used to estimate economic models which ultimately allow someone to explain how various factors affect some outcome of interest and to forecast future events. Ordinary Least Square (OLS) technique is the most popular method of performing regression analysis and estimating econometric models because, in standard situations (meaning the model satisfies a series of statistical assumptions) it produces optimal (the best possible) results.

The proof that OLS generates the best results is known as the Gauss-Markov Theorem, but the proof requires several assumptions. These assumptions known as the classical linear regression model (CLRM) assumptions were considered in this research. These are desirable properties of OLS estimators and require separate discussion in a detailed manner. In this case, due to the behavior of the time series data only four assumptions were considered and tested in the overall model specification.

1) **Assumption 1: No Heteroscedasticity**

The error term observations came from the same probability distribution with a constant variance. If the variance of the distribution of the error term changes from each observation or range of observation then we have what's called heteroscedasticity points (Gujarat & Porter, 2009; Wooldridge, 2009). Heteroscedasticity (the violation of homoscedasticity) is present when the size of the error term differs across values of an independent variable. It is posited that the impact of violating the assumption of homoscedasticity is a matter of degree, increasing as heteroscedasticity increases (Gujarat, et. al, 2009). It can be expressed in the following mathematical equation.

$yi = \beta 1 + \beta 2Xi + \varepsilon i$ ……Equation (3.5.)

Where:

γi is the residual value which is observed from critical values

β_1 is the parameter of the vectors in the regression

β_2 correspondent values of the explanatory variables considered in the regression

εi is the white noise or the error term

In this case, the hypothesis of null (homoscedastic) and alternative (heteroscedastic) of the Jarque-Bera, a goodness-of-fit test of whether sample data have the skewness and Kurtosis matching a normal distribution for its data validity. The null hypothesis is a joint hypothesis of the skewness being zero and the excess of kurtosis being zero (Carlos M. Jarque & Anil K. Bera, 1980). According to (Robert Hall & David Lilien, 1995), when using Jarqu-Bera test, along with multiple regression analysis, the right estimation is

$$\mathrm{JB} = \frac{\mathrm{n}-\mathrm{k}}{6}\left(S2 + \frac{1}{4}(k-3)2\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Equation(3.6.)$$

Therefore, if the p-value associated to heteroscedasticity test falls below a certain threshold (0.05 critical values), it could be concluded that the data is significantly heteroscedastic (Jarque-Bera, 1980).

2) Assumption 2: No Serial Correlation (independent variables are uncorrelated with the error term)

This assumption is referred to as exogeneity. If an independent variable is correlated with the error term, we can use the independent variable to predict the error term, which violates the notion that the error term represents unpredictable random error. As such, we need to find a way to incorporate that information into regression model itself. When this type of correlation exists, there is endogeneity. Violations of this assumption can occur because there is simultaneity between the independent variable and dependent variable, omitted variable bias, or measurement error in the independent variable. Thus it should be noted that violating this assumption biases the coefficient estimate. Therefore, due attention have to be given to ignore bias by bearing in mind that the error term always explains some of the variability in the dependent variable (s) (Jim Frost, 2019). When the residuals are auto correlated, it means that the current values are dependent of the historic (previous) values and that there is a definite unexplained pattern in the Y variable that shows up in the disturbances.

3) The regression model is linear in the coefficients and the error term

This assumption addresses the functional form of the model. It assumes that the relationship is really linear, and that the errors, or residuals, are simply random fluctuations around the true line. It also posits that the variability in the response variable(s) doesn't increase the value of the predictor increase, which means there is equal variance. Regression model is linear when all terms in the model are either constant or a parameter multiplies by an independent variable. Model equation should be built only by adding the terms together. If a linear model makes sense, the residuals will have a constant variance, can be approximately normally distributed with a mean of zero, and be independent of each other. It also discusses that one or more predictor variables explain the dependent (criterion) variable. These rules constrain the model to one type which later be discussed thoroughly in the next chapter.

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \cdots + \beta kXk + \epsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Equation\ (3.7.)$$

In the equation, the betas (βs) are the parameters that OLS estimates. Epsilon (ε) is the random error.

4) Error term should be normally distributed

The observations of the errors are drawn independently from a distribution that a mean of zero (assumption1) has a constant variance. It can be inferred from the shape of distribution and normal distribution is expected.

3.10. Unit Root Test

In order avoid non stationary problem in time series data, it is highly recommended to employ the Augmented Dicky-Fuller (ADF) Test to test the stationary status of the variables used in the research. The presence of unit root in the series means that the variable is not stationary, hence the degree or order of integration is one or higher. While the absence of unit root means that the time series under consideration is stationary. To study the absence of random walk in the time series under consideration, a unit root test is performed. This is done in order to find out the nature of stationary of the data and in order to avoid spurious regression model. To do the analysis of stationarity, the conventional Augment Dicked Fuller test (ADF) by Dickey and Fuller (1979) were used. The objective is to ensure that the variables are not I(2) so as to avoid spurious results. In the case of I(2), the results can be spurious which makes the (VECM) bound test not suitable (Pesaran & Shin, 1998).

CHAPTER FOUR

4. Results and Discussions

In this chapter, the study analyzed the data collected using statistical tool and presents the result and discussion accordingly by employing Eviews 10.

The purpose of this report was to investigate the impact of real effective exchange rate index (REER) that would have on Ethiopian international trade through the development of export and import with their respective volumes index. In particular, the study examined the interaction of REER index movement or changes against other determinant variables that affects the country's trade practices.

4.2. Econometric Analysis

This chapter contains detailed presentation and discussion of data analysis and the results of this research. The findings are presented under the following major headings: lag length criteria, unit root test, Johansen co-integration, vector error correct model (VECM), and residual tests (major assumptions of statistical test).

4.2.2. Lag Length Selection

In economics and time series studies, the dependence of a variable Y (outcome variable or regressand) on another variable(s) X (the predictor variable or regressor) is rarely instantaneous (Jeferry Wooldridge, 2009; Gujarati & Porter, 2009). Very often Y responds to X with a lapse of time. Such a lapse of time is called a lag. Estimating lag length of vector autoregressive (VAR) process for a time series is a crucial econometric exercise in most economic studies (Venus Khim-Sen Liew, 2004; Gujarat, 2009; Porter, 2009; Wooldridge, 2009). It is aimed to use an optimal lag length by appropriate selection criterion in determining the autoregressive lag length. The most populous and applied techniques in lag determination are; Akaike Information Criterion (AIC) (Akaike, 1973), Shwarz Information Criterion (SIC) (Shwarz, 1978), Hannan-Quinn Criterion (HQC) (Hannan & Quinn, 1979), Final Prediction Error (FPE) (Akaike, 1969) and Bayesina Information Criterion (BIC) (Akaike, 1979). Among these criteria, especially Akaike Information Criterion (AIC) (Akaike, 1973) has been popularly adopted in time series studies; see for examples the works of (Sarantis, 1999 & 2000) which is also considered in this case. The purpose of selecting AIC among others is that in estimating the amount of information lost by a model, AIC deals with the trade-off between the goodness-of-fit of the model and the

simplicity of the model (Hirotugu Akaike, 1979). In other words, AIC deals with both the risks of overfitting and the risk of under fitting. This is mainly due to the fact that if the lag length increases, specifically for small sample size, it leads to spurious regression result and thus reduces confidence interval (Gujarat, 2009; Porter, 2009; Wooldridge, 2009).

Hence, before estimating of a time series equation, it is necessary to decide on the maximum lag length by using appropriate lag length selection criteria. In this case, Akaike Information Criterion (AIC) (Akaike, 1979) is employed to derive the optimal lag length though vector autoregressive (VAR) techniques. The formula for AIC is as follows;

Akaike information criterion, $AICp = -2log + 2k + (2k(k+1)/(n-k-1)$……Eq.2

Where:

- n= sample size,
- k=number of model parameters,
- Log-likelihood is a measure of model fit.

Table 2: Lag Structure

VAR Lag Order Selection Criteria						
Endogenous Variables: LNREERI LNMI LNFXR LNRGDP LNTT LNTO LNXI						
Exogenous Variables: C						
Included Observations: 36						
Sample: 1981 2019						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	253.9329	NA	1.61e-16	-13.66294	-13.31104	-13.54012
1	481.5531	341.4303	1.98e-20	-22.75295	-19.58591	-21.64757
2	586.7314	111.0215	3.53e-21	-25.04063	-19.05845	-22.95269
3	763.6217	108.0997*	4.65e-23*	-31.31232*	-22.51499*	-28.24182*

*indicates lag order selected by the criterion

LR: sequential modified LR test statistics (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Shwarz information criterion

HQ: Hannan-Quinn information criterion

As it can be seen from the above table, the optimal lag length for this data set is lag3 as represented by * under AIC selection criteria with the model parameters of -31.31232*. Therefore, for the total observation of 39 data set, the appropriate lag length (optimal lag length) here is 3 (three) as it is later reduced to 2 as per the VECM model selection criteria since the data is recorded in annual basis. Therefore, it can be concluded that the optimal lag for this time series is 3, which is later reduced to 2 in VECM equation as the rule of thumb (Damodar Gujarati, 2009; Wooldridge, 2009).

4.2.3. Unit Root Test

Since macroeconomic time series data are usually non-stationary (Nelson and Plosser, 1982), it is thus conducive to spurious regression. In order avoid this, it is important to test for stationarity of time series at the outset of co-integration analysis. Non stationary problem in time series data can be detected by employing a unit root of Augmented Dicky-Fuller (ADF) Test to test the stationary status of the variables used in the research (Dickey and Fuller, 1979). The presence of unit root in the series means that the variable is not stationary, hence the degree or order of integration is one or higher. While the absence of unit root means that the time series under consideration is stationary. To study the absence of random walk in the time series under consideration, a unit root test is performed.

This is done in order to find out the nature of stationary of the data and in order to avoid spurious regression model. To do the analysis of stationarity, the conventional Augment Dicked Fuller test (ADF) by Dickey and Fuller (1979) were used. The objective is to ensure that the variables are not I(2) so as to avoid spurious results. In the case of I(2), the results can be spurious which makes the (VECM) bound test not suitable (Pesaran & Shin, 1998). The table below indicates results of the test on the time series data using Augmented Dicky-Fuller test. For this purpose, the researcher conducted an Augmented Dicky-Fuller (ADF) test, which is based on the ratio of the parameter in the following regression.

$$\Delta Xt = k + \text{ᔓ} + \boldsymbol{\Theta i X}\text{t} - \text{i} + \sum_{i=1}^{n} \varphi i \Delta Xt - i + \boldsymbol{\varepsilon t} \ldots\ldots\ldots\ldots\ldots \textbf{Eq (1)}$$

Where X is the variable under consideration, Δ is the first difference operator, t captures time trend, εt is a random error, and n is the maximum lag length. The optimal lag length is defined so as to ensure that the error term is white noise. While k,Θ and φ are the parameters to be

estimated. If we cannot reject the null hypothesis $\Theta = 0$, then we conclude that the series under consideration has a unit root and is therefore non-stationary. It is thus, essential at the onset of co – integration analysis, that the researcher should solve the problem of optimal lag length because multivariate co – integration analysis which the researcher is going to conduct in the study is very sensitive to lag length selection. The two most commonly used lag length selection criteria are the Akaike Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC). Although there are several different ways to report the criteria, the researcher selects the same lag length. For this study, the Akaike Information Criterion (AIC) was applied and the result is explained below (see Table 3).

Table 3: Unit Root test (ADF) (MaxLag=3)

Variables	Level		Decision	1st Difference		Decision
	F-statistics	Probability		F-statistics	Probability	
lnReer	-1.769753	0.3893	Not stationary	-6.259487	0.0000	I (1) at 1%
lnRGDP	1.299794	0.8603	Not stationary	-2.807355	0.0675	I (1) at 10%
lnFXR	-0.816907	0.8028	Not stationary	-5.367098	0.0001	I(1) at 1%
lnMI	0.035722	0.9559	Not stationary	-9.994197	0.0000	I(1) at 1%
lnXI	-0.487768	0.8827	Not stationary	-5.814985	0.0000	I (1) at 1%
lnTT	-2.322867	0.1707	Not stationary	-7.319901	0.0000	I (1) at 1%
lnTO	-1.469648	0.5379	Not stationary	-6.124455	0.0000	I (1) at 1%

Source: Author's computation, Eviews 10

The Augmented Dicky-Fuller (ADF) test result in the table above indicates that all the variables have a unit root after first difference I(1). This implies that all variables (real effective exchange rate index, real GDP, export value index, import value index, terms of trade and trade openness) are not stationary in levels. As proven by its F-Statistics result and their respective probability values (See Table 3), high and less than 0.05 levels, the variables become stationary at first difference which is an evidence to select VECM model for this case.

