ADDIS ABABA UNIVERSITY OF SCHOOL OF COMMERCE

COLLEGE OF BUSINESS AND ECONOMICS

THE IMPACT OF EXCHANGE RATE FLUCTUATION ON INTERNATIONAL TRADE: IN ETHIOPIA

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE MASTERS OF ARTS (MA) IN DEVELOPMENT ECONOMICS

By

Abraham Siltan

Advisor: Dr. Berhanu Denu

JUNE, 2022

ADDIS ABABA, ETHIOPIAN

Declaration

I, the undersigned, declare that the thesis is my original work and has not been presented for a degree in any other university and that all source of materials used for the thesis have been duly acknowledged.

Declared by:

Abraham Siltan	_____	_____
Name	**Signature**	**Date**

Confirmed by Advisor:

Dr. Berhanu Denu	_____	_____
Name	**Signature**	**Date**

ADDIS ABABA UNIVERSITY OF SCHOOL OF COMMERCE

COLLEGE OF BUSINESS AND ECONOMICS

Approved By Board of Examiners

This is to certify that Abraham Siltan thesis, **The Impact of Exchange Rate Fluctuation on International Trade in Ethiopia**, which was submitted in partial fulfillment of the requirements for the Degree of Masters of Arts (MA) in Development Economics, complies with university rules and standards for originality and quality.

Signed by the Examining Committee:

External Examiner:

_____	_____	_____
Name	**Signature**	**Date**

Internal Examiner:

_____	_____	_____
Name	**Signature**	**Date**

_____

Chair of Department or Graduate Program Coordinator

ACKNOWLEDGMENT

My sincerest appreciation and honour go to the almighty God and his holy mother, who have shaped me into the person I am today. Everything I understood today, including the start and conclusion of this article, would be impossible without His guidance and support. Second, I'd want to express my heartfelt gratitude to my adviser, Dr. Berhanu Denu, who provided me with invaluable advice, constructive criticism, and encouragement. In addition, I'd want to express my gratitude to my wife, Mrs. Rahel Berihun, for his insightful initial comments.

I'm also grateful to my family for their financial, material, and emotional support, all of which contributed significantly to the completion of my paper and my overall accomplishment. It gives me great joy to thank my friends for their constructive criticism and encouragement.

Finally, I want to express my gratitude to the National Bank of Ethiopia (NBE) staff, particularly the members of the Economic modeling and statistical analysis department, who supported me without tiring me.

ABSTRACT

This study investigates the impact of exchange rate fluctuation on international trade in Ethiopia. The research is carried out under the assumption that exchange rate fluctuations are deemed to impact the volume of export and import trading activities. The study made use of secondary data from 1980 to 2021; on the following variables real effective exchange rate (REER), exports (Exp), imports (Imp), real Gross Domestic Product (RGDP), and inflation rate. The data were analyzed using descriptive and econometric methods in this study. Descriptive statistical methods such as mean, standard deviation, and graphical comparisons were used for measuring trends of the real effective exchange rate to compare with export and import sectors. Econometric methods in line with the theoretical and Empirical framework discussed in the literature review section, the following technique are applied, Johansen co-integration technique, vector error correction model (VECM), Granger causality, and variance decomposition to capture both short-run and long-run impact of the exchange rate. The VECM was used to capture both short- and long-run interactions. The results revealed a significant and positive association between the real effective exchange rate, real gross domestic product, and export, but have a negative relationship between inflation and export. At the same time, there is a significant and positive relationship between inflation, real GDP, and imports. However, the real effective exchange rate and imports have a negative relationship. This paper finds evidence that exchange rate fluctuation is the main factor that affects the level of international trade as measured by export and import flows in Ethiopia. It appears that if policymakers wish to promote export and decrease imports to improve the balance of trade in Ethiopia, they have to keep an open eye on steady appreciation of the exchange rate and reduce volatility.

Key words: Exchange Rate Volatility, International Trade, Export, and Import

Table of Contents

List of Table

Table of Contents Pages

List of Figure

Table of Contents Pages

ABBREVIATION AND ACRONYM

ADF ↔ Augmented Dickey-Fuller

DF ↔ Dickey-Fuller

Exp ↔ Export

Imp ↔ Import

INF ↔ Inflation Rate

IPLC ↔ International Product Life Cycle Theory

NBE ↔ National Bank of Ethiopia

PPP ↔ Purchasing Power Parity

REER ↔ Real effective exchange rate

RGDP ↔ Real Gross Domestic Product

VAR ↔ Vector Auto Regressive

VECM ↔ Vector Error Correction Model

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

International trade refers to activities that include the exchange of commodities and services across countries (Adeleye et al. 2015). The number of activities connected to cross-border trading between dealers should include a minimum of two countries. The level of domestic production, consumption, and international activity on goods and services has all been used to evaluate an economy in terms of its level of growth and individual income levels. As a result, international commerce plays a vital role in the transformation of nations' economic and social characteristics, particularly in emerging countries (Adsuyi et al. 2013).

Foreign exchange is used to buy goods and provide ancillary services, to buy financial assets, to avoid losses or profit from changes in the rate of foreign exchange, to achieve and maintain international competitiveness, and thus to ensure a viable Balance of Payments position, to send or receive gifts or investment income payments, to buy or sell financial assets from abroad, to avoid losses or profit from changes in the rate of foreign exchange, and to achieve and maintain international competitiveness. It also aids foreigners in making payments for products and services exported, as well as unilateral transfers, investments, and investment income to the home country (Ruta, 2013).

The exchange rate is one of the most important elements in determining the volume of international trade since it has a direct impact on local prices, the profitability of traded goods and services, resource allocation, and investment decisions. For a better outcome in international trade and a positive balance of payments, exchange rate stability is essential (Takaendesa, et al, 2005). It is also the trade between two or more countries that makes it becomes possible to exchange the currency of one to another (Udoka and Ubom 2003). As a result, the exchange rate is the price of one country's currency in terms of another. It determines the relative prices of domestic and imported commodities, as well as the degree of the external sector's involvement in international commerce.

The fluctuation of exchange rates increases or decreases the cost of exports and imports of industrial and agricultural goods, and the variable's unstable tendency adds a measure of uncertainty or risk to commerce (Kandil Magda, 2015). The Ethiopian economy has been attempting to resolve the problem of external and internal balance, which is caused by disequilibrium in our balance of payment, resulting in an economic balance of payment deficit, but the main goal of this currency devaluation was to encourage export, thereby improving the economy. However, despite the government's various efforts to stabilize the economy, this goal of increasing export through devaluation of the birr has not been achieved.