Sometimes, two or more series have the same stochastic trend in common. In this special case, referred to as co-integration, regression analysis can reveal the long-run relationship among time series variables (Johansen, 1989). According to Johansen (1991), co-integration can be used to confirm whether there exists a linear long – run economic relationship among variables. For time series that are individually I (1), that is contain a unit root. The co – integration of series is an

important condition for the existence of long – run relationship. Johansen-Juselius (1979) approach provides a test for co – integration and reveals number of co – integration relationships. This procedure uses two tests to figure out the number of co – integration equations; the trace and the maximum Eigen value tests. The co – integration test results of the Johansen co – integration tests are given in the following tables.

4.2.4. Johansen Co-integration Test

Since the unit root test result states that the variables are co – integrated of order one, which is stationary at first difference, in this scenario it is assumed that the variables are stationary at first difference and they are I(1) as well as integrated of order one. Thus, it is necessary to perform a co – integration test to establish a long-run relationship by using Johansen co – integration (Johansen, 1988). The purpose of applying Johansen co-integration (Johansen, 1988), is that it has proposed a framework of estimating and testing of vector correction model (VECM) based on vector autoregressive (VAR) equation with which the researcher can find out how many co-integrating relationships exist among the variables. Hence, the researcher can assume that there is long run relationship in the model (Gojarat, 2009). To assure this fact, two prominent co – integration tests for I (1) series have been discussed and applied by different scholars, that is Engel Granger Co – integration test and Johansen Co – integration tests with two possible test results (trace tests and maxeignen). One thing should be noted that co – integration test should be performed on the level form of the variables and not on their first difference. Thus, the variables have been tested with log transformation of raw variables in this case. The decision criteria here is that rejecting null hypothesis if the value of Trace and Max Statistics is greater than 5% critical level, or otherwise, fail to reject the null hypothesis (Gojarat, 2009; Porter, 2009; Wooldridge, 2009).

Table 4 (1): Johansen Cointegration Test for Import Value

Trend assumption: Linear deterministic trend				
Series: LNXI LNREERI LNFXR LNRGDP LNTO LNTOT				
Lags interval (in first differences): 1 to 3				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.974258	323.5072	95.75366	0.0000
At most 1 *	0.917295	195.4195	69.81889	0.0000
At most 2 *	0.863876	108.1828	47.85613	0.0000
At most 3 *	0.508650	38.38613	29.79707	0.0040
At most 4	0.318284	13.51517	15.49471	0.0972
At most 5	0.003000	0.105170	3.841466	0.7457

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Own computation (Eviews 10)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistics	0.05 Critical Value	Prob.**
None *	0.974258	128.0878	40.07757	0.0000
At most 1 *	0.917295	87.23662	33.87687	0.0000
At most 2 *	0.863876	69.79671	27.58434	0.0000
At most 3 *	0.508650	24.87096	21.13162	0.0142
At most 4	0.318284	13.41000	14.26460	0.0679
At most 5	0.003000	0.105170	3.841466	0.7457

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

It can be seen that the trace statistic is computed to be (323.5072 & 95.75366), (195.4195 & 69.81889), (108.1828 & 47.85613), and (38.38613 & 29.79707) for trace statistics and critical values respectively for the hypothesized number of coefficients; none, almost 1, almost 2 and almost 3 respectively. This indicates a rejection of the null of no co-integrating equation. Thus, the alternate hypothesis of four co-integrating equations is accepted.

Similarity, the Max-eigenvalue test indicates four co-integrating equation(s) at the 0.05 level (statistic = 128.0878, 87.23662, 69.79671, and 24.87096) with (critical values = 40.07757, 33.87687, 27.58434, and 21.13162), respectively. These results indicate that there exists a sustainable long run equilibrium relationship between variables import value index, real effective exchange rate index, foreign exchange reserve, real GDP, trade openness, and terms of trade, respectively in logged form. This is therefore, it can be concluded that there are at least four co-integrating variables in the test result from the respective equation.

Table 4 (2): Johansen Cointegration Test for Export Value

Trend assumption: Linear deterministic trend				
Series: LNXI LNREERI LNFXR LNRGDP LNTO LNTOT				
Lags interval (in first differences): 1 to 3				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.965118	296.0877	95.75366	0.0000
At most 1 *	0.901857	178.6349	69.81889	0.0000
At most 2 *	0.803455	97.38825	47.85613	0.0000
At most 3 *	0.532410	40.44798	29.79707	0.0021
At most 4	0.273725	13.84224	15.49471	0.0874
At most 5	0.072875	2.648337	3.841466	0.1037

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Own computation (Eviews 10)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistics	0.05 Critical Value	Prob.**
None *	0.965118	117.4528	40.07757	0.0000
At most 1 *	0.901857	81.24661	33.87687	0.0000
At most 2 *	0.803455	56.94027	27.58434	0.0000
At most 3 *	0.532410	26.60574	21.13162	0.0077
At most 4	0.273725	11.19391	14.26460	0.1448
At most 5	0.072875	2.648337	3.841466	0.1037

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

As it can be seen from the Johansen co-integration result, it has observed that (296.0877, 178.6349, 97.38825, and 40.44798) and (95.75366, 69.81889, 47.85613, and 29.79707), have a co-integration equation for trace statistics and critical values respectively for the hypothesized number of coefficients, none*, almost 1, almost 2 and almost 3 respectively. This indicates a rejection of the null of no co-integrating equation. Thus, the alternate hypothesis of four co-integrating equations is accepted at the 0.05 level. Therefore, there is sustainable long run equilibrium relationship among the export value index, real effective exchange rate index, real GDP, foreign exchange reserve, trade openness and terms of trade.

Similarity, the Max-eigenvalue test indicates there are four co-integrating equation(s) at the 0.05 level (Max-Eigen statistic = 117.4528, 81.24661, 56.94027 and 26.60574) with (critical values = 40.07757, 33.87687, 27.58434, and 21.13162), respectively. These results indicate that there exists a sustainable long run equilibrium relationship between variables export value index, real

effective exchange rate index, foreign exchange reserve, real GDP, trade openness, and terms of trade, respectively in logged form. Overall, if series are co – integrated, that is they exhibit a long – run relationship, it implies that the series are related and can be combined in a linear fashion. That is, even if there are shocks in the short run, which may affect movement in the individual series, they would converge with time in the long – run). Hence, since there is a long – run co – integrating equation, it is necessary to estimate both short – run and long – run models. To do so, the appropriate estimation technique for this case is the vector error correction (VEC) model (Gojarat & Porter, 2009; Wooldridge, 2009).

4.2.5. Empirical Results

4.2.5.1. VECM Equation for Import Value Index

4.2.5.1.1. A Long Run Dynamics (Import Value Index)

Also, as we can see from the Johansen normalization result, LNMI (the logged form of import value index), is positioned as the target variable (dependent variable). The result shows that there are four co – integrating equation in the long – run (see table 4(a)). The result confirm the existence of long run relationship among import value index taken as dependent variable, real effective exchange rate index, real GDP, foreign exchange reserve, trade openness and terms of trade as independent variables for Ethiopia.

From the results, of co-integration tests discussed hereinabove, there exists all co-integrating vector among variables, thus here it can be estimated that the long run relationship for imports and exports of the country. The long run relationship for exports and imports and their explanatory variables was given by normalizing exports and imports separately and dividing each of the co-integrating coefficients by the coefficients of exports and imports respectively.

The long run equation of Import Value Index is derived as follows;

$$lnMI = \beta 0 + \beta 1 lnReeri + \beta 2 lnRGDP + \beta 3 lnFXR + \beta 4 lnTO + \beta 5 lnTOT + \varepsilon i \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots Eq.(4.1.)$$

According to the model of import value index above, the researcher found four long run relationship between import value index and other variables; the real effective exchange rate, foreign exchange reserve, real GDP growth and trade openness have shown a negative effect on import values of Ethiopia while terms of trade has shown a positive effect on import value of the country (See Table 4(a) and 4 (b).

The findings revealed that a percentage change in real effective exchange rate of the country, all other thing being constant will lead to decrease in imports of the country in terms of value. The coefficient of -0.1599 implies that a unit increase in real effective exchange rate of Ethiopia will lead to decrease of imports by 0.1599. This result is consistent with the theory and hypothesis of "the real effective exchange rate has a negative and significant impact on import trades."

This result is supported by some other study conducted in the country by (Nandeeswara Rao P., & Tassefw Tufera T., 2016). The co-authors conducted the determinants of real exchange rate in Ethiopia by using 1971 to 2010 time series data and confirmed that real exchange rate has had a direct effect on trade; particularly on international trade of the country. The researchers used the same VECM model for their research and found that foreign exchange reserve that is one of the variables under current research has found to be significant. Overall they conclude that the results of both long run and short-run models mostly suggested that the fluctuations of real effective exchange rates were found to be predominantly responds to monetary policy shocks than fiscal policy shocks.

On the other hand, another academic result got by (Boopen Seetanah, Zameelah Khna J & Noor-Ul Hacq S., 2020) confirmed that terms of trade GDP per capita, net foreign assets and trade openness were found to be key factors that cause fluctuation in the real effective exchange rate for most Sub-Saharan African countries in the long run. The study has selected 15 Sub-Saharan African countries to analyze the determinants of cross-country real effective exchange rate by using ARDL model that covers annual time series data from 1980 to 2015.

Also a country's foreign exchange reserve exerts negative effect on import values. The coefficient of -0.0488 of foreign exchange reserve implies that a unit increase in foreign exchange reserve of the country will lead to 0.0488 decrease in import values. This result is surprisingly consistent with major object of holding foreign currency assets that foreign currency is reserved by central bank in order to back liability as well as to influence monetary policy of a particular country. It is a common practice in countries around the world for their central bank to hold a significant amount of reserves in their foreign exchanges (DOC, 2019). DOC is a research institute of Korean Origin asserts macroeconomic views towards holding adequate foreign exchange reserve. It asserts that in the long run, it is suggested that foreign exchange reserves (FOREX) should be enough to manage shocks by accounting for around six months' worth of

imports and should not be used to manipulate exchange rates by underpricing through large accumulations of FOREX, as many East Asian countries have done.

Other variable (Real GDP) has a negative effect on import values of Ethiopia. The coefficient of (LNRGDP = -1.3236) reveals that a unit change real GDP growth will lead decrease of the country's import value by 1.3296, which in other hand paves way for export promotion. This is supported by empirical evidences (Scott A., Wolla, 2018) as exerted that imports reduce economic output of one country in a manner that for instance, in nearly every quarter since 1976 net exports (X-M) have been negative which seems to imply that trade reduces domestic output and growth, which can also influence the people's perspective on trade. This essay explains that the imports variable (M) corrects for the value of imports that have already been counted as personal consumption (C).

On the other hand, trade openness of the country exerts a negative effect on import value of the country. The coefficient of (LNTO = -1.2223) implies that a unit increase in trade openness of the country reduces the import value by 1.2223 on average ceteris paribus. The evidence shows that the more open the country's international trade the less likely to import goods from abroad as a result of foreign direct investment. This result also reaffirms that trade protectionism (Halit Yanikkaya & Abdullah Alton, 2021, pp.973-995) is has potential to increase import trade of the country while export is likely expected to grow simultaneously. This result is supported by a study conducted in Uganda (Stephen Esaku & Miao Wang, 2021) positing that an encouragement to more trade and imports, at policy level is advisable to embody technology or immediate inputs which is essential in the production process that could also increase economic growth in the long-run while expanding the scope of exports and imports is important in the short run.

This result is consistent with the notion that trade openness is generally accepted to play a role in the determination of currency crisis. Regarding to this, several studies have been conducted to see the inter-relationship between trade openness and international trade. For instance, (Glick, R., & Hutchison, M. M. 2013), greater trade integration reduces a country's financial fragility and the likelihood of a currency crisis by increasing both the ability and willingness to service external obligations. It is also highly asserted that a greater export ratio decreases the likelihood

of sharp reversal of capital flows, as the country is more able to service its foreign currency denominated debt (IMF, 2002b).

Terms of trade shows a positive effect on import value of the country; a coefficient of 0.067 implies that a unit change or increase in terms of trade will lead the country's import value to increase by 0.067 on average ceteris paribus in the long run (See table 5 (1.1.)) below.

This result is supported by (IMF, 2009) conducted as the price and volumes of international trade: background, purpose and uses of export and import price indices; with the argument that changes in the ratio of export to import prices have a direct impact on changes in the real income of the country. This statement is explained with the assumption that, if the prices of a country's exports rise faster (or fall more slowly) than the prices of its imports (i.e., if its terms of trade improve) fewer exports are needed to pay for a given volume of imports. Thus, an improvement in the terms of trade, or a trading gain, (IMF, 2009) makes it possible for an increased volume of goods and services to be purchased by residents out of the incomes generated by a given level domestic production – the real income of a country increases.

Table 5(1): Long Run VECM Equation (Import Value Index)

Co-integrating Eq:	**CointEq1**
LNMI(-1)	1.000000
LNREERI(-1)	-0.159933
	(0.14472)
	[-1.10512]
LNFXR(-1)	-0.049853
	(0.04884)
	[-1.02080]
LNRGDP(-1)	-1.329685
	(0.12725)
	[-10.4492]
LNTO(-1)	-1.222380
	(0.11746)
	[-10.4066]
LNTOT(-1)	0.067481
	(0.26689)
	[0.25284]
C	7.515601

$$ECT\ t-1 = [1000lnmi - 0.159933lnreeri - 0.049853lnfxr - 1.329685lnrgdp - 1.222380lnto + 0.067481lntot - 7.515601]$$

4.2.5.2. VECM Equation for Export Value Index

4.2.5.2.1. A Long Run Dynamics

Also, as we can see from the Johansen normalization result, LNXI (the logged form of export value index), is positioned as the target variable (dependent variable). The result shows that there are four co – integrating equation in the long – run (see table 4(b)). The result confirms the existence of long run relationship among export value index taken as dependent variable, real effective exchange rate index, real GDP, foreign exchange reserve, trade openness and terms of trade as independent variables for Ethiopia. From the results, of co-integration tests it is discussed hereinabove, based on the findings of all co-integrating vector among variables. Here it is estimated the long run relationship for exports of the country. The equation was derived from normalized vectors. The long run relationship for exports and imports and their explanatory variables was given by normalizing exports and dividing each of the co-integrating coefficients by the coefficients of exports. The long run equation of export Value Index is derived as follows;

$$lnXI = \beta 0 + \beta 1lnReer + \beta 2lnRGDP + \beta 3lnFXR + \beta 4lnTO + \beta 5lnTOT + \varepsilon i \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots Eq.(4.1.)$$

According to the model of export value index above, the is it revealed that there exists four long run relationships between export value index and other variables; the real effective exchange rate, foreign exchange reserve, real GDP growth, trade openness and terms of trade have shown a negative effect on export values of Ethiopia. The findings revealed that a percentage change in real effective exchange rate of the country, all other thing being constant will lead to decrease in export values of the country. The coefficient of -0.301303 implies that a unit increase in real effective exchange rate of Ethiopia will lead to decrease of export value by 0.30. This result is the opposite of the assumption that an increase appreciation of foreign currency will promote export trade while decreasing domestic price (Marshall and Lerner, 1905). A study conducted by (Yisehak Teka Nibere, 2016) in his research which was aimed to look the impact of foreign exchange depreciation on Ethiopian export performance found a mixed result. He found out that the foreign exchange is overvalued during the time, which resulted in the export performance to increase hand on hand. He also added that gradual depreciation of local currency value on export performance was not profounding by asserting that the country's major export his highly

dependent on agricultural products especially, on coffee export. This may be the reason why the country's export performance is not enhanced as expected by monetary policy taken through time.

This result is also supported by other empirical result; for instance, (Yisehak Teka N., 2016) argued that the depreciation of local currency on export performance is not profounding due to the reason that Ethiopia's total production and productivity is by far low as compared to its competitors in order to get price competitiveness that results from depreciation of local currency. Likewise, depreciation of local currency did not discouraged the import as majority of imports of the country are either capital goods which are not locally produced or basic necessity of goods that have excess demand from the people (Yisehak, 2016). Similar study conducted on Bangladesh by (Rubana Hassan, Shmapa Chakraborty, Nasrin Sultana & Md. Mokhlersun Rahaman, 2016) confirmed that appreciation of real effective exchange rate has a negative impact on real export earnings of Bangladesh. They conducted such study to estimate the long and short-run effects of real effective exchange rate (REER) by using annual time series data for the period covering from 2003 to 2015 by employing error correction model and confirmed that the REER has a significant impact on real export earnings in the long-run while it has no significant impact on short run.

A study in Pakistan (Mohammed Siddique, Ahsan Anwar, & Mohammed Abdul Quddus, 2020) exerted that devaluation of REER has a positive effect on selected real comparative advantage index value of the country and helps enhance Pakistan's export trade meanwhile appreciation of REER is having an adverse impact. They have conducted the impact of real effective exchange rate on revealed comparative advantage and trade of Pakistan by applying linear autoregressive distributed lag (ARDL) technique to test asymmetric evidence and concluded that REER depreciation is useful to decrease trade balance deficit of the country for the period covering from 1980 to 2018 (Mohammad S., et. al., 2020).

Also a country's foreign exchange reserve exerts negative effect on export values. The coefficient of -0.1794 of foreign exchange reserve implies that a unit increase in foreign exchange reserve of the country will lead to 0.1794 decrease in export values – export earnings.

This result is supported by a study conducted by Asian Development Bank Institute (ADBI) which was co-authored by (Fukuda S., & Kon Y., 2010) positing that an increase in foreign

exchange reserves raises external debt outstanding that resulting in shortening of debt maturity. This implies that the foreign exchange reserve is like to be leveraged to reduce debt than enhancing export earnings. The authors (Fukuda S., et. al., 2010) were aimed to explore possible long-run impacts of foreign exchange accumulation on macroeconomic variables in developing countries by analyze simple open economy model for the period of 1980 to 2005. Thus, they concluded that the increased foreign exchange reserves might lead to a decline in consumption however, when the tradable sector is capital intensive, the increase may enhance the investment and economic growth (Fukuda S., et. al., 2010) but this disappears when its impact could well be controlled through investment.

Other variable (Real GDP), has a negative effect on export values of Ethiopia. The coefficient of (LNRGDP = -0.50) reveals that a unit change real GDP growth will lead decrease of the country's export value by 0.50. On the other hand, trade openness of the country exerts a negative effect on export value of the country. The coefficient of (LNTO = -1.688) implies that a unit increase in trade openness of the country reduces the export value by 1.688 on average ceteris paribus. Terms of trade also shows a negative effect on export values of the country; a coefficient of -1.260 implies that a unit change or increase in terms of trade will lead the country's import value to decrease by 1.260 on average ceteris paribus in the long run (See table 5 (2)).

Table 5(2): A Long Run VECM Equation (Export Value)

Co-integrating Eq:	**CointEq1**
LNXI(-1)	1.000000
LNREERI(-1)	-0.301303
	(0.11694)
	[-2.57645]
LNFXR(-1)	-0.179440
	(0.03669)
	[-4.89010]
LNRGDP(-1)	-0.500082
	(0.10044)
	[-4.97883]
LNTO(-1)	-1.688823
	(0.08977)
	[-18.8132]

LNTOT(-1)	-1.260632
	(0.19430)
	[-6.48791]
C	7.189462

4.2.5.3. A Short Run Dynamics

4.2.5.3.1. Import Value

Table 6(1): VECM Equation for Import Value

Variables	Coefficient	St. Error	T-Statistic	Prob. Value
D(LNMI(-1))	0.105268	0.130546	0.806370	0.4287
D(LNMI(-2))	0.423065	0.111509	3.794007	0.0010
D(LNREERI(-1))	-0.139513	0.150601	-0.926374	0.3643
D(LNREERI(-2))	-0.018783	0.134168	-0.139998	0.8899
D(LNFXR(-1))	-0.133849	0.033324	-4.016658	0.0006
D(LNFXR(-2))	0.094699	0.045944	2.061171	0.0513
D(LNRGDP(-1))	-0.126190	0.442381	-0.285251	0.7781
D(LNRGDP(-2))	-1.441512	0.437387	-3.295737	0.0033
D(LNTO(-1))	-0.260334	0.237581	-1.095769	0.2850
D(LNTO(-2))	-0.076021	0.224491	-0.338637	0.7381
D(LNTOT(-1))	0.551579	0.202493	2.723944	0.0124
D(LNTOT(-2))	-0.464638	0.216631	-2.144839	0.0433
ECM	-0.057705	0.014818	-3.894236	0.0008
$R^{2:}$ = 0.880817 DW : 2.337696 Adj. $R^{2:}$ = 0.810390				

LNMI as a dependent variable

$$\Delta lnmi = a + \Delta lnmi - j + \Delta lnreerit - j + \Delta lnfxrt - j + \Delta lnrgdpt - j + \Delta lntot - j + \Delta lntot + ut$$

$$\Delta lnmi = [-0.686645 lnmi - 0.139513 lnreeri - 0.133849 lnfxr - 0.126190 lnrgdp - 0.260334 lnto + 0.551579 lntot - 0.057705]$$

As we can see from the short run VECM equation, the previous period's deviation from long run equilibrium is corrected in the current period as an adjustment speed of 68.66 per cent.

A percentage change in real effective exchange rate is associated with 0.139513 percent decrease in import value index on average ceteris paribus in the short run. A percentage change in foreign exchange reserve is associated with 0.049 percent decrease in import value index on average ceteris paribus in the short run. Also a percentage change in real GDP is associated with a 0.126190 in import value on average ceteris paribus in the short run. Also a percentage change in trade openness of the country is associated with 0.260334 per cent decrease in import value index on average ceteris paribus in the short run. A percentage change in terms of trade is associated with 0.55 percentage increase in export value on average ceteris paribus in the short run.

4.2.5.3.2. Export Value

Table 6(2): VECM Equation for Export Value

Variables	Coefficient	St. Error	T-Statistic	Prob. Value
D(LNXI(-1))	0.049370	0.142220	0.347139	0.7318
D(LNXI(-2))	0.236432	0.147363	1.604417	0.1229
D(LNREERI(-1))	-0.129167	0.160698	-0.803791	0.4301
D(LNREERI(-2))	-0.448896	0.162441	-2.763445	0.0113
D(LNFXR(-1))	-0.103068	0.052078	-1.979108	0.0605
D(LNFXR(-2))	0.129541	0.062331	2.078271	0.0496
D(LNRGDP(-1))	0.286383	0.537359	0.532945	0.5994
D(LNRGDP(-2))	-0.688717	0.549051	-1.254378	0.2229
D(LNTO(-1))	-0.260334	0.237581	-1.095769	0.2850
D(LNTO(-2))	-0.776596	0.269772	-2.878709	0.0087
D(LNTOT(-1))	-0.442485	0.316997	-1.395866	0.1767
D(LNTOT(-2))	-0.084555	0.263351	-0.321072	0.7512
ECM	0.024682	0.020393	1.210314	0.2390
$R^{2:}$ = 0.762491 DW : 1.739896 Adj. $R^{2:}$ = 0.622145				

LNXI as a dependent variable

$$\Delta lnxi = a + \Delta lnxi - j + \Delta lnreerit - j + \Delta lnfxrt - j + \Delta lnrgdpt - j + \Delta lntot - j + \Delta lntot + ut$$

$$\Delta lnxi = [-0.340117lnmi - 0.129617lnreeri - 0.103068lnfxr + 0.286383lnrgdp - 0.7765lnto - 0.442485lntot + 0.024682]$$

As we can see from the short run VECM equation, the previous period's deviation from long run equilibrium is corrected in the current period as an adjustment speed of -34.01 per cent.

A percentage change in real effective exchange rate is associated with 0.12916 percent decrease in export value index on average ceteris paribus in the short run. A percentage change in foreign exchange reserve is associated with 0.103068 percent decrease in export value index on average ceteris paribus in the short run. Also a percentage change in real GDP is associated with a 0.286383 in export value increase on average ceteris paribus in the short run. This findings support export led-growth hypothesis (Marisen O., & Sarah Pilcher, 2014) insinuating that an increase in exported merchandise leads to subsequent increase in GDP. The findings in some literature state that the similar increase in GDP goes with an increasing percentage of exports. This result is inconsistent to the Null Hypothesis H01: "the real effective exchange rate has a significant positive effect on export values" in case of Ethiopia.

Also a percentage change in trade openness of the country is associated with 0.7765 per cent decrease in export value index on average ceteris paribus in the short run. A percentage change in terms of trade is associated with 0.44 percentage decrease in export value on average ceteris paribus in the short run. The VECM model was developed to observe and estimate both long-run and short-run effect of one times series over another and to test the stability of the long-run. According to Engel and Granger (1991), it was indicated that when the variables are co-integrated, the dynamic relationship can be specified by and error correction representation in which an error correction term (ECT) calculated from the long-run equation has to be added in order to capture both short-run and long-run relationships. This error correction terms has to be statistically significant with a negative sign. This results, is consistent with the theory and empirical evidences discussed in the relationship between trade openness versus real effective exchange rate in the second chapter of this paper. Also the Null Hypothesis (H05) of the research "*the trade openness has a significant linkage between REER and Export – Import values*" has been assured.

As we can review from the tables (5(1.1. and 1.2.)) above, the coefficients of the error correction terms are -0.057705 and 0.024682 for imports and exports respectively. Coefficient value for import is negative and statistically significant while the coefficient value for export is positive and not statistically significant. The insignificance of the coefficient (export in this case) shows the absence of co-integrating relationships in short run. As indicated by the table above, imports at lag one is insignificant while lag two is significant. At lag one, imports apply a positive effect on current import values by 0.105268 whereas, import at lag two have a positive sign. The results reveal that the insignificant effect of import on current import insinuates that the former import cannot be used to batten the future period at lag one and the current import insinuates that the former import can be used to batten the future at lag two. The real exchange rate at both lags (one and two) shows insignificant effect on imports and possesses a negative sign. The existence of a negative value indicates the negative impact on imports while all other things being equal.