Ethiopia developed several currency rate systems, according to Getachew (2020). The Empiral and Derge regimes, for example, had a fixed exchange rate with huge appreciation and devaluation between periods. The fortnightly auction exchange rate was adopted in May 1993. In 2001, the auction system was finally phased out and replaced by a daily interbank exchange rate mechanism. The exchange rate is envisaged to be mostly determined by supply and demand in this daily interbank system; however, the national bank of Ethiopia would vary the pressure on the exchange rate by imposing reserve requirements. As a result, it's easy to deduce that Ethiopia is now pursuing a managed floating exchange rate. According to (Oaikhenan & Aigheyisi, 2015; Perera & Jayasuriya, 2016), exchange rate volatility is an inherited fact in the day-to-day life of a country adopting a floating or reactive exchange rate system. They also said that exchange rate volatility is associated with huge fluctuations in the value of the currency or short-term fluctuations in the long-term average trends of the currency. Furthermore, they mentioned (by quoting Martins, 2015) that volatility or change refers to the swings that occur when the value of one country's currency appreciates or depreciates. It led to unforeseen outcomes in any international and indirect national undertaking.

Generally, a weaker currency stimulates exports and makes imports expensive, thus decreasing the country’s trade deficit. On the other hand, a strong currency can reduce exports and make imports cheaper, effectively widening the trade deficit. While it is commonly considered that a strong currency is beneficial to a country's economy, this may not be the case. An unjustifiable strong currency can cause a drag on the economy over the long term, as entire industries are rendered uncompetitive and thousands of jobs are lost. Because exports are closely connected to GDP, a weaker currency, contrary to popular assumption, may actually boost the country's

economy. On the other hand, a depreciating currency can result in inflation as the cost of importing goods increases. Currency fluctuations also have a direct impact on the monetary policy of a country, as exchange rates play a vital role in deciding interest rates set by a country's central bank. Constant currency fluctuations can also affect the market adversely, causing it to become volatile, and affecting both local and foreign trade (Sharma, P. 2020).

1.2. Statement of the Problem

Economists have long debated the theoretical literature on the impact of exchange rate fluctuations on trade and the resulting demand for stable anchoring, according to Moccero and Winograd (2006, p.2) (exchange rate fixing). Traditional models based on the producer theory of the business under uncertainty, where company profitability is connected to exchange rate changes, looked at the impact of exchange rate volatility on trade. Some theoretical models suggest that there is a positive relationship. When hedging alternatives exist, a rise in exchange rate volatility does not necessarily lead to an unfavorable effect on the level of trade, according to Baron (1976) and Otieno and Mudaki(2011).

Furthermore, some scholars have found that increased exchange rate volatility might be favourable to trade (De Grauwe and Franke, 1988 and Mwanza, 2011). The most prominent illustration is that of risk-takers among exporters. However, De Grauwe (1988) shows that a positive link can still exist when exporters are sufficiently risk-averse. Firms that are extremely risk-averse were concerned about the worst-case situation. When risk rises, the best approach to avoid a drastic decline in export revenues is to increase the volume of exports. According to Franke (1988), more volatility may boost exports if it is accompanied by an increase in the real exchange rate level.

One of the most common arguments against flexible exchange rates is that exchange rate volatility could have negative effects on trade and investment. If currency rate fluctuates are not fully expected, risk-averse agents will reduce import and/or export activities and reallocate production toward domestic markets (Dell' Aricca, 1999, Slottje, 2004,and Chit et al. 2010). In addition, Foreign exchange rate movements, according to Coric and Pugh (2010), have a negative impact on international trade on average. Exporting firms may be more sensitive to foreign exchange rate fluctuations than domestic firms, but this sensitivity is likely to be

mitigated by factors such as the use of hedging instruments, the presence of imported inputs, the presence of firms on the global market where upward and downward movements of various exchange rates cancel out, the ability to invoice in the local currency, and the capacity to absorb losses due to exchange rate changes and other factors.

According to a review of the theoretical literature over the last two decades, there is no clear-cut relationship between exchange rate volatility and trade flows. Analytical results are based on a set of assumptions that only hold true in certain circumstances. The impact of currency rate fluctuation on export and import activity, for example, is studied independently and yields inconsistent results across countries (Baum and Caglayan, 2006). So, what is the relationship between exports and exchange rate volatility, and what about the relationship for imports?

On a theoretical level, models show that increasing risk associated with volatility causes risk-averse actors to allocate their resources to less risky economic activity. Cote (1994) highlighted theoretical studies by Hooper and Kohlhagen (1978), Clark (1973), Were et al., (2002), Kiptui (2008) and others that concluded that volatility depresses trade. Other theoretical models, on the other hand, suggest that increased risk provides more opportunities for profit, and hence exchange rate volatility should increase trade to the extent that it increases risk Ngigi (2004), Gertz (2008) and Maana et al., (2010). Because of the ambiguity of theoretical predictions, the discussion has shifted to an empirical one. Unfortunately, much of the empirical literature's findings are riddled with the same ambiguity and inconsistencies (Todani and Munyama, 2005). So, how exchange rate fluctuations exercise influence over particularly Ethiopia export and import?

1.3. Objectives of the Study

The main objective of this study is to examine the impact of exchange rate fluctuations on international trade. The specific objectives include:

a) To examine the trends of Ethiopian international trade.
b) To examine whether the foreign exchange rate is significantly affecting exports and imports in Ethiopia.

c) To see bidirectional relationship between exchange rate and trade balance

1.4. Research Questions

As a result of the above-mentioned objectives, the following research questions are thought relevant to the study.

1) To what extent has exchange rate volatility affected the level of exports in Ethiopia?
2) What is the nature of relationships between exchange rate volatility and imports in Ethiopia?
3) What is the nature of relationships between exchange rate volatility and inflation rate?

1.5. Research Hypotheses

The following hypothesis, which was being the focus of this study, was tested.

Hypothesis I

H_0: There is no significant relationship between exchange rate volatility and export trades in Ethiopia in the long run.

H_a: There is a significant relationship between exchange rate volatility and export trades in Ethiopia in the long run.

Hypothesis II

H_0: There is no significant relationship between exchange rate volatility and trade imports in Ethiopia in the long run.

H_a: There is a significant relationship between exchange rate volatility and trade imports in Ethiopia in the long run.

Hypothesis III

H_0: There is no significant relationship between exchange rate volatility and inflation rate in Ethiopia in the long run.

H_a: There is a significant relationship between exchange rate volatility and the inflation rate in Ethiopia in the long run.

1.6. Significance of Study

The study reviewed the effects of exchange rate volatility on international trading activities in Ethiopia. This study will assist policymakers in developing more effective and efficient policies to manage Ethiopia's exchange rate fluctuations in the future. The study will also serve as reference material for future and further works on the impact of exchange rate volatility on international trade in Ethiopia and its attendant effects on the economy. It will also serve as a foundation for additional comparative study in both developed and developing economies.

1.7. Scope of the Study

The study covers the impact of exchange rate volatility on international trade in Ethiopia for the period 1980 to 2021. The goal of this study looked at Ethiopia's export and import performance, as well as currency rate fluctuations.

As a result, it can only follow the responses of some export and import components to exchange rate shocks through time, and the hypothesis test has been removed. This range was chosen to provide a significant degree of freedom for accurate estimations.