The increase in real effective exchange rate will lead to 0.448896 decreases in imports which is theoretically supported and expected to be in imports side of one country. Real GDP at lag one has shown insignificant effect, which means that it has no significant effect on imports and hold positive sign. However, at lag two the result shows that a unit change in real gross domestic product (GDP) will lead to decrease in imports of 1.441512 statistically significant at 5% (0.05) level and hold a negative sign. The country's foreign exchange reserve at both lags (lag one and two) showed a significant effect on import value. The results reveal that a unit change in country's foreign exchange reserve will lead to decrease of 0.103068 imports at lag one while a unit change in foreign exchange reserve will lead to increase of 0.094699 imports at lag two at 10% and 5% critical level.

4.3. Discussion of Results

4.3.2. Major Findings

This research is aimed to investigate the impact of real effective exchange rate (REER) on international trade in terms of export-import values of Ethiopia for the period covering from 1981 – 2019. Therefore, this sub topic contains details presentation and discussion of data analysis and the results of this study. The findings are presented under the following headings:

the impact of real effective exchange rate on both export and import values, short and long-run relationships of the variables. The hypotheses of the research are also presented in this section.

4.3.2.1. REER and Export Values

As it can be seen from the VECM result of long run dynamic, there is a co-integrating equation among the variable (see Table 4(b)). The result confirmed that there is a strong and long run relationship between real effective exchange rate and export value as indexed to it average ceteris paribus. As depicted by long run normalization result, the real effective exchange rate has a coefficient of -0.301303, which implies that a unit increase or appreciation in real effective exchange rate in case of Ethiopia will lead to a decrease of export value by 0.30. This result is shockingly unexpected and opposite of the economic theory that appreciation of foreign currency and depreciating the domestic currency will enhance export trade (Marshall & Lerner, 1905; IMF, 2009; World Bank; 2010, Philbean, 2006; etc.). However, the result is consistent with other empirical results conducted in the country before. For instance, (Yisehak, 2016) in his research conducted to look the impact of foreign exchange depreciation on Ethiopia's export performance found the same result. His findings revealed that gradual depreciation of domestic currency in Ethiopia, especially for export performance is not profounding by asserting that the country's major export is highly dependent on agricultural products specifically on coffee. This may be the reason why the current result has produced the same result. Similarly, the author (Yisehak, 2016) argued that the depreciation of local currency with the aim of enhancing export performance as a policy measurement has failed to achieve the result due to the reason that Ethiopia's total production and productivity is by far low as compared to its competitors in order to get price competitiveness that would result in from depreciation of local currency. Similar study conducted in Bangladesh (Rubana Hassan, Shampa Chakraborty, Nasrin Sultana and Md Mokhlersun Rahaman, 2016) confirmed that appreciation of real effective exchange rate has a negative and significant impact on real export earnings of Bangladesh. They also found that the appreciation of real effective exchange rate has a significant impact on real export earnings in the long – run while it has not significant impact in short term.

Also a study conducted in Pakistan (Mohammed Siddique, Ahsan Anwar & Mohammed Abdul Quddus, 2020) to examine the impact of real effective exchange rate on selected real comparative advantage index of trade found that devaluation of REER has a positive effect on

export trade while appreciation of REER had an adverse impact on export trade of the country (Mohammed S., et. al., 2010). This evidence confirms that appreciation of REER is not profound for developing countries as observed in Pakistan economy in the long run, but may be in the short term. According to World Bank report, (Gabriela Mundaca, 2011) also asserted that an increase in exchange rate volatility leads to uncertainty for agents participating in international trade, and such uncertainty might have a negative impact on international trade flows and participation thereby reducing the advantages of world-wide specialization. It also argued that this is especially crucial and practicing for countries where exchange rate derivatives markets are not yet well developed and the costs of hedging exchange rate risk would be very high. It finally concluded that a high level of exchange rate volatility can deter entrepreneurs from becoming exporters, even though exporting can be highly profitable (Gabriela M., 2011). Thus, depreciation of REER improves export earnings of Ethiopia as argued by (Samuel Elisa K., 2016; Jong Woo Kang, 2016).

The hypothesis H01: *Real effective exchange rate has a positive and significant impact on export value* has been rejected due to the negative sign of the coefficients real effective exchange rate over export value in case of Ethiopia. Therefore, the first hypothesis of the research is rejected and it can be concluded that real effective exchange rate in terms of index for the countries like Ethiopia will have a negative impact on its export values. This implies the countries in developing country should not only focus on depreciating of its home currency but also focus on the development of products what they export in due consideration to market demand elasticities.

4.3.2.2. REER and Import Value

As it can be seen from the (Table 5(1.1.)), the real effective exchange rate in terms of index has shown a negative effect on import values of the country, while other things remained constant. The result depicts that the real effective exchange rate or appreciation has a coefficient of -0.1599 which implies a percentage increase or appreciation in REER will lead to a -0.1599 percentage decrease in import prices. This result is consistent with the theory of appreciation of REER and strongly supports that an increase in REER will decrease the import trade of a country by making the price of imports expensive. The result is supported by other empirical evidence (Nandeeswara Rao P., & Tassew Tufera T., 2016). Theory of exchange rate (i.e. Marshall-Lerner, 1941)) asserts that a real devaluation (in fixed exchange rates) or a real devaluation (in

floating exchange rates of the currency improves the currency account balance of the particular country.

The theory assumes that trade in services, investment-income flows, and unilateral transfers should be equal to zero, so that the trade account is equal to the current account (Marshall-Lerner, 1941). This result is consistent with the hypothesis of "*the REER has a significant and negative impact in import values*." Other empirical evidences have also come up with similar result. For instance, (Kishore G., Kulkami, 2012; Mohammed Siddique, et. al., 2020; Tiblet Nguse, Betgilu Oshora, Maria Fekete F., Anita Tangil, & Goshu Desalegn, 2021; Ionel Bostan, Carmen Toderascu (Sandu), and Bogdan-Narcis Fietescu, 2018; Sujan Kairala, 2018) asserting that the impact of the real effective exchange rate over international trade especially in import has a compatible result with traditional approach to exchange rate. However, some others like (Marc Auboin, et. al, 2012) suspect that the effect of real effective exchange rate on international trade depends on the number of features such as the pricing strategy of firms engaging in international trade and the importance of global production networks. They also assert that the effected might disappear in the long-run, unless some other distortion characterizes the economy of a particular country. Also (Marc A., et. al, 2012) argued that short run effects can exist, but their size and persistence over time would not be consistent across countries.

4.4. Residual Test Results

4.4.2. Residual Test Result of Export

4.4.2.1. Serial Correlation Test (Export)

Table 7(1): Serial Correlation (LM Test)

VEC Residual Serial Correlation LM Tests						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* Stat	df	Prob.	Rao F-stat	df	Prob.
1	37.01902	36	0.4217	1.025092	(36, 51.1)	0.4610
2	42.88288	36	0.1999	1.244942	(36, 51.1)	0.2329
3	20.08425	36	0.9852	0.486858	(36, 51.1)	0.9874

*Edgeworth expansion corrected likelihood ratio statistic.

As we can see from the test the null hypothesis of no serial correlation at 5% significant level is not rejected. Hence, it can be concluded that the model does not suffer from a serial correlation. This indicates that the export model is not suffering from serial correlation due to the fact that the probability values of the residuals at lag 3 is higher than 0.05 % critical level. As a rule of

thumb, if the probability value of the residuals is higher than the 0.05 % confidence interval, it can be concluded that the model has no serial correlation problem (Gujarati & Porter, 2009).

4.4.2.2. Normality Test (Export)

When VECM is used estimating (Johansen, 1988) procedure, normality test is required because the procedure uses the Maximum Likelihood. As a rule of thumb, Jarque-Bera test used to check the normality of residuals (whether residuals are symmetrically distributed or not). In doing so the joint Jarque-Bera (Jarque & Bera, 1987) result needed to be compared with the critical value of 0.05 % significant level. If result of the residuals greater than the 0.05 % critical level it is assumed that the residuals in the model are symmetrically distributed.

In this case, the joint probability value of the Jarque-Bera result (prob. Value = 0.6190) which is greater than the 0.05 % critical value. This implies that the residuals in the model are normally distributed and their maximum likelihood is stable at this rate (See Normality Table).

Table 7(2): Normality Test

Component	Jarque-Bera	df	Prob.
1	2.003534	2	0.3672
2	1.702156	2	0.4270
3	1.340466	2	0.5116
4	1.913727	2	0.3841
5	1.329829	2	0.5143
6	1.675368	2	0.4327
Joint	9.965081	12	0.6190

*approximate p-values do not account for coefficient estimation

Source: Author's computation, Eviews 10.

As we can see from normality test of joint Jarque-Bera result, variables are normally distributed so that the residuals are normally distributed in the model. According to the above result, residuals (1, 2, 3, 4, 5 and 6) are normally distributed with probability value 0.3672, 0.4270, 0.5116, 0.3841, 0.5143 and 0.4327) respectively. Therefore, for the entire model, this implies that the model doesn't suffer from normality cases with joint probability value (prob. 0.6190) which is greater than the critical value (0.05) at 5% significant level (see Table7 above).

4.4.2.3. Heteroscedasticity Test (Export)

Heteroscedasticity refers to a situation where the variance of the residuals is unequal over a range of measured values (Breusch Pagan & and Harvey Godfrey, 1979). If the residuals in the model are not heteroscedastic, which means the residuals are equal over a range of measured values (white noise), the model is stable and hence the data model-fits data (goodness-fit test). Hence, the probability value of the joint residual test is compared with its 0.05 % confidence interval (if the joint prob. Value exceeds the 0.05% critical value) the null hypothesis is rejected.

Table 7(3): Heteroscedasticity test

Joint test:			
Chi-sq	df	Prob.	
555.0552	504	0.0573	

Source: Own computation (Eviews 10)

As we can see from the test result, the model is not heteroskedastic since the joint probability (0.0573) is higher than the critical value (0.05). This assures that the variables are not heteroscedastic from the normality distribution. This implies that the null hypothesis for White's test that the variances for the errors are equal is rejected. And the alternative hypothesis of data is heteroscedastic is accepted with the threshold of probability (0.3868), which is higher than the 5% (0.05) critical values. Therefore, it can be concluded that the error terms in the data are normally distributed (Table 8).

4.4.3. Residual Test Result (Import)

4.4.3.1. Serial (Autocorrelation LM Test)

Table 8(1): Autocorrelation Test (Serial Correlation)

VEC Residual Serial Correlation LM Tests						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	49.88568	36	0.0618	1.533556	(36, 51.1)	0.0791
2	20.26584	36	0.9839	0.491948	(36, 51.1)	0.9863
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	49.88568	36	0.0618	1.533556	(36, 51.1)	0.0791
2	97.58219	72	0.0241	1.466594	(72, 33.0)	0.1127

*Edgeworth expansion corrected likelihood ratio statistic

Source: Own computation (Eviews 10)

As we can see from the test the null hypothesis of no serial correlation at 5% significant level is not rejected. Hence, it can be concluded that the model does not suffer from a serial correlation. This indicates that the export model is not suffering from serial correlation due to the fact that the probability values of the residuals at lag 2 (Prob. = 0.9863 & 0.0027) is higher than 0.05 % critical level. As a rule of thumb, if the probability value of the residuals is higher than the 0.05 % confidence interval, it can be concluded that the model has no serial correlation problem (Gujarati & Porter, 2009).

4.4.3.2. Normality Test

Table 8(2): Normality Test Result

Component	Jarque-Bera	df	Prob.
1	1.227933	2	0.5412
2	1.172556	2	0.5564
3	3.219276	2	0.2000
4	1.202217	2	0.5482
5	8.159169	2	0.0169
6	2.424838	2	0.2975
Joint	17.40599	12	0.1350

*Approximate p-values do not account for coefficient estimation

Source: Author's computation, Eviews 10.

As we can see from normality test of joint Jarque-Bera result, variables are normally distributed so that the residuals are normally distributed in the model. According to the above result, residuals (1, 2, 3, 4, and 6) are normally distributed with probability value 0.5412, 0.5564, 0.2000, 0.5482 and 0.2975) respectively. Therefore, for the entire model, this implies that the model doesn't suffer from normality cases with joint probability value (prob. 0.1350) which is greater than the critical value (0.05) at 5% significant level (see Table7 above). However, one of the variables (5) is found significant. This problem has been resolved in the heteroscedasticity test below (see Table 11).

4.4.3.3. Heteroscedasticity Test

Heteroscedasticity refers to a situation where the variance of the residuals is unequal over a range of measured values (Breusch Pagan & and Harvey Godfrey, 1979). If the residuals in the model are not heteroscedastic, which means the residuals are equal over a range of measured values (white noise), the model is stable and hence the data model-fits data (goodness-fit test). Hence, the probability value of the joint residual test is compared with its 0.05 % confidence interval (if the joint prob. Value exceeds the 0.05% critical value) the null hypothesis is rejected.

Table 8(3): Heteroscedasticity Test

Joint test		
Ch-sq	df	Prob.
564.8306	546	0.2798

Source: Own computation (Eviews 10)

As we can see from the test result, the model is not heteroskedastic since the joint probability (0.2798) is higher than the critical value (0.05). This assures that the variables are not heteroscedastic from the normality distribution. This implies that the null hypothesis for White's test that the variances for the errors are equal is rejected. And the alternative hypothesis of data is heteroscedastic is accepted with the threshold of probability (0.2798), which is higher than the 5% (0.05) critical values. Therefore, it can be concluded that the error terms in the data are normally distributed (Table 11).

4.5. Granger Causality Test

Granger Causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another (John Granger, 1969) and remained a popular method of causality analysis in time series due to its computational simplicity. Since this study is aimed to examine the impact of the real effective exchange rate index in international trade, in terms of export and import volumes, it is thus necessary to see the direction of causality that which one of the variables determines the other in forecasting.

Also as clearly noted by the author, a time series X said to Granger cause Y, if it can be shown, usually through a series to t-test and f-tests on lagged values of X (and with lagged values of Y

also included), that those X values provide statistically significant information about future values of Y. It is intuited that a variable X that evolves over time Granger causes another evolving variable Y if predictions of the values Y based on its own past values and on the past values of X are better than predictions of Y based on Y's own past values. Granger has defined the causality relationship based on two principles; (1) the cause happens prior to its effect and (2) the cause has unique information about the future values of its effect (John Granger, 1969). Given these two assumptions, about the causality, Granger proposed to test the following hypothesis for identification of a causal effect of X on Y: $\mathbb{P}(\gamma(t+1) \in A \mid l(t)\} \neq \mathbb{P}[\gamma(t+1) \in A \mid l - \mathrm{x}(t)]$ (John Granger, 1969).

Where $\mathbb{P}$ refers to probability, $\boldsymbol{A}$ is an arbitrary non-empty set, and $\boldsymbol{l(t)}$ and $\boldsymbol{l} - \mathrm{x}(\boldsymbol{t})$ respectively denote the information available as of time **t** in the entire universe (study), and that in the modified universe in which **X** is excluded. If the above hypothesis is accepted we say that **X** granger – causes **Y**.

Mathematically;

Let y and x be stationary time series. To test the null hypothesis that x doesn't granger cause y, one first finds the proper lagged values of y to include in a univariate auto regression of y:

$$yt = a0 + a1yt - 1 + a2yt - 2 + \cdots + amyt - m + errort$$

Next, the auto regression is augmented by including lagged values of x:

$$yt = a0 + a1yt - 1 + a2yt - 2 + \cdots amyt - m + bpxt - p + \cdots + bqxt - q + errort$$

Multivariate Granger causality analysis is usually performed by fitting a vector autoregressive model (VAR) to the time series. In particular, let $X(t) \in \mathbb{R}dx1$ for $t = 1, \ldots T$be a $d -$ dimensional multivariate time series. Granger causality is performed by fitting a VAR with L time lags as follows;

$$\mathrm{X(t)} = \sum_{r=1}^{L} \mathrm{ArX(t - r)} + \varepsilon\mathrm{(t)}$$

Where $\mathcal{E}t$ is a white Gaussian random vector, and Ar is a matrix for every$r$. A time series Xi is called a Granger cause of another time series Xj, if at least one of the elements $Ar\ (j,i)for\ r =$

$1, \ldots, L$ is significantly larger than zero (in absolute value) (Granger, 1969). The result is explained in the following manner.

Table 9: Granger causality Test

Table 9(1): Granger causality Test (Import)

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREERI does not Granger Cause LNMI	37	4.74143	0.0157
LNMI does not Granger Cause LNREERI		4.27536	0.0226

Source: Own computation (Eviews 10)

According to the granger causality test, it can be seen that the variables (real effective exchange rate and import) of the country hold a bi-directional causality. The findings revealed that the real effective exchange rate granger cause (influence) the import of the country at 0.05 per cent significant. Also the import of the country granger causes the real effective exchange rate at 0.05 significant level. The granger result also states that the null hypothesis of a logged form of real effective exchange rate doesn't granger cause the logged form of import is rejected at 0.0157 which is less than 0.05 critical value. This indicates that there is evidence to reject the null hypothesis which leads to accept the alternative option (see table 12(a)). This result is consistent with the Null Hypothesis 2: "*the real effective exchange rate volatility has a significant negative effect on import values".*

Table 9(2): Granger causality Test (Export)

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREERI does not Granger Cause LNXI	37	3.18958	0.0546
LNXI does not Granger Cause LNREERI		1.07718	0.3526

Source: Own computation (Eviews 10)

As indicated in the table above, the null hypothesis of "real effective exchange rate doesn't granger cause the export trade" is rejected. The result exerts that the real effective exchange rate granger causes (influences) the export trade un-directionally at 10% significance level. However, the null hypothesis of "export trade in terms of value doesn't granger cause the real effective exchange rate" cannot be rejected because there is no evidence. This exerts that a change in real effective exchange rate influences the import trade of the country at 10% significant level while the change in the export value has no significant influence over real effective exchange rate.

Thus, it can be concluded that the export trade in terms of value is dependent (i.e. influenced) by a change in real effective exchange rate hence the sign of the influence is discussed in chapter four as coefficients (see Table 6(1.1.) and Table 12 (b)).

CHAPTER FIVE

5. Conclusion and Recommendation

5.1. Conclusion

This study was aimed to investigate the impact of real effective exchange rate on international trade in terms of export and import in Ethiopia by using annual time series data from 1981 to 2019. Based on the literature review, the researcher found that the effect of exchange rate volatility on foreign trade is an empirical issue rather than theoretical because no theory itself cannot determine the relationship between exchange rate volatility and foreign trade. Results based on unit root test indicate that all variables have got no unit root at levels and became stationary at first difference.

The co-integrating test results of both trace and maximum eigenvalues show the existence of co-integrating equation at 0.05 levels i.e. trace and maximum eigenvalues indicate the existence of long-run relationship between the dependent and independent variables. Based on the findings of all co-integrating vector among the variables the researcher estimated the long run relationship for export and import and their explanatory variables from normalized vectors, and found that an increase of exchange rate all things being equal leads to a decrease of export while an increase in exchange rate leads to decrease in imports values respectively.

The Vector error correction model (VECM) results indicate that the coefficients of error correction term are not statistically significant for import while it is statistically significant for exports values. This insignificance of error correction term implies the absence of short run relationship between import and other variables while the significant side implies the existence of both long run and short run relationship between export values and other explanatory variables. Exchange rate is statistically significant and holds a negative sign at both lags (lag one and two). While other variables such as real GDP, foreign exchange reserve, trade openness, and terms of trade at lag one statistically insignificant and significant at lag two in terms of import.

On the other hand, the VECM results indicate that there is no short run relationship between export and other explanatory variables, except foreign exchange reserve. The findings revealed that the increase in exchange rate leads to affect the level of export in terms of value. The

granger causality test have been used to see the causal effect of one variable on another variables and based on the result, the real effective exchange rate and import value have an effect on each other at 5% significant level while the real effective exchange rate holds uni-directional causality or influence on export trade of the country. This indicates that a unit change in real effective exchange rate influences the import trade and vice versa. On the other hand, it hold true only for real effective exchange rate to influence the export trade of the country. This implies that the country's export trade influenced by the change in real effective exchange rate and the reverse is not true in this case. Basing on the findings, there is a strong evidence that real effective exchange rate is the main factor affecting the international trade in Ethiopia as it negatively affects export as well as import flows.

5.2. Recommendation

The research investigated the impact of real effective exchange rate on international trade in Ethiopia by using a time series data from 1981 to 2019. The findings revealed that there is a long run relationship among export, import and real effective exchange rate suggesting that exchange rate volatility or change appears to be an important factor affecting the international trade of Ethiopia. Establishing the relationship between exchange rate volatility and export/import may help to formulate trade and exchange rate policy.

The findings exerted that the currency fluctuation has an adverse effect on both export and import flows. The establishment of fluctuations in the exchange rate and quantitative determination of the magnitude of the effect such volatility or change might help in focusing on how to alleviate the impact. It appears that if policy makers wish to promote export and demote import in order to improve the balance of trade in Ethiopia, they have to keep an eye on steady appreciation of the exchange rate and to reduce volatility. Furthermore, since the international trade has different determining factors to have a positive effect in one country's foreign trade, other factors should also be considered rather than depreciation of domestic currency of the country. The findings support the importance of including the impact of exchange rate volatility in international trade flow models to avoid the issues omitted-variables bias. To this end, I suggest that future research on this topic and related topic should be done at disaggregated level.

References

Aguirre, A., & Calderón, C. (2005). Real exchange rate misalignments and economic performance. *Documentos de Trabajo (Banco Central de Chile)*, (315), 1-49.

Akwabi, P. R. (2016). *The Effect of Foreign Exchange Rate Volatility on Kenyan Export* Trade (Doctoral dissertation, University of Nairobi).

Anagaw, B. K., & Demissie, W. M. (2012). Determinants of Export Performance in Ethiopia: VAR Model Analysis. *Journal of Research in Commerce & Management*, *2*(5), 94-109.

Auboin, M., & Ruta, M. (2011). The relationship between exchange rates and international trade: a review of economic literature. *Available at SSRN 1955847*.

Auboin, M., & Ruta, M. (2013). The relationship between exchange rates and international trade: a literature review. *World Trade Rev.*, *12*, 577.

Arize, A. C., & Shwiff, S. S. (1998). Does exchange-rate volatility affect import flows in G-7 countries? Evidence from cointegration models. *Applied Economics*, *30*(10), 1269-1276.

Ayen, Y. W. (2014). The effect of currency devaluation on output: The case of Ethiopian economy. *Journal of Economics and International Finance*, *6*(5), 103-111.

Befirdu, E. (2014). Effects of Exchange Rate Devaluation and Its Impact on Trade Balance in Ethiopia.

Breusch, T. S. (1978). Testing for autocorrelation in dynamic linear models. *Australian Economic Papers*, *17*(31), 334-355.

Bofinger, P., & Wollmershäuser, T. (2001). Managed floating: Understanding the new international monetary order.

Calvo, G. A., & Mishkin, F. S. (2003). The mirage of exchange rate regimes for emerging market countries. *Journal of Economic Perspectives*, *17*(4), 99-118.

Colacelli, M. (2008). Export responses to real exchange rate fluctuations: development status and exported good effects. *Columbia University*.

Ćorić, B., & Pugh, G. (2010). The effects of exchange rate variability on international trade: a meta-regression analysis. *Applied Economics*, *42*(20), 2631-2644.

Costinot, A., & Donaldson, D. (2012). Ricardo's theory of comparative advantage: old idea, new evidence. *American Economic Review*, *102*(3), 453-58.

David Ricardo, (1817). Theories of Comparative Advantage. *History of political economy*, *34*(4), 727-748.

Denbel, F. S., Ayen, Y. W., & Regasa, T. A. (2016). The relationship between inflation, money supply and economic growth in Ethiopia: Co integration and Causality Analysis. *International Journal of Scientific and Research Publications*, *6*(1), 556-565.

Demirhan, E., & Demirhan, B. (2015). The dynamic effect of exchange-rate volatility on Turkish exports: Parsimonious error-correction model approach. *Panoeconomicus*, *62*(4), 429-451.

Dincer, N., & Kandil, M. (2011). The effects of exchange rate fluctuations on exports: A sectoral analysis for Turkey. *The Journal of International Trade & Economic Development*, *20*(6), 809-837.

Douglas, P. H. (1976). The Cobb-Douglas production function once again: its history, its testing, and some new empirical values. *Journal of political economy*, *84*(5), 903-915.

Engle, R., & Granger, C. (1991). *Long-run economic relationships: Readings in cointegration*. Oxford University Press.

Ethiopia, U. N. D. P. (2018). Ethiopia's progress towards eradicating poverty. *Implementation of the Third United Nations Decade for the Eradication of Poverty (2018–2027) Discussion Paper*.

Feenstra, R. C. (2003). A homothetic utility function for monopolistic competition models, without constant price elasticity. *Economics Letters*, *78*(1), 79-86.

Frankel, J. A. (2003). Experience of and lessons from exchange rate regime in emerging economies.

Fukuda, S. I., & Kon, Y. (2010). ADBI Working Paper Series.

Fukuda, S. I., & Kon, Y. (2010). Macroeconomic impacts of foreign exchange reserve accumulation: Theory and evidence (ADBI Working Paper Series, Vol. 197).

Genemo, K. B. (2017). Effect of exchange rate on trade balance in major east African countries: Evidence from panel cointegration. *European Business & Management*, *3*(6), 95-104.

Genye, T. (2011). Currency devaluation and economic growth the case of Ethiopia. *Departments of* Economics, *Stockholm University. Dostupnona: http://www. ne. su. se/polopoly_fs/1.25800, 1318417049*.

Glick, R., & Hutchison, M. M. (2013). Models of currency crises. *The evidence and impact of financial globalization*, *3*, 485-497.

Godfrey, L. G. (1978). Testing for higher order serial correlation in regression equations when the regressors include lagged dependent variables. *Econometrica: Journal of the Econometric Society*, 1303-1310.