1.8. Limitation of the study

Limitation of the study has aroused from the problem of inconsistency of data prepared by different institutions. Even data from the same institution, different figures for the same year. Generally, this study faced with the problem of inadequate materials for assessment and difficulty to access to relevant data for thorough analysis, limited time, and inconsistent data.

1.9. Definition of the Term

International trade, which is the exchange of goods and services between two nations, helps the economy grow.

Exports are goods and services produced in the home country for sale in other markets, whereas **imports** are any good or service brought in from another country.

Exchange rate: This is the cost of one country's money in another country's money.

1.10. Organization of the Study

There are five sections to this study. The study's introduction was in section one, followed by a theoretical and empirical review in section two, a description of the research methodology used in this study in part three, the empirical findings in section four, and the primary conclusions and suggestions in section five.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

The relevant literature associated with this study was reviewed from the standpoint of theoretical and empirical framework.

2.1. Definition of Concepts

2.1.1. The Meaning of International Trade

The exchange of products and services across international borders is known as international trade (foreign trade). International trade, according to Esezobor (2009), is "trading between sovereign governments. “International trade" is defined as "the selling and purchase of consumer or capital products and services, raw commodities, securities, or gold across national borders," according to the Encyclopedia Britannica. Such transactions can be carried out through barter or, more commonly, by exchanging national currencies." International trade, according to the Encyclopedia Americana, is described as "commercial exchanges between people of different sovereign political units." Only when nations exist and begin to formulate national commercial policies does it become clearly different from local or domestic trade, and then it becomes international trade."

International trade, according to the Grolier Family Encyclopedia, is "the exchange of products and services among countries." According to this definition, countries tend to specialize in the production and export of commodities and services that they can manufacture relatively inexpensively, while importing goods and services that are produced more efficiently elsewhere. Exports and imports are thus the two primary pillars of international trade (Esezobor 2009). These are briefly reviewed below:

2.1.2. Exports

One of the most important functions of international trade is to ensure that items produced in one country are transferred to another for sale or trade in the future. Each sale contributes to the gross

domestic product of the producing country. As a result, exports are commodities and services that one country sells to another (Lequiller and Blades, 2006).

Exports are one of the oldest kinds of economic transfer, and they take place on a large scale between countries with less trade constraints, such as tariffs or subsidies. "The term export stems from the commodities and services that leave a country's port," Lequiller and Blades (2006) write. The seller of such goods and services is known as an exporter, while the buyer from another country is known as an importer." Exports are defined as transactions in products and services (sales, barter, gifts, or grants) from residents to non-residents, according to national accounts. Smuggled items must be counted as part of the export calculation."

Any direct purchases made by non-residents in the country's economic territory are recorded as service exports in national accounts; hence, any expenditure made by foreign tourists in the country's economic region are considered part of the country's export services. International flows of illegal services must also be taken into account. Exports also include the distribution of information that can be delivered via e-mail, fax, or shared over the phone (Ojukwu, 2011). In economics, an export is any good or commodity that is legally carried from one country to another, usually for commercial purposes. Many countries participate in international trade.

2.1.3. Imports

Because commodities are frequently delivered by boat to foreign nations, the word "import" is derived from the word "port." Import is thus derived from the conceptual sense of transporting goods and services from one country's port to another's port. The buyer of such goods and services is known as an "importer," while the vendor from another country is known as an "exporter" (Mohan, 2009). As a result, an import is any commodity or service that is legally transported from one country to another, usually for commercial purposes. It is a product that is imported for sale from another country (Arthur et al., 2003). Foreign producers give imported items or services to domestic consumers. An expert in the sending country is regarded as an import in the receiving country. When the domestic quantity required exceeds the domestic quantity provided, or when the price of the good (or service) on the world market is cheaper than the price on domestic markets, a country has demand for imports.

2.1.4. Exchange Rates

People who go to other countries must exchange their money for local currency. When items are imported, the same is true. When Americans import items from Japan or Europe, for example, the dollars paid must be exchanged for Yen or Euros. The rate at which two currencies was exchanged is referred to as an exchange rate in finance. It's also known as the exchange rate of one country's currency against another (Sulliavan et al.2003). Money dealers will quote a separate buying and selling rate in the retail currency exchange market. The buying rate is the price at which money dealers will purchase foreign currency, while the selling rate is the price at which they will sell it. The quoted rates will include a margin (or profit) provision for a trader's margin, or the margin may be recovered in the form of a "commission" or in some other method.

2.1.5. Exchange Rate Volatility

The tendency for foreign currencies to appreciate or depreciate, affecting the profitability of foreign currency trades, is referred to as exchange rate volatility. Volatility is the measurement of the amount that these rates change and the frequency of such changes. There are many instances of exchange rate volatility, including business dealings between parties in two different countries and international investments. Volatility in such circumstances is difficult to avoid. Exchange rate volatility explains a fluctuation in the economy exchange rate (https://www.smartcapital mind. com/what-is –exchange rate –volatility, htm, 2021)

Currency traders will price a separate buying and selling rate in the trade currency exchange market. The buying rate is the price at which currency traders will purchase foreign currency, while the selling rate is the price at which they will sell it. The quoted rates will include a margin (or profit) provision for a trader's margin, or the margin may be recovered in the form of a "commission" or in some other method (Esezobor, 2009).

2.1.6. Nominal Exchange Rates versus Real Exchange Rates

The nominal exchange rate is the cost of exchanging one currency for another. If the nominal exchange rate between the dollar and the Birr is 48, then for one dollar, one may purchase 48 Birr. The amount of foreign money that may be acquired for one unit of the home currency is always expressed in terms of exchange rates. As a result, the nominal exchange rate is calculated

by determining how much foreign cash may be purchased for one unit of domestic currency. The nominal exchange rate indicates how much foreign cash can be exchanged for one unit of home currency, but the actual exchange rate indicates how many products and services from one country may be swapped for goods and services from another. The following equation represents the real exchange rate: (nominal exchange rate X domestic price) / (foreign price) equals real exchange rate (Esezobor, 2009).

2.1.7. Net Exports and the Real Exchange Rate

Net exports and the real exchange rate within a country have a significant link. The relative price of items at home is higher than the relative price of goods abroad when the real exchange rate is high. Import is more likely in this circumstance since foreign items are less expensive in real terms than domestic goods. When the actual exchange rate is high, net exports decline while imports rise. When the actual exchange rate is low, net exports rise in tandem with exports. The consequences of changes in the real exchange rate can be seen using this connection (Esezobor, 2009).

2.1.8. Inflation and Interest Rates

Inflation and interest rates have a significant impact on imports and exports due to their impact on the currency rate. Higher interest rates are usually associated with higher inflation. It's unclear whether this results in a stronger or weaker currency. The power of the central bank to influence the real interest rate is a critical component of the monetary transmission mechanism. Changes in real interest rates affect spending on durable goods, which are a component of overall spending. However, there is another avenue of effect. If the Fed cuts interest rates, for example, then the demand for Birr to invest in Ethiopia's asset markets will be reduced. This will reduce the foreign currency price of Birr. The weaker Birr means that goods produced in Ethiopia are cheaper, so Ethiopia's exports will increase, and Ethiopia's imports will decrease (https://saylordotorg.github.macroeconomics-monetary-policy).