Ghosh, A. R., Lane, T., Schulze-Ghattas, M., Bulir, A., Hamann, J., & Mourmouras, A. (2002b). *IMF-supported programs in capital account crises*. Washington DC: International Monetary Fund.

Gujarati, D. (2009). N., and Dawn C., Porter (2009),". *Basic Econometrics, 5th Edi.*

Hassan, R., Chakraborty, S., Sultana, N., & Rahman, M. M. (2016). *The impact of the real effective exchange rate on real export earnings in Bangladesh*. Monetary Policy and Research Department, Bangladesh Bank.

Huang, X. (2017). Exchange rate movements and export market dynamics: evidence from China. Economics*: The Open-Access, Open-Assessment E-Journal*, *11*(2017-23), 1-27.

Ikechi, K. S., & Anthony, N. (2020). Exchange Rate Volatility and International Trade in Nigeria. *International Journal of Management Science and Business Administration*, *6*(5), 56-72.

Jaffur, Z. K., & Seetanah, B. (2020). Noor-Ul-Hacq Sookia,(2020)"A cross-country analysis of the determinants of the real effective exchange rate in fifteen Sub-Saharan African countries". Economics Bulletin, 40(2), 1686-1697.

Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics letters*, *6*(3), 255-259.

Kasman, A., &Kasman, S. (2005). Exchange rate uncertainty in Turkey and its impact on export volume. *METU Studies in Development*, *32*(1), 41.

Kedir Bekeru Genemo (2017). Effect of Exchange Rate on Trade Balance in Major East African Countries: Evidence from Panel Cointegration. *European Business & Management*. Vol. 3, No. 6, pp. 95-104. doi: 10.11648/j.ebm.20170306.11

Klein, M. W., & Shambaugh, J. C. (2012). *Exchange rate regimes in the modern era*. MIT press.

MacDonald, R. (2007). *Exchange rate economics: theories and evidence*. Routledge.

Maembe, G. (2015). *Assessing the Impact of Exchange Rate Fluctuations on the Revaluation of Foreign Currency in Tanzania* (Doctoral dissertation, The Open University Of Tanzania).

Mankiw, N. G., Weinzierl, M., & Yagan, D. (2009). Optimal taxation in theory and practice. *Journal of Economic Perspectives*, *23*(4), 147-74.

Mengistu, A. T., Montero, E., & Segura, A. (2017). The impacts of exchange rate movements on prices and trade across sectors: Evidence from Ethiopian firms. *Centre for Economic Policy Research*, *2018*, 1-48.

Mohamed Ezzat, A. (2018). The effect of exchange rate movements on trade balance performance in Egypt: Is there a J-curve phenomenon?, *48*(4), 659-692.

Moosa, I. (2006). *Exchange rate regimes: fixed, flexible or something in between?*. Springer.

National Bank of Ethiopia, (2017), Annual Report (accessed from: www.nbe.gov.et/publishments/annualreport/2017.

NIBERE, Y. T. (2016). *The Impact of foreign exchange rate depreciation on export performances and its macroeconomic reprecusions* (Doctoral dissertation, KDI School).

Obstfeld, M., & Rogoff, K. (1995). Exchange rate dynamics redux. *Journal of political economy*, *103*(3), 624-660.

Olson, M., Pilcher, S., & Whitman, N. (2014). Empirical analysis of the Relationship between Exports and GDP.

Pettinger, T. (2017). *Cracking economics*. Octopus Books.

Pilbeam, K. (2005). Theories of Exchange Rate Determination. In *Finance and Financial Markets* (pp. 300-333). Palgrave, London.

Prizzon, A., Greenhill, R., & Mustapha, S. (2017). An 'age of choice'for external development finance? Evidence from country case studies. *Development Policy Review*, *35*, O29-O45.

Reinhart, C. M. (1995). Devaluation, relative prices, and international trade: evidence from developing countries. *Staff papers*, *42*(2), 290-312.

Salvatore, D. (2013). Cyclical Policies, Structural Imbalances and Growth of the US Economy. In *Public Debt, Global Governance and Economic Dynamism* (pp. 39-51). Springer, Milano.

Schoonenboom, J., & Johnson, R. B. (2019). Mixed Methods Research in Peace Promotion. In *The Psychology of Peace Promotion* (pp. 373-395). Springer, Cham.

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSSKölnerZeitschriftfürSoziologie und Sozialpsychologie*, *69*(2), 107-131.

Siddique, M., Anwar, A., & Quddus, M. A. (2020). The impact of real effective exchange rate on revealed comparative advantage and trade balance of Pakistan. *Economic Journal of Emerging Markets*, *12*(2), 193-207.

Menji, S. (2010). Export Performance and determinants in Ethiopia.

Statistical Office of the European Communities. (2009). Export and import price index manual: Theory and practice. International Monetary Fund.

Sweidan, O. D. (2013). The effect of exchange rate on exports and imports: The case of Jordan. *The International Trade Journal*, *27*(2), 156-172.

Tarawalie, A. B., Ahortor, C. R. K., &Umo, M. (2014). Real Exchange Rate Volatility and Export Performance in the West African Monetary Zone (WAMZ). In *Regional Economic Integration in West Africa* (pp. 101-135). Springer, Cham.

Taye, H. K. (1999). The impact of devaluation on macroeconomic performance: The case of Ethiopia. *Journal of Policy Modeling*, *21*(4), 481-496.

TWAMUGIZE, G., Xuegong, Z., & Rmadhani, A. A. (2017). The Effect of Exchange Rate Fluctuation on International Trade in Rwanda. *IOSR Journal of Economics and Finance*, *8*, 82-91.

Vladmir Popov (2019). Exchange rate and foreign exchange reserve policies: Expert comment on DOC, Research Institute (2019). An exchange rate service at Hong Konjo International Airport Credit: wittayayut/Bigsstockphot.com, pp.1.

Wondemu, K. A., & Potts, D. J. (2016). The impact of the real exchange rate changes on export performance in Tanzania and Ethiopia.

World Bank. (2017). *World development report 2018: Learning to realize education's promise*. The World Bank.

World Bank. (2019). *Ethiopia Financial Sector Development: The Path to an Efficient Stable and Inclusive Financial Sector*. World Bank.

Appendices/Annexes

A) VECM TEST (Export)

Vector Error Correction Estimates
Included observations: 36 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNMI(-1)	1.000000
LNREERI(-1)	-0.159933
	(0.14472)
	[-1.10512]
LNFXR(-1)	-0.049853
	(0.04884)
	[-1.02080]
LNRGDP(-1)	-1.329685
	(0.12725)
	[-10.4492]
LNTO(-1)	-1.222380
	(0.11746)
	[-10.4066]
LNTOT(-1)	0.067481
	(0.26689)
	[0.25284]
C	7.515601

Error Correction:	D(LNMI)	D(LNREERI)	D(LNFXR)	D(LNRGDP)	D(LNTO)	D(LNTOT)
CointEq1	-0.686645	-0.230952	-1.410528	-0.055533	0.436699	0.267115
	(0.15681)	(0.17501)	(0.91323)	(0.05601)	(0.16704)	(0.13228)
	[-4.37878]	[-1.31966]	[-1.54455]	[-0.99151]	[2.61429]	[2.01936]
D(LNMI(-1))	0.105268	0.234622	0.474153	0.029252	-0.072182	0.081338
	(0.13055)	(0.14570)	(0.76026)	(0.04663)	(0.13906)	(0.11012)
	[0.80637]	[1.61036]	[0.62367]	[0.62736]	[-0.51906]	[0.73862]
D(LNMI(-2))	0.423065	0.052167	-0.294524	0.138391	-0.011327	0.118752
	(0.11151)	(0.12445)	(0.64940)	(0.03983)	(0.11878)	(0.09406)
	[3.79401]	[0.41918]	[-0.45353]	[3.47477]	[-0.09536]	[1.26248]
D(LNREERI(-1))	-0.139513	-0.290359	-0.025375	0.065131	0.203034	0.229472
	(0.15060)	(0.16808)	(0.87706)	(0.05379)	(0.16043)	(0.12704)
	[-0.92637]	[-1.72752]	[-0.02893]	[1.21083]	[1.26558]	[1.80631]
D(LNREERI(-2))	-0.018783	-0.304066	0.757879	0.088771	0.221571	0.173812
	(0.13417)	(0.14974)	(0.78136)	(0.04792)	(0.14292)	(0.11318)
	[-0.14000]	[-2.03065]	[0.96995]	[1.85246]	[1.55029]	[1.53576]
D(LNFXR(-1))	-0.133849	-0.080566	0.109008	0.010407	0.078694	-0.006609
	(0.03332)	(0.03719)	(0.19407)	(0.01190)	(0.03550)	(0.02811)
	[-4.01666]	[-2.16630]	[0.56170]	[0.87438]	[2.21688]	[-0.23511]
D(LNFXR(-2))	0.094699	-0.211716	-0.174033	0.027395	0.079949	0.129080
	(0.04594)	(0.05128)	(0.26757)	(0.01641)	(0.04894)	(0.03876)
	[2.06117]	[-4.12893]	[-0.65043]	[1.66943]	[1.63354]	[3.33059]
D(LNRGDP(-1))	-0.126190	0.274599	-2.921339	0.375303	0.670175	-0.169265
	(0.44238)	(0.49372)	(2.57630)	(0.15800)	(0.47124)	(0.37317)
	[-0.28525]	[0.55618]	[-1.13393]	[2.37527]	[1.42214]	[-0.45359]
D(LNRGDP(-2))	-1.441512	0.378713	-1.777885	-0.391054	0.095890	0.466232

	(0.43739)	(0.48815)	(2.54722)	(0.15622)	(0.46592)	(0.36895)
	[-3.29574]	[0.77582]	[-0.69797]	[-2.50322]	[0.20581]	[1.26366]
D(LNTO(-1))	-0.260334	-0.287597	0.643286	-0.101416	0.374136	-0.001446
	(0.23758)	(0.26515)	(1.38360)	(0.08486)	(0.25308)	(0.20041)
	[-1.09577]	[-1.08465]	[0.46494]	[-1.19516]	[1.47832]	[-0.00721]
D(LNTO(-2))	-0.076021	-0.153246	-2.054484	0.095724	0.436736	0.227635
	(0.22449)	(0.25054)	(1.30737)	(0.08018)	(0.23914)	(0.18937)
	[-0.33864]	[-0.61166]	[-1.57146]	[1.19384]	[1.82629]	[1.20208]
D(LNTOT(-1))	0.551579	0.149621	-1.199289	0.088266	-0.089270	-0.194849
	(0.20249)	(0.22599)	(1.17926)	(0.07232)	(0.21570)	(0.17081)
	[2.72394]	[0.66207]	[-1.01698]	[1.22043]	[-0.41385]	[-1.14073]
D(LNTOT(-2))	-0.464638	0.064300	-0.379727	-0.015961	-0.377642	-0.619126
	(0.21663)	(0.24177)	(1.26160)	(0.07737)	(0.23077)	(0.18274)
	[-2.14484]	[0.26596]	[-0.30099]	[-0.20629]	[-1.63648]	[-3.38806]
C	0.057705	-0.012330	0.194803	0.019049	-0.026970	-0.019801
	(0.01482)	(0.01654)	(0.08629)	(0.00529)	(0.01578)	(0.01250)
	[3.89433]	[-0.74557]	[2.25745]	[3.59935]	[-1.70863]	[-1.58415]
R-squared	0.880817	0.728995	0.422810	0.706232	0.442389	0.516560
Adj. R-squared	0.810390	0.568855	0.081743	0.532642	0.112892	0.230890
Sum sq. resids	0.047243	0.058845	1.602288	0.006027	0.053609	0.033617
S.E. equation	0.046340	0.051718	0.269873	0.016551	0.049364	0.039090
F-statistic	12.50688	4.552247	1.239668	4.068389	1.342619	1.808244
Log likelihood	68.36556	64.41296	4.935767	105.4293	66.09018	74.49078
Akaike AIC	-3.020309	-2.800720	0.503569	-5.079408	-2.893899	-3.360599
Schwarz SC	-2.404496	-2.184907	1.119381	-4.463595	-2.278086	-2.744786
Mean dependent	0.033915	-0.001854	0.077195	0.027030	-0.003138	0.000548
S.D. dependent	0.106421	0.078764	0.281629	0.024211	0.052411	0.044573

Determinant resid covariance (dof adj.)	1.61E-16
Determinant resid covariance	8.37E-18
Log likelihood	401.2926
Akaike information criterion	-17.29403
Schwarz criterion	-13.33523
Number of coefficients	90

Vector Error Correction Estimates
Included observations: 36 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNXI(-1)	1.000000
LNREERI(-1)	-0.301303
	(0.11694)
	[-2.57645]
LNFXR(-1)	-0.179440
	(0.03669)
	[-4.89010]
LNRGDP(-1)	-0.500082
	(0.10044)
	[-4.97883]
LNTO(-1)	-1.688823
	(0.08977)
	[-18.8132]
LNTOT(-1)	-1.260632
	(0.19430)

	[-6.48791]					
C	7.189462					

Error Correction:	D(LNXI)	D(LNREERI)	D(LNFXR)	D(LNRGDP)	D(LNTO)	D(LNTOT)
CointEq1	-0.340117	-0.041920	-1.014235	-0.077743	0.425271	0.102040
	(0.14220)	(0.13637)	(0.65172)	(0.04613)	(0.09463)	(0.09533)
	[-2.39188]	[-0.30740]	[-1.55625]	[-1.68549]	[4.49426]	[1.07039]
D(LNXI(-1))	0.049370	0.044113	0.011069	0.088831	0.094767	0.219867
	(0.14222)	(0.13639)	(0.65183)	(0.04613)	(0.09464)	(0.09535)
	[0.34714]	[0.32343]	[0.01698]	[1.92555]	[1.00133]	[2.30600]
D(LNXI(-2))	0.236432	-0.014218	0.842332	0.039596	-0.151161	0.036631
	(0.14736)	(0.14132)	(0.67540)	(0.04780)	(0.09806)	(0.09879)
	[1.60442]	[-0.10061]	[1.24716]	[0.82835]	[-1.54146]	[0.37078]
D(LNREERI(-1))	-0.129167	-0.263474	-0.239630	0.135727	0.173952	0.175299
	(0.16070)	(0.15411)	(0.73651)	(0.05213)	(0.10694)	(0.10773)
	[-0.80379]	[-1.70963]	[-0.32536]	[2.60381]	[1.62668]	[1.62716]
D(LNREERI(-2))	-0.448896	-0.265575	1.024563	0.063430	0.261726	0.159890
	(0.16244)	(0.15578)	(0.74450)	(0.05269)	(0.10810)	(0.10890)
	[-2.76344]	[-1.70477]	[1.37617]	[1.20379]	[2.42121]	[1.46820]
D(LNFXR(-1))	-0.103068	-0.071345	0.023813	0.005759	0.151277	0.026958
	(0.05208)	(0.04994)	(0.23869)	(0.01689)	(0.03466)	(0.03491)
	[-1.97911]	[-1.42851]	[0.09977]	[0.34089]	[4.36515]	[0.77215]
D(LNFXR(-2))	0.129541	-0.203148	-0.197067	0.019912	0.107101	0.097122
	(0.06233)	(0.05978)	(0.28568)	(0.02022)	(0.04148)	(0.04179)
	[2.07827]	[-3.39844]	[-0.68982]	[0.98481]	[2.58206]	[2.32420]
D(LNRGDP(-1))	0.286383	0.587966	-3.148657	0.277915	0.746752	-0.294077
	(0.53736)	(0.51534)	(2.46284)	(0.17431)	(0.35759)	(0.36025)
	[0.53294]	[1.14093]	[-1.27847]	[1.59441]	[2.08830]	[-0.81632]
D(LNRGDP(-2))	-0.688717	0.586608	-2.387488	-0.411598	0.253391	0.279819
	(0.54905)	(0.52655)	(2.51643)	(0.17810)	(0.36537)	(0.36809)
	[-1.25438]	[1.11406]	[-0.94876]	[-2.31107]	[0.69352]	[0.76020]
D(LNTO(-1))	-0.776596	-0.123809	0.816375	-0.069803	0.429531	-0.070889
	(0.26977)	(0.25872)	(1.23643)	(0.08751)	(0.17952)	(0.18086)
	[-2.87871]	[-0.47855]	[0.66027]	[-0.79767]	[2.39264]	[-0.39196]
D(LNTO(-2))	0.482440	0.051538	-2.294754	-0.003599	0.688794	0.211110
	(0.28946)	(0.27760)	(1.32667)	(0.09389)	(0.19262)	(0.19406)
	[1.66668]	[0.18566]	[-1.72971]	[-0.03834]	[3.57584]	[1.08787]
D(LNTOT(-1))	-0.442485	0.133588	-2.838974	-0.066236	0.335821	-0.213371
	(0.31700)	(0.30401)	(1.45287)	(0.10283)	(0.21095)	(0.21252)
	[-1.39587]	[0.43943]	[-1.95405]	[-0.64415]	[1.59197]	[-1.00402]
D(LNTOT(-2))	-0.084555	0.004960	-2.124391	-0.025848	0.214487	-0.245280
	(0.26335)	(0.25256)	(1.20700)	(0.08542)	(0.17525)	(0.17655)
	[-0.32107]	[0.01964]	[-1.76006]	[-0.30258]	[1.22390]	[-1.38928]
C	0.024682	-0.016175	0.213300	0.025918	-0.041641	-0.011670
	(0.02039)	(0.01956)	(0.09346)	(0.00661)	(0.01357)	(0.01367)
	[1.21031]	[-0.82705]	[2.28214]	[3.91813]	[-3.06853]	[-0.85361]
R-squared	0.762491	0.691217	0.448368	0.626111	0.664218	0.528812
Adj. R-squared	0.622145	0.508754	0.122404	0.405176	0.465801	0.250382
Sum sq. resids	0.072900	0.067047	1.531337	0.007670	0.032282	0.032765
S.E. equation	0.057564	0.055205	0.263830	0.018672	0.038306	0.038591
F-statistic	5.432928	3.788263	1.375513	2.833918	3.347585	1.899267
Log likelihood	60.55756	62.06395	5.751006	101.0883	75.21973	74.95285
Akaike AIC	-2.586531	-2.670220	0.458277	-4.838238	-3.401096	-3.386269
Schwarz SC	-1.970718	-2.054407	1.074090	-4.222425	-2.785283	-2.770456
Mean dependent	0.023232	-0.001854	0.077195	0.027030	-0.003138	0.000548

S.D. dependent	0.093646	0.078764	0.281629	0.024211	0.052411	0.044573

Determinant resid covariance (dof adj.)	7.09E-17
Determinant resid covariance	3.69E-18
Log likelihood	416.0243
Akaike information criterion	-18.11246
Schwarz criterion	-14.15366
Number of coefficients	90

B) Wald Test Result (Export)

Dependent Variable: D(LNXI)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 11/18/21 Time: 13:53
Sample (adjusted): 1984 2019
Included observations: 36 after adjustments
D(LNXI) = C(1)*(LNXI(-1) - 0.30130306236*LNREERI(-1) - 0.179440121535*LNFXR(-1) - 0.500082210611*LNRGDP(-1) - 1.6888229794*LNTO(-1) - 1.26063240505*LNTOT(-1) + 7.18946242102) + C(2)*D(LNXI(-1)) + C(3)*D(LNXI(-2)) + C(4) *D(LNREERI(-1)) + C(5)*D(LNREERI(-2)) + C(6)*D(LNFXR(-1)) + C(7) *D(LNFXR(-2)) + C(8)*D(LNRGDP(-1)) + C(9)*D(LNRGDP(-2)) + C(10) *D(LNTO(-1)) + C(11)*D(LNTO(-2)) + C(12)*D(LNTOT(-1)) + C(13) *D(LNTOT(-2)) + C(14)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.340117	0.142196	-2.391881	0.0257
C(2)	0.049370	0.142220	0.347139	0.7318
C(3)	0.236432	0.147363	1.604417	0.1229
C(4)	-0.129167	0.160698	-0.803791	0.4301
C(5)	-0.448896	0.162441	-2.763445	0.0113
C(6)	-0.103068	0.052078	-1.979108	0.0605
C(7)	0.129541	0.062331	2.078271	0.0496
C(8)	0.286383	0.537359	0.532945	0.5994
C(9)	-0.688717	0.549051	-1.254378	0.2229
C(10)	-0.776596	0.269772	-2.878709	0.0087
C(11)	0.482440	0.289462	1.666678	0.1098
C(12)	-0.442485	0.316997	-1.395866	0.1767
C(13)	-0.084555	0.263351	-0.321072	0.7512
C(14)	0.024682	0.020393	1.210314	0.2390

R-squared	0.762491	Mean dependent var	0.023232
Adjusted R-squared	0.622145	S.D. dependent var	0.093646
S.E. of regression	0.057564	Akaike info criterion	-2.586531
Sum squared resid	0.072900	Schwarz criterion	-1.970718
Log likelihood	60.55756	Hannan-Quinn criter.	-2.371596
F-statistic	5.432928	Durbin-Watson stat	1.739896
Prob(F-statistic)	0.000264		

C) Granger Causality Test (Export)

Pairwise Granger Causality Tests
Date: 11/19/21 Time: 09:52
Sample: 1981 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREERI does not Granger Cause LNXI	37	3.18958	0.0546
LNXI does not Granger Cause LNREERI		1.07718	0.3526
LNFXR does not Granger Cause LNXI	37	9.35831	0.0006
LNXI does not Granger Cause LNFXR		0.92453	0.4071
LNRGDP does not Granger Cause LNXI	37	4.36951	0.0210
LNXI does not Granger Cause LNRGDP		0.51610	0.6017
LNTO does not Granger Cause LNXI	37	1.82541	0.1775
LNXI does not Granger Cause LNTO		0.66722	0.5201
LNTOT does not Granger Cause LNXI	37	1.66642	0.2049
LNXI does not Granger Cause LNTOT		4.16724	0.0246
LNFXR does not Granger Cause LNREERI	37	1.18750	0.3181
LNREERI does not Granger Cause LNFXR		0.25280	0.7782
LNRGDP does not Granger Cause LNREERI	37	0.19053	0.8274
LNREERI does not Granger Cause LNRGDP		0.39228	0.6787
LNTO does not Granger Cause LNREERI	37	2.32190	0.1144
LNREERI does not Granger Cause LNTO		3.32303	0.0488
LNTOT does not Granger Cause LNREERI	37	0.21521	0.8075
LNREERI does not Granger Cause LNTOT		1.10236	0.3444
LNRGDP does not Granger Cause LNFXR	37	1.89132	0.1674
LNFXR does not Granger Cause LNRGDP		3.99065	0.0284
LNTO does not Granger Cause LNFXR	37	1.19483	0.3159
LNFXR does not Granger Cause LNTO		2.31715	0.1149
LNTOT does not Granger Cause LNFXR	37	0.15738	0.8550
LNFXR does not Granger Cause LNTOT		0.71064	0.4989
LNTO does not Granger Cause LNRGDP	37	0.44701	0.6435
LNRGDP does not Granger Cause LNTO		1.94833	0.1590
LNTOT does not Granger Cause LNRGDP	37	2.20660	0.1265
LNRGDP does not Granger Cause LNTOT		1.33261	0.2780
LNTOT does not Granger Cause LNTO	37	2.70701	0.0820
LNTO does not Granger Cause LNTOT		1.32313	0.2805

D) Serial Correlation LM Test (Export)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.795484	Prob. F(2,20)	0.4651
Obs*R-squared	2.652722	Prob. Chi-Square(2)	0.2654

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/19/21 Time: 11:03
Sample: 1984 2019
Included observations: 36
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.055719	0.152147	-0.366216	0.7180
C(2)	-0.115843	0.175292	-0.660861	0.5162
C(3)	0.120266	0.177005	0.679448	0.5046
C(4)	-0.019117	0.169433	-0.112827	0.9113
C(5)	-0.026083	0.165371	-0.157725	0.8763
C(6)	-0.010944	0.053808	-0.203399	0.8409
C(7)	-0.001313	0.063097	-0.020808	0.9836
C(8)	-0.032746	0.544886	-0.060096	0.9527
C(9)	-0.032969	0.557923	-0.059092	0.9535
C(10)	-0.129189	0.342361	-0.377348	0.7099
C(11)	0.004702	0.318768	0.014750	0.9884
C(12)	-0.120980	0.364921	-0.331524	0.7437
C(13)	-0.060669	0.297757	-0.203753	0.8406
C(14)	0.002297	0.020666	0.111132	0.9126
RESID(-1)	0.360819	0.355562	1.014784	0.3223
RESID(-2)	-0.258550	0.317326	-0.814776	0.4248

R-squared	0.073687	Mean dependent var	-3.89E-17
Adjusted R-squared	-0.621048	S.D. dependent var	0.045638
S.E. of regression	0.058107	Akaike info criterion	-2.551963
Sum squared resid	0.067528	Schwarz criterion	-1.848177
Log likelihood	61.93534	Hannan-Quinn criter.	-2.306323
F-statistic	0.106065	Durbin-Watson stat	2.193921
Prob(F-statistic)	0.999971		

E) Heteroscedasticity Test (Export)

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.173396	Prob. F(18,17)	0.3728
Obs*R-squared	19.94591	Prob. Chi-Square(18)	0.3359
Scaled explained SS	3.790974	Prob. Chi-Square(18)	0.9998