The Fisher Effect is a theory developed by economist Irving Fisher to explain the relationship between inflation and both real and nominal interest rates. The real interest rate is equal to the nominal interest rate minus the predicted inflation rate, according to the Fisher Effect. Therefore,

real interest rates fall as inflation increases, unless nominal rates increase at the same rate as inflation (https://www.investopedia.com/terms/f/fishereffect.asp).

2.2. Theoretical Framework on International Trade

Many theories have been proposed to explain why international trade exists. The Mercantilist, Absolute Advantage, and Comparative Advantage Theories are all examples of this. The Heckscher-Ohlin Theory of Factor Endowment, Country Similarity Theory, International Product Life Cycle Theory (IPLC), and Global Strategic Rivalry Theory are only a few of the others.

2.2.1. International Trade Theoretical Framework

There are three schools of thought that explain how exchange rate volatility affects international trade. They are the traditional school, the risk-portfolio school, and the political-economic theory. Theoretical frameworks may or may not be a primary focus of our current investigation. In an attempt to explain the exchange rate volatility - trade flow relationship, two general theoretical schools of thought, which are the Traditional and the Risk-Portfolio Schools, have been developed. High exchange rate volatility, according to the Traditional School, increases risk, limiting international trade flows. On the contrary, the Risk-portfolio school assumes that high exchange rate volatility presents a greater opportunity for profit and therefore should increase trade (Esezobor, 2009).

According to the Purchasing Power Parity (PPP) and Standard Trade theories, fluctuations of the exchange rate and the real exchange rate should have an expected negative sign with the endogenous variable, exports and imports. According to relative PPP theory, if a country's price changes relative to another country's price, the exchange rate will respond in the opposite direction for the same basket of goods. The notion is based on the idea that when one country's prices are higher than those of its trading partners, imports become more attractive due to reduced pricing. Exports will lose their competitiveness in the international market at the same time. Furthermore, the exchange rate will fluctuate when citizens purchase a country's currency at lower rates while selling it at higher ones (Gallagher, 2000).

While the conventional trade theory is a straightforward method that ties trade performance to fluctuations in the actual currency exchange rate, the theory also emphasizes that, ceteris paribus, fluctuations in the exchange rate will affect international trade volume. If there is an increase in the real foreign exchange rate in the home country, also known as real currency depreciation, this would indicate that domestic households would purchase fewer imported goods and export relatively more goods, as foreign households would purchase more goods from the domestic country. (Zhang, 2010).

2.2.1.1. Traditional School of Thought

Based on the producer theory of the firm under uncertainty, the conventional school investigates the impact of exchange rate volatility on trade. When a company's profitability is affected by changes in the exchange rate. Increased exchange rate uncertainty, according to this school of thinking, influences the volume (value) of a trade by making prices and profits indeterminate in the future.

The exact spot rate at which transactions was carried out is unknown. Exchange rate uncertainty also affects investment decisions, output structure, and trade patterns by altering the relative prices of domestic and foreign goods in specific industries (Fang et al., 2006). Risk-averse enterprises may respond by reallocating resources to the production of less risky non-tradable in the absence of hedging measures, resulting in a backward shift in the supply curve at a given price (Choudhury, 2005).

As several theoretical models on this issue have arisen over the years, a chronological outline of selected theoretical theories is provided. Early theoretical models describing the relationship between exchange rate volatility and trade for enterprises operating under uncertainty are presented by Baron (1976). Firms in their model aim to maximize profits while dealing with exchange rate risk, which is the only source of risk in the trade. A number of other simplifying assumptions are used, including those involving utility functions, risk aversion, market structure, and the presence of hedging tools, among others. As a result of these assumptions, we may conclude that exchange rate volatility tends to reduce trade volume (Chipili, 2010).

Clark (1973), in a paper co-authored with the IMF, focuses on exchange rate volatility and its impact on export levels. Under a variety of simplifying assumptions, one of the major equations in his model, in which the firm's goal is to maximize the expected value of a quadratic utility function of profits formed from a mix of profit and quadratic utility functions, is provided by

$$U(\pi) = a\pi + b\pi^2 \quad \ldots\ldots(1)$$

$$\pi = f\,pq - C(q) \quad \ldots\ldots(2)$$

Where π is profit, f is the forward rate, p the price of exports in foreign currency, q is quantity of export produced, C is the cost function, a is the production of trade that is hedged through the forward exchange market and b captures the risk-averseness of the exporting firm. Equation (1) defines the utility function while the profit function is given by equation (2). π is stochastic (in domestic currency) given the unpredictability of f. The first order condition for equation (1) is that

$$MR - MC = \frac{-(\frac{2b}{a})p^2\sigma^2 f}{1+(\frac{2b}{a})E(\pi)} \quad \ldots\ldots(3)$$

Where, MR is marginal revenue, MC is marginal cost, $\sigma^2 f$ is variance of f and $E(\pi)$ is expected profit. The right hand side is the risk premium. As p equals MR under perfect competition, the price for exports covers costs (MC) and compensates the exporting firm for the exchange risk it is exposed to. Thus, as $\sigma^2 f$ increases, the supply curve shifts to the left which in turn reduces q for a risk-averse firm $b < 0$.

For a developing country like Ethiopia, the traditional school of thought is useful in explaining the relationship between exchange rate volatility and trade flows. This is because, in Ethiopia, as in most poor countries, hedging capabilities are essentially non-existent, leaving exporters and importers to absorb the full brunt of exchange rate changes. As a result, for a developing country like Ethiopia, an increase in exchange rate volatility is likely to reduce trade flows.

Arize et al. (2000), on the other hand, have slammed the traditional school of thought for failing to correctly describe how corporations manage risk, not just through the use of derivatives markets, but also as a means of increasing profitability.

2.2.1.2. Risk-Portfolio School of Thought

The Risk-Portfolio school of thought is made up of a number of hypotheses that argue that the traditional school of thought is unrealistic and that there is a positive association between exchange rate volatility and international trade flows. DeGrauwe (1988) develops a simple model in which a firm producing for both domestic and overseas markets maximizes the expected utility of total income under competitive market conditions. The utility function is believed to have only a few constraints (concavity and reparability). Because pricing is in foreign currency and the exchange rate is arbitrary, export revenues in domestic currencies are unclear (source of risk). The domestic good, on the other hand, is priced in the local currency. As a result, whether expected marginal utility is convex or concave under a random exchange rate exposed to some degree of (relative) risk aversion affects the reduction in expected utility of export earnings.