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 1984 2019
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.113504	0.059597	1.904514	0.0739
LNXI(-1)	0.017679	0.008387	2.107984	0.0502
LNREERI(-1)	0.006320	0.008171	0.773391	0.4499
LNFXR(-1)	0.001552	0.001676	0.926105	0.3674
LNRGDP(-1)	0.015158	0.022006	0.688801	0.5002
LNTO(-1)	0.007883	0.010333	0.762849	0.4560
LNTOT(-1)	-0.019847	0.014243	-1.393427	0.1814
LNXI(-2)	-0.002106	0.007397	-0.284735	0.7793
LNXI(-3)	-0.001774	0.006226	-0.284902	0.7792
LNREERI(-2)	0.004632	0.008359	0.554109	0.5867
LNREERI(-3)	-0.006295	0.006315	-0.996750	0.3329
LNFXR(-2)	0.001261	0.002563	0.492021	0.6290
LNFXR(-3)	-0.001511	0.002812	-0.537213	0.5981
LNRGDP(-2)	-0.049326	0.030780	-1.602518	0.1275
LNRGDP(-3)	0.017627	0.021543	0.818224	0.4246
LNTO(-2)	-0.000159	0.011937	-0.013352	0.9895
LNTO(-3)	-0.027696	0.013469	-2.056325	0.0554
LNTOT(-2)	0.002665	0.013350	0.199666	0.8441
LNTOT(-3)	0.001798	0.011422	0.157434	0.8768

R-squared	0.554053	Mean dependent var	0.002025
Adjusted R-squared	0.081874	S.D. dependent var	0.002072
S.E. of regression	0.001985	Akaike info criterion	-9.300796
Sum squared resid	6.70E-05	Schwarz criterion	-8.465050
Log likelihood	186.4143	Hannan-Quinn criter.	-9.009098
F-statistic	1.173396	Durbin-Watson stat	2.364162
Prob(F-statistic)	0.372754		

F) Normality Test (Export)

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Sample: 1981 2019
Included observations: 36

Component	Skewness	Chi-sq	df	Prob.*
1	0.304583	0.556625	1	0.4556
2	0.068900	0.028483	1	0.8660
3	0.448563	1.207250	1	0.2719
4	-0.421419	1.065562	1	0.3020
5	-0.400096	0.960459	1	0.3271
6	-0.465789	1.301755	1	0.2539
Joint		5.120135	6	0.5285

Component	Kurtosis	Chi-sq	df	Prob.
1	2.017856	1.446909	1	0.2290
2	1.943694	1.673673	1	0.1958
3	3.298011	0.133216	1	0.7151
4	3.751960	0.848166	1	0.3571
5	2.503768	0.369370	1	0.5433
6	2.500926	0.373613	1	0.5410
Joint		4.844946	6	0.5638

Component	Jarque-Bera	df	Prob.
1	2.003534	2	0.3672
2	1.702156	2	0.4270
3	1.340466	2	0.5116
4	1.913727	2	0.3841
5	1.329829	2	0.5143
6	1.675368	2	0.4327
Joint	9.965081	12	0.6190

*Approximate p-values do not account for coefficient estimation

(A) VECM Test (Import)

Vector Error Correction Estimates
Date: 11/19/21 Time: 10:57
Sample (adjusted): 1984 2019
Included observations: 36 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNMI(-1)	1.000000
LNREERI(-1)	-0.159933
	(0.14472)
	[-1.10512]
LNFXR(-1)	-0.049853
	(0.04884)
	[-1.02080]
LNRGDP(-1)	-1.329685
	(0.12725)
	[-10.4492]
LNTO(-1)	-1.222380
	(0.11746)
	[-10.4066]
LNTOT(-1)	0.067481
	(0.26689)
	[0.25284]
C	7.515601

Error Correction:	D(LNMI)	D(LNREERI)	D(LNFXR)	D(LNRGDP)	D(LNTO)
CointEq1	-0.686645	-0.230952	-1.410528	-0.055533	0.436699
	(0.15681)	(0.17501)	(0.91323)	(0.05601)	(0.16704)
	[-4.37878]	[-1.31966]	[-1.54455]	[-0.99151]	[2.61429]
D(LNMI(-1))	0.105268	0.234622	0.474153	0.029252	-0.072182
	(0.13055)	(0.14570)	(0.76026)	(0.04663)	(0.13906)
	[0.80637]	[1.61036]	[0.62367]	[0.62736]	[-0.51906]
D(LNMI(-2))	0.423065	0.052167	-0.294524	0.138391	-0.011327
	(0.11151)	(0.12445)	(0.64940)	(0.03983)	(0.11878)
	[3.79401]	[0.41918]	[-0.45353]	[3.47477]	[-0.09536]
D(LNREERI(-1))	-0.139513	-0.290359	-0.025375	0.065131	0.203034
	(0.15060)	(0.16808)	(0.87706)	(0.05379)	(0.16043)
	[-0.92637]	[-1.72752]	[-0.02893]	[1.21083]	[1.26558]
D(LNREERI(-2))	-0.018783	-0.304066	0.757879	0.088771	0.221571
	(0.13417)	(0.14974)	(0.78136)	(0.04792)	(0.14292)
	[-0.14000]	[-2.03065]	[0.96995]	[1.85246]	[1.55029]
D(LNFXR(-1))	-0.133849	-0.080566	0.109008	0.010407	0.078694
	(0.03332)	(0.03719)	(0.19407)	(0.01190)	(0.03550)
	[-4.01666]	[-2.16630]	[0.56170]	[0.87438]	[2.21688]
D(LNFXR(-2))	0.094699	-0.211716	-0.174033	0.027395	0.079949
	(0.04594)	(0.05128)	(0.26757)	(0.01641)	(0.04894)
	[2.06117]	[-4.12893]	[-0.65043]	[1.66943]	[1.63354]
D(LNRGDP(-1))	-0.126190	0.274599	-2.921339	0.375303	0.670175
	(0.44238)	(0.49372)	(2.57630)	(0.15800)	(0.47124)
	[-0.28525]	[0.55618]	[-1.13393]	[2.37527]	[1.42214]
D(LNRGDP(-2))	-1.441512	0.378713	-1.777885	-0.391054	0.095890
	(0.43739)	(0.48815)	(2.54722)	(0.15622)	(0.46592)
	[-3.29574]	[0.77582]	[-0.69797]	[-2.50322]	[0.20581]

D(LNTO(-1))	-0.260334	-0.287597	0.643286	-0.101416	0.374136
	(0.23758)	(0.26515)	(1.38360)	(0.08486)	(0.25308)
	[-1.09577]	[-1.08465]	[0.46494]	[-1.19516]	[1.47832]
D(LNTO(-2))	-0.076021	-0.153246	-2.054484	0.095724	0.436736
	(0.22449)	(0.25054)	(1.30737)	(0.08018)	(0.23914)
	[-0.33864]	[-0.61166]	[-1.57146]	[1.19384]	[1.82629]
D(LNTOT(-1))	0.551579	0.149621	-1.199289	0.088266	-0.089270
	(0.20249)	(0.22599)	(1.17926)	(0.07232)	(0.21570)
	[2.72394]	[0.66207]	[-1.01698]	[1.22043]	[-0.41385]
D(LNTOT(-2))	-0.464638	0.064300	-0.379727	-0.015961	-0.377642
	(0.21663)	(0.24177)	(1.26160)	(0.07737)	(0.23077)
	[-2.14484]	[0.26596]	[-0.30099]	[-0.20629]	[-1.63648]
C	0.057705	-0.012330	0.194803	0.019049	-0.026970
	(0.01482)	(0.01654)	(0.08629)	(0.00529)	(0.01578)
	[3.89433]	[-0.74557]	[2.25745]	[3.59935]	[-1.70863]
R-squared	0.880817	0.728995	0.422810	0.706232	0.442389
Adj. R-squared	0.810390	0.568855	0.081743	0.532642	0.112892
Sum sq. resids	0.047243	0.058845	1.602288	0.006027	0.053609
S.E. equation	0.046340	0.051718	0.269873	0.016551	0.049364
F-statistic	12.50688	4.552247	1.239668	4.068389	1.342619
Log likelihood	68.36556	64.41296	4.935767	105.4293	66.09018
Akaike AIC	-3.020309	-2.800720	0.503569	-5.079408	-2.893899
Schwarz SC	-2.404496	-2.184907	1.119381	-4.463595	-2.278086
Mean dependent	0.033915	-0.001854	0.077195	0.027030	-0.003138
S.D. dependent	0.106421	0.078764	0.281629	0.024211	0.052411

Determinant resid covariance (dof adj.)	1.61E-16
Determinant resid covariance	8.37E-18
Log likelihood	401.2926
Akaike information criterion	-17.29403
Schwarz criterion	-13.33523
Number of coefficients	90

(B) Wald Test (Import)

Dependent Variable: D(LNMI)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 11/19/21 Time: 10:58
Sample (adjusted): 1984 2019
Included observations: 36 after adjustments
D(LNMI) = C(1)*(LNMI(-1) - 0.159933231634*LNREERI(-1) - 0.049852942449*LNFXR(-1) - 1.32968531867*LNRGDP(-1) - 1.22237983928*LNTO(-1) + 0.0674809911841*LNTOT(-1) + 7.51560124548) + C(2)*D(LNMI(-1)) + C(3)*D(LNMI(-2)) + C(4) *D(LNREERI(-1)) + C(5)*D(LNREERI(-2)) + C(6)*D(LNFXR(-1)) + C(7) *D(LNFXR(-2)) + C(8)*D(LNRGDP(-1)) + C(9)*D(LNRGDP(-2)) + C(10) *D(LNTO(-1)) + C(11)*D(LNTO(-2)) + C(12)*D(LNTOT(-1)) + C(13) *D(LNTOT(-2)) + C(14)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.686645	0.156812	-4.378782	0.0002
C(2)	0.105268	0.130546	0.806370	0.4287

C(3)	0.423065	0.111509	3.794007	0.0010
C(4)	-0.139513	0.150601	-0.926374	0.3643
C(5)	-0.018783	0.134168	-0.139998	0.8899
C(6)	-0.133849	0.033324	-4.016658	0.0006
C(7)	0.094699	0.045944	2.061171	0.0513
C(8)	-0.126190	0.442381	-0.285251	0.7781
C(9)	-1.441512	0.437387	-3.295737	0.0033
C(10)	-0.260334	0.237581	-1.095769	0.2850
C(11)	-0.076021	0.224491	-0.338637	0.7381
C(12)	0.551579	0.202493	2.723944	0.0124
C(13)	-0.464638	0.216631	-2.144839	0.0433
C(14)	0.057705	0.014818	3.894326	0.0008

R-squared	0.880817	Mean dependent var	0.033915
Adjusted R-squared	0.810390	S.D. dependent var	0.106421
S.E. of regression	0.046340	Akaike info criterion	-3.020309
Sum squared resid	0.047243	Schwarz criterion	-2.404496
Log likelihood	68.36556	Hannan-Quinn criter.	-2.805374
F-statistic	12.50688	Durbin-Watson stat	2.337696
Prob(F-statistic)	0.000000		

(C) Granger Causality Test

Granger Causality Test (Import)
Pairwise Granger Causality Tests
Date: 11/19/21 Time: 11:00
Sample: 1981 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREERI does not Granger Cause LNMI	37	4.74143	0.0157
LNMI does not Granger Cause LNREERI		4.27536	0.0226
LNFXR does not Granger Cause LNMI	37	9.96859	0.0004
LNMI does not Granger Cause LNFXR		1.38866	0.2640
LNRGDP does not Granger Cause LNMI	37	1.85515	0.1729
LNMI does not Granger Cause LNRGDP		1.33479	0.2775
LNTO does not Granger Cause LNMI	37	8.27186	0.0013
LNMI does not Granger Cause LNTO		1.28894	0.2895
LNTOT does not Granger Cause LNMI	37	6.25914	0.0051
LNMI does not Granger Cause LNTOT		1.78736	0.1837
LNFXR does not Granger Cause LNREERI	37	1.18750	0.3181
LNREERI does not Granger Cause LNFXR		0.25280	0.7782
LNRGDP does not Granger Cause LNREERI	37	0.19053	0.8274
LNREERI does not Granger Cause LNRGDP		0.39228	0.6787
LNTO does not Granger Cause LNREERI	37	2.32190	0.1144
LNREERI does not Granger Cause LNTO		3.32303	0.0488
LNTOT does not Granger Cause LNREERI	37	0.21521	0.8075
LNREERI does not Granger Cause LNTOT		1.10236	0.3444

LNRGDP does not Granger Cause LNFXR	37	1.89132	0.1674
LNFXR does not Granger Cause LNRGDP		3.99065	0.0284
LNTO does not Granger Cause LNFXR	37	1.19483	0.3159
LNFXR does not Granger Cause LNTO		2.31715	0.1149
LNTOT does not Granger Cause LNFXR	37	0.15738	0.8550
LNFXR does not Granger Cause LNTOT		0.71064	0.4989
LNTO does not Granger Cause LNRGDP	37	0.44701	0.6435
LNRGDP does not Granger Cause LNTO		1.94833	0.1590
LNTOT does not Granger Cause LNRGDP	37	2.20660	0.1265
LNRGDP does not Granger Cause LNTOT		1.33261	0.2780
LNTOT does not Granger Cause LNTO	37	2.70701	0.0820
LNTO does not Granger Cause LNTOT		1.32313	0.2805