In order to avoid a severe drop in revenue, sufficiently risk-averse enterprises increase export quantities in reaction to an increase in exchange rate risk, as an increase in risk raises the predicted marginal utility of export revenue. For less risk-averse enterprises, the converse is true: export output falls as exchange rate risk increases, resulting in a decrease in predicted marginal utility of export earnings because the exporter is unconcerned about the worst-case scenario. As a result, an increase in exchange rate risk has income and substitution consequences, with the total effect depending on which dominates the other. The income effect has a positive impact on trade (more resources are used to avoid a sharp drop in export revenue), whereas the substitution effect has a negative impact on trade (the attractiveness of the risky venture is reduced in favor of domestic production), resulting in a decrease in trade volume (De Grauwe, 1988). In general, the income effect outweighs the substitution effect.

A positive trade-exchange rate risk link is theoretically supported. Farrelet al (1983), for example, claimed that economic agents optimize profits by diversifying risk levels in their investments by engaging in low, medium, and high risk activities at the same time. As a result,

increased exchange rate volatility, which carries a larger risk, would not deter risk-averse agents from trading. Increased exchange rate volatility would allow risk neutral agents to diversify their risk portfolios, improving the likelihood of profitability.

Franke (1991) bases his argument on the assumption of a risk-neutral exporting corporation functioning under monopolistic competition with the goal of maximizing net present value of expected cash flows from exports, similar to Farrelet al (1983). The exporting firm's entry and withdrawal from a foreign market is based on a cost-benefit analysis. As long as the cash flow function is convex in the exchange rate, exchange rate volatility produces gains for a firm if the present value of cash flows exceeds the entry and exit costs.

Dellas et al (1993) explored trade decisions in the context of a portfolio-savings decision model under uncertainty, which is another theory from the Risk-Portfolio school of thought. In their model, a tiny open economy with a single domestic agent imports, exports, and consumes two products over two time periods is assumed. Furthermore, asset markets are believed to be imperfect, and the agent makes trading decisions fully aware of price risk. They looked at the implications of uncertainty in the absence of a forward market as well as with competing and incomplete hedging options.

2.3. Empirical Review

In this part, a review of empirical works on exchange rate fluctuation was done. The section is divided into three. In the first section, other countries' experience, a review of literature on some European and Asian countries was made. In the second part, literature on African countries was reviewed. Finally, in the third section, a review of the literature on Ethiopian exchange rate fluctuation was made.

2.3.1. Other Counties Literature

Nergiz Dincer and Magda Kandil's (2009) study looks at the effects of exchange rate fluctuations on disaggregated data from Turkey's 21 exporting sectors (BEC categorization). The empirical analysis analyzes the effects across demand and supply channels, based on a theoretical model that decomposes exchange rate fluctuations into anticipated and unanticipated components.

Expected exchange rate appreciation has a considerable negative impact on export growth in several sectors. The impact of asymmetric exchange rate changes on sectoral export growth is asymmetric. Export demand appears to be more sensitive to currency appreciation over time, according to the evidence. The effect of depreciation in encouraging export growth, on the other hand, has slowed over time. The expected exchange rate directs export strategies, emphasizing the significance of managing fundamentals in order to make sensible forecasts. Furthermore, reducing exchange rate volatility is likely to benefit Turkey's sectoral export growth over time.

Sherzod Yarmukhamedov (2007) Evidence from Sweden on the trade effect of exchange rate volatility. The data covers the period from January 1993 to December 2006, and it considers export and import volumes in terms of their determinants, such as exchange rate volatility, as estimated by the EGARCH model. The results for Sweden reveal that short term volatility dynamics are negatively associated with both export and import, whereas preceding period volatility shows a positive association. These results are consistent with the most findings of prior studies, where the relationship remained ambiguous.

Sudhir Pasricha(2020) impact of exchange rate on international trade of the country. A stronger currency makes a country's imports cheaper and its international exports more expensive. A lower-valued currency makes imports more expensive for a country and exports less expensive in foreign markets. A higher exchange rate is likely to worsen a country's trade balance, whilst a lower exchange rate is likely to improve it. The current research looked at the annual values of India's foreign exchange rate (in Indian rupees and US dollars) and its international trade from 1991 to 2019. The conventional Least Square regression model was used to determine the association between the country's exchange rate and its international commerce. The study's findings show a link between the variables studied. The uncertainty of the exchange rates influences the Indian sense of foreign trade. The second consequence is that currency exchange misalignment has a significant impact on international trade flows. Undervaluation encourages exports while restricting imports, and overvaluation does the opposite. There is a lot of potential in the study as the study uses only exchange rate as one of the variables to predict international trade of the trade. In future study other variables like GDP, exports and imports policies, tariff and duties etc. can be taken to predict international trade of the country.

Literature Review on Exchange Rate Volatility and Trade by Ozturk's (2006)

Table 2.1. Exchange Rate Volatility and Trade: Literature Survey

Study	Sample Period	Nominal or real exchange rate used	Countries and Estimation technique used	Main Result
Akhtar and Hilton (1984)	1974-81Q	Nominal	OLS	Negative effect
Gotur (1985)	1974-82Q	Nominal	OLS	Little to no effect
Bailey, Tavlas and Ulan (1986)	1973-84Q	Nominal	OLS	mixed effects
Bailey, Tavlas and Ulan (1987)	1962-85Q	Nominal	OLS	Little to no effect
Bailey and Tavlas (1988)	1975-86Q	Nominal	OLS	Not significant
Koray and Lastpares (1989)	1961-85M	Real	VAR	Weak -ve relationship
Mann (1989)	1977-87Q	Real	OLS	Few significant
Peree and Steinherr (1989)	1960-85A	Nominal	OLS	Negative effect
Caballero and Corbo (1989)	--	Real	OLS and IVE	Significant and negative effect
Lastrapes and Koray (1990)	1975-87Q	Real	VAR	Weak relationship
Medhora (1990)	1976-82A	Nominal	OLS	Not significant and positive effect
Asseery and Peel (1991)	1972-87Q	Real	OLS - ECM	Significant & (+)
Chowdhury(1993)	1973-90Q	Real	VAR	Significant negative
Hook and Boon (2000)	1985-97Q	Both	VAR	Negative effect
Arize et al. (2005)	1973- 2004Q	Real	ECM	(-) effect on export
Hwang and Lee (2005)	1990-2000M	Real	GARCH-M	(+) import and export
Lee and Saucier (2005)	1986-2003Q	Nominal	ARCH-GARCH	- effect on trade

2.3.2. African Literature

Dennis Brown (2019) examines the effects of currency rate variations on Nigerian international trade. The Nigerian Central Bank and the Federal Bureau of Statistics Bulletin provided data for the study. From 1980 to 2014, the statistics used were Exchange Rate (EXR), Import (IMP), and Export (EXP) in international price level (PL), as well as Gross Domestic Product (GDP). The statistical tools employed in analyzing the data were; The OLS, co-integration/ECM and the Granger Causality test methods. The decision to use these econometric methods was based on

the fact that time series data can lead to erroneous results. The results of the Parsimonious Error Correction Model (ECM) show that the dynamic model is a good fit. The error correction term's coefficient has the right sign (negative) and is statistically significant at the 5% level. This shows that about 55 percent disequilibria in the foreign trade in the previous year were corrected for in the current year. It, therefore, follows that the ECM could rightly correct any deviations from short run to long-run equilibrium relationship between Foreign Trade and the explanatory variables (exchange rate, gross domestic product and price level). Diversification of the Nigerian economy is required to minimize overreliance on a single product and to reduce importation.

Solomon Tonkei (2015) evaluated the effect of foreign exchange rate fluctuations on exports earnings with evidence from the flower industry in Kenya. For a ten-year period (2005–2014), the study employed quarterly secondary data acquired from HCDA, KNBS, KFC, EPC, and CBK. The information gathered was processed, evaluated, interpreted, and presented in a clear, exact, and unambiguous manner. Using descriptive statistics, the data was quantified and coded. The SPSS 22 was used to describe, sort, and sift through the data, as well as analyze it. The model's results demonstrate its dependability. The regression results revealed that the dependent variable (log of total flower industry export revenues) and the independent factors have a positive association (foreign exchange rate, inflation rate, interest rate). From these results, the study recommended that policy makers need to maintain a robust exchange rate regime that will ensure a non-volatile behavior. To increase flower exports from Kenya, policy measures to mitigate significant exchange rate volatility must be implemented.

2.3.3. Ethiopian Literature

Muluken Nigussie (2016) aims to explore the impact of exchange rates on Ethiopian economic growth using annual time series data from 1985/86 to 2014/15. Explanatory variables in this analysis included the real effective exchange rate, government final consumer spending, gross fixed capital creation, broad money supply, and trade openness. Real exchange rates are measured using the multilateral real exchange rate. According to the findings of the VECM, real effective exchange rates, broad money supply, and trade openness all have a positive long-run effect on economic growth, whereas government final consumption has a negative long-run effect on Ethiopia's economic growth. Undervaluation of the currency is contractionary in the

long run and neutral in the short term, according to the regression results. As a result, the impact of exchange rates on economic growth is mediated by the supply channel. It is a reflection of the government's many economic and policy shocks, namely strategy revisions. Based on the findings of this study, the researcher suggested that because Ethiopian output is dominated by primary agricultural items, it is unaffected by exchange rate fluctuations. Government action is required to counteract the negative effects of exchange rate swings until the economy has successfully transitioned from an agrarian to an industrial economy and is less reliant on imported raw materials.

Simeneh Almaw's study Determinants of Exchange Rate in Ethiopia: A Graphical Approach (2020). The goal of this article was to examine the relationship between the level of the Ethiopian exchange rate and a number of key determinant elements asserted in both the flow and stock theories of exchange rate determination. The analysis was carried out by detail reviewing the prior researchers work on the area and using correlation and trend analysis for the 18 (2000-2017 G.C) year data obtained from National bank of Ethiopia Quarterly bulletin. The result shows that nominal exchange rate of Ethiopia relates positively with government spending, broad money supply, inflation level, economic growth, interest rate and negatively with term of trade balance and current account balance. Moreover, it revealed that, government spending; broad money supply and nominal interest rate are the major determinants than inflation, economic growth term of trade balance, and current account balance.

Andualem Telaye (2016) investigates the effects of exchange rate fluctuations on prices and trade across sectors using data from Ethiopian businesses. We document two primary findings using a unique decomposition and extensive customs data for the universe of Ethiopian enterprises. First, fluctuations of the Ethiopian Birr against the principal invoicing currency, in this case the USD, have a greater impact on pricing and quantity than movements of the Ethiopian Birr against the currencies of trading partners. Second, rates of exchange rate-pass through, and subsequent trade volume impacts, vary considerably across sectors. This variation across sectors occurs in ways that are plausibly consistent with different sourcing and selling strategies for manufacturing firms relative to firms in other sectors of the economy. These findings suggest that focusing on just one sector when assessing the effects of currency

movements may result in inaccurate estimates of overall impacts, and that in countries like Ethiopia, where the majority of trade is conducted in a foreign currency, it is critical to account for movements against the major currency of invoicing as well as the currencies of trading partners.

2.4. Identified Gap

The literature is awash with studies on the effect of exchange rate volatility on the trade of developed countries, but it appears to be scarce with regard to African countries, especially Ethiopia. Some studies on African countries were based on panel data and the OLS estimation technique. Given the inadequate amount of studies in the context of Ethiopia, the present study intends to fill this gap.

CHAPTER THREE

3. RESEARCH METHODOLOGY

A research technique is a method for solving a research problem. It is the way of studying how research is done scientifically. This chapter gives the methodology employed to conduct this study. Here the data source and variable used, estimation method, residual diagnostic test, and model specification were briefly discussed mentioned.

3.1. Data Type and Source

In the study, secondary data were used. The data for this empirical study were taken from the National bank of Ethiopia (NBE) annual time series data spanning from 1980 to 2021 on the variables: such as real effective exchange rate (REER), exports (Exp), imports (Imp), real Gross Domestic Product (RGDP), and inflation rate (INF) are all indicators of the economy.

3.2. Method of Data Analysis

The data was analyzed using descriptive and econometric methods in this study. The study applied a quantitative method of data analysis using time-series data. To analyze the data, Eviews-10 Software was used.

3.2.1. Descriptive Analysis

Several statistical methods such as mean, standard deviation, and graphical comparisons were used for measuring trends of the real effective exchange rate to compare with export and import sectors.

3.2.2. Econometrics Analysis

The estimation Method needs knowledge about the theoretical relationship among variables of interest and their expected sign (Lutkepohl, 2005). In line with the theoretical and Empirical framework discussed in the literature review section, the following techniques are applied, Johansen co-integration technique, vector error correction model (VECM), Granger causality, and variance decomposition to capture both short-run and long-run impact of exchange rate

fluctuation on international trade. Nevertheless, before estimating the model, the properties of the variables were substantiated in terms of stationarity and long-term relationship. The econometric tools that were used for these verifications are the Augmented Dickey-Fuller test for stationarity and the Johansen co-integration test for a long-term relationship, given that the variable is integrated of the same order, especially order one I (1).

3.3. Model Specification

The impact of exchange rate volatility on trade is measured using two functional forms: export and import function. These models are determined using the following variables: real GDP, real effective exchange rate, and inflation rate. Exchange rate and real exchange rate fluctuations should have an expected negative sign with the endogenous variable, exports and imports, according to the Purchasing Power Parity (PPP) and Standard Trade theories (Gallagher, 2000). (Zhang, 2010). So, in this study, export and import are used as the dependent variables. For the purposes of this study, the functional relationship between the variables can be specified below:

$$Exp_t = f(REER_t, RGDP_t, INF_t) \quad \text{.....(3.1)}$$

$$\text{Im}\, p_t = f(REER_t, RGDP_t, INF_t) \quad \text{.....(3.2)}$$

Therefore, the variables were transformed into log form to minimize the value of their standard deviations before estimation. The operational and log form of the model is stated thus:

$$LExp_t = \alpha_0 + \alpha_1 LREER_t + \alpha_2 LRGDP_t + \alpha_3 LINF_t + \mu_t \quad \text{.....(3.3)}$$

$$L\,\text{Im}\, p_t = \beta_0 + \beta_1 LREER_t + \beta_2 LRGDP_t + \beta_3 LINF_t + \varepsilon_t \quad \text{.....(3.4)}$$

Where , Equation (1) and (2) are specified in functional form, with $LExp_t$ denoting log of export, $L\,\text{Im}\, p_t$ denoting log of import, $LREER_t$ denoting log of Real effective exchange rate, $LRGDP_t$ denoting log of Real Gross domestic product, $LINF_t$ denoting log of inflation rate. β_0 *and* α_0 *are* intercept, $\alpha_1, \alpha_2, \alpha_3$, β_1 , β_2 *and* β_3 are parameter estimates of the explanatory variables, μ_t *and* ε_t is the error term while L is natural log.

According to the relative price effect, as there was an increase in the real effective exchange rate (depreciation) which may have the export volume increase, therefore, it was expected that $\alpha_1 > 0$, and vice versa for imports, where it was expected that $\beta_1 < 0$. Besides, the predicted value was that $\alpha_2, \beta_2 > 0$ *or* $\alpha_2, \beta_2 < 0$, when the rate of currency exchange fluctuation was experiencing an ambiguous relationship with the level of international trade. Additionally, the gravity theory of international trade indicates that if the real GDP were increasing, an increase in exports would be expected. Similarly, inflation primarily impacts imports and exports by affecting the exchange rate. Inflation causes higher interest rates, which causes the currency to weaken. Higher inflation will also influence exports by directly affecting price of commodities such as materials and labour and, therefore, it was expected that $\alpha_3 < 0, and\ \beta_3 > 0.$

3.3.1. Definition of Variables

Importing and exporting activity can have an impact on a country's GDP, exchange rate, and inflation rate.

Exports: An export in international trade is a good produced in one country that is sold in another country, or a service provided in one country for a national or resident of another country.

Imports: Imports are the value of foreign goods and services bought by a country's households, firms, government agencies, and other organizations in a given period of time. Payments for final products and intermediate items, such as oil and other commodities, finished and semi-finished goods, and components, are all visible imports.

Inflation Rate: If the country has a relatively high rate of inflation, domestic households and firms are likely to buy a significant number of imports. Exporting is also going to be tough for the country's businesses. A fall in inflation, however, would increase the country's international competitiveness and would be likely to increase exports and reduce imports.

GDP: If incomes rise at home, more imports may be bought. Companies are anticipated to purchase more raw materials and capital products, some of which was imported. More products were purchased by households, some of which was imported. The rise in domestic demand may also encourage some domestic firms to switch from the foreign to the domestic market. If this

does occur, exports will fall. Foreigners will buy more things if their incomes improve. This may allow the country to increase its exports.

The price of one country's currency in terms of another country's currency is known as an **exchange rate**. When a country's exchange rate falls, export prices fall and import prices rise. This is anticipated to boost the value of its exports while reducing the amount spent on imports.

The weighted average of a country's currency against an index or basket of other major currencies is known as the **real effective exchange rate (REER)**. The weights are determined by comparing a country's relative trade balance to that of each other country in the index.

3.3.2. Vector Auto Regressive (VAR) Model

The statistical features of data are used to create the VAR model. The VAR model considers each endogenous variable in the system as the lagged value of all endogenous variables in the system, transforming the univariate autoregressive model to a vector autoregressive model with multivariate time series variables. Christopher Sims brought the VAR model to the economic profession in 1980 and pushed its broad use in economic system dynamic research. The VAR model can be created in the following way:

$$Y_t = \theta + \sum_{i=1}^{k} \beta_i X_{t-i} + \varepsilon_{ti} \quad \text{.....(3.5)}$$

Where $Y_t \; is (n \times 1)$ vector of the endogenous dependent variable, $\theta is (n \times 1)$ vector of constants, $\beta_i \; is (n \times n)$ matrix of coefficients, $X_{t-i} \; is (n \times n)$ the lags of endogenous explanatory variables, and $\varepsilon_{ti} \; is (n \times 1)$ vector of white noise, innovations, or shocks.

3.3.3. Vector Error Correction Model (VECM)

The VAR model is a generic framework for describing how stationary variables interact dynamically. If the time series is not stationary, the VAR specified above needs to be modified to allow consistent estimators of the relation among the variables. In order to capture both short-run and long-run relations in the models, they study the Vector Error Correction Model (VECM), a special case of the VAR for the variables in their first differences. VECM also takes co-integration among the variables under consideration. If there is a long-run relationship among the

variables, an error correction model can be formulated to show the long-run interaction between variables (Verbeek, 2008). VECM shows the achievement of the long term and the rate of change in the short-run to achieve equilibrium. It is useful in determining short-term dynamics between variables by restricting the long-run behavior of variables.

Therefore, the vector error correction model is perfectly suited for carrying out analysis in this paper. The vector error correction model is small steps from the VAR model; we change VAR equations into their respective first difference and the lag of the error correction term. The VECM for this thesis is simply derived as

$$\Delta Y_t = \theta + \sum_{i=1}^{k-1} \beta_i \Delta X_{t-i} + \Omega ECT_{t-k} + \varepsilon_{ti} \text{ .....(3.6)}$$

Where Y_t is a vector of the endogenous dependent variable, k-1= shows that the lag length is reduced by 1, θ is constant, Δ is a difference of explanatory variables, β_i = Coefficients of the model adjustment to long-run equilibrium. **Ω** = speed of adjustment parameter, ECT= error correction term, ε_{ti} = residual and often called white noise, stochastic error terms, impulses innovations, or shock.

3.4. Impulse Response and Variance Decomposition

Once the influence of exchange rate fluctuations on international trade has been determined using a well-defined model, the next relevant question is how exchange rate volatility affects exports and imports. To illustrate which factors in the model have statistically significant influences on the future values of each of the variables in the system, block F-tests and a causality evaluation in a VAR can be utilized. However, these tests will not disclose if changes in the value of a certain variable have a positive or negative impact on the other variables in the system, or how long it will take for the effect to make its way through the system (Brooks, 2002). To provide such information, impulse response and forecast error variance decomposition analyses for a VECM process with co-integrated variables are used.

3.4.1. Impulse Response Analysis

Impulse response analysis is used to track the responsiveness of the dependent variable in the VAR to shocks to the other variables. It shows the sign of the selected exchange rate volatility in export and import trading in the context of this paper. A shock to a variable in a VAR impacts that variable directly, but it also affects all other endogenous variables in the system due to the VAR's dynamic structure. For each variable from the equations independently, a unit or one-time shock is delivered to the forecast error and the consequences on the VAR system over time are noted. The VECM is subjected to an impulse response analysis, and the shock should gradually fade away if the system is stable (Brooks, 2002). The Cholesky orthogonalization approach is employed to perform impulse response analysis in this work. This method is popular because it involves small sample degrees of freedom changes, unlike other methods.

3.4.2. Variance Decomposition Analysis

The fraction of forecast error variance in a variable that is explained by impulses in itself and other variables is measured using variance decomposition analysis. It provides the proportion of the movements in the dependent variables that are due to their own shocks versus shocks to the other variables (Brooks, 2002n. In the variance decompositions, the same factorization technique and information used in estimating impulse responses are applied.

3.5. Method of Estimation Technique

3.5.1. Stationarity and Non-stationarity Test

Time series data are made up of observations that can be thought of as realizations of random variables that can be represented by stochastic processes. The qualities of these stochastic processes are related to the concept of "Stationarity." The idea of "Weak Stationarity" is used in this study, which means that the data are presumed to be stationary if the series' means, variances, and covariance are time-independent, rather than the full distribution.

Non-stationarity in a time series occurs when there is no constant mean μ, no constant variance δ^2, or both of these properties. It can come from a variety of places, but the unit root is the most

significant.

3.5.2. Unit Root Tests

The most often used unit root tests, Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF), can be used to assess whether the variables have unit roots. An augmented Dickey–Fuller test (ADF) in statistics and econometrics tests the null hypothesis that a unit root exists in a time series sample. Depending on which version of the test is employed, the alternative hypothesis is usually stationary or trend-stationary. For a bigger and more intricate set of time series models, it is an enhanced version of the Dickey–Fuller test. The ADF test follows the same technique as the Dickey–Fuller test; however it is applied to the model:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + ...+ \delta_{p-1} \Delta y_{t-1+p} + \varepsilon_t \qquad (3.7)$$

Where α is a constant, β the coefficient on a time trend, y_{t-1} is the relevant time series at the time of $t-1$, Δ is a first difference operator, t is a linear trend or time, p the lag order of the autoregressive process and ε_t is the error term. Modeling a random walk with the constraints $\alpha = 0$ and $\beta = 0$ equates to modeling a random walk, and modeling a random walk with a drift corresponds to using the constraint $\beta = 0$.

3.5.3. Testing for Co-integration

Theoretically, integrated variables of order one, I (1), could have a co-integration relationship; hence, testing for the existence of such a relationship is critical. If the variables are individually integrated in the same order and there is at least one stationary linear combination of these variables, they are said to be co-integrated.

The co-integrated variables will never drift apart and was drawn together in the long run. The existence of such a long-run relationship between economic variables must be tested for co-integration. Engle and Granger created the notion of co-integration. The series is considered to be co-integrated if two or more series are non-stationary but a linear combination of them is stationary.

Generally, two approaches are broadly applied to test co-integration. One is the Engle-Granger test, which is only used for a single series. An alternative is the Johansen approach, which is suitable for a multivariate case. The Johansen setup permits the test of hypotheses about the long-run equilibrium between the variables.

3.5.4. Granger Causality Tests

Granger causality is a method for determining if two variables in a time series are causally related. The technique is a probabilistic view of causality that finds patterns of correlation using empirical data sets. Although not identical, causality is strongly related to the concept of cause-and-effect. If X causes Y or Y causes X, the variable X is causative to the variable Y. However, with Granger causality, you are not testing a true cause-and-effect relationship; what you want to know is if a particular variable comes before another in the time series. In other words, if you find Granger causality in your data there is not a causal link in the true sense of the word (for example, sales of Easter baskets Granger-cause Easter!). Note: When econometricians say cause what they mean is Granger-cause, although a more appropriate word might be precedence (Goldstein, M., and Khan, M. S. 1985).

3.6. Method of Evaluation

To check the verifiability of the estimated long-run model, some residual diagnostic test is undertaken. The diagnostics test is an important concept in model selection. The vector error-corrected model should pass diagnostics tests like serial correlation test, Heteroscedasticity test, and normality test in order to say the correct model is selected on the basis of selection criteria if it does not passé the above diagnostics test then other action is needed.

Serial Correlation Test: In time series analysis, the selected model should satisfy the assumption of no serial correlation unless adding lags of variables to remove serial correlation. To test the existence of serial correlation in the VECM model LM test was considered. The null hypothesis stated here is that the residuals are not serially correlated against there is a serial correlation on the alternative hypothesis. To say the model is well done the null hypothesis should not be rejected (Andrei, D. M., and Andrei, L. C. 2015).

Heteroscedasticity Test: The other diagnostic test is the Heteroscedasticity test, which is used to test the homoscedasticity of residuals in the model. The null hypothesis stated that the residuals are homoscedastic against the alternative the residuals are Heteroscedasticity.

Normality Test: The selected model should be normally distributed in order to say the model is good. To test normality, the Jarque bera test was considered, and the null hypothesis stated that the residuals are normally distributed against the residuals that are not normally distributed.

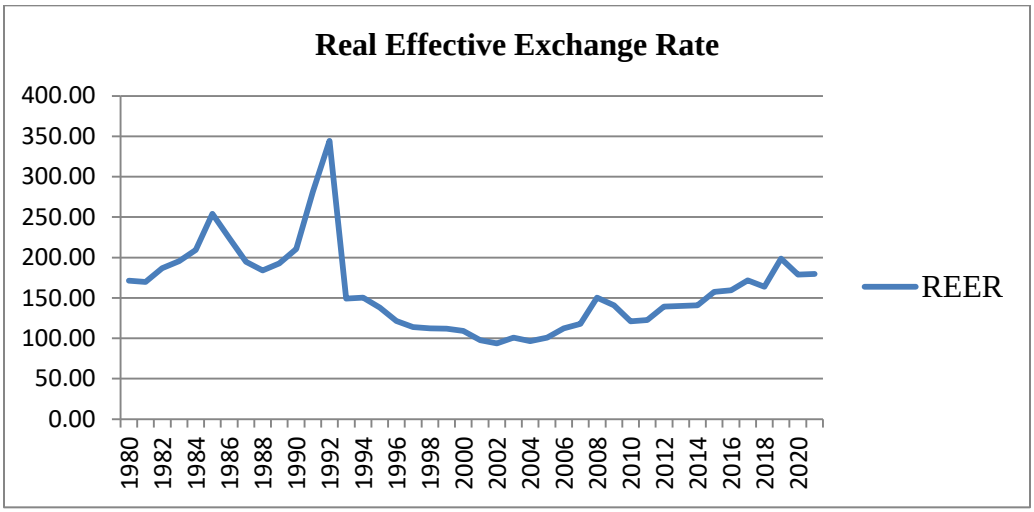
CHAPTER FOUR

4. RESULT AND DISCUSSION

In the preceding chapter, methods of analyzing the long-run and short-run relationships between exchange rate fluctuation and international trade have been discussed. The outcomes of the econometric methodologies mentioned in the previous chapter are discussed in detail in this chapter. The initial part of this chapter deals with a descriptive analysis of the data.

4.1. Descriptive Statistics Results

The figure below shows the graph of the annual real effective exchange rate for the period 1980-2021.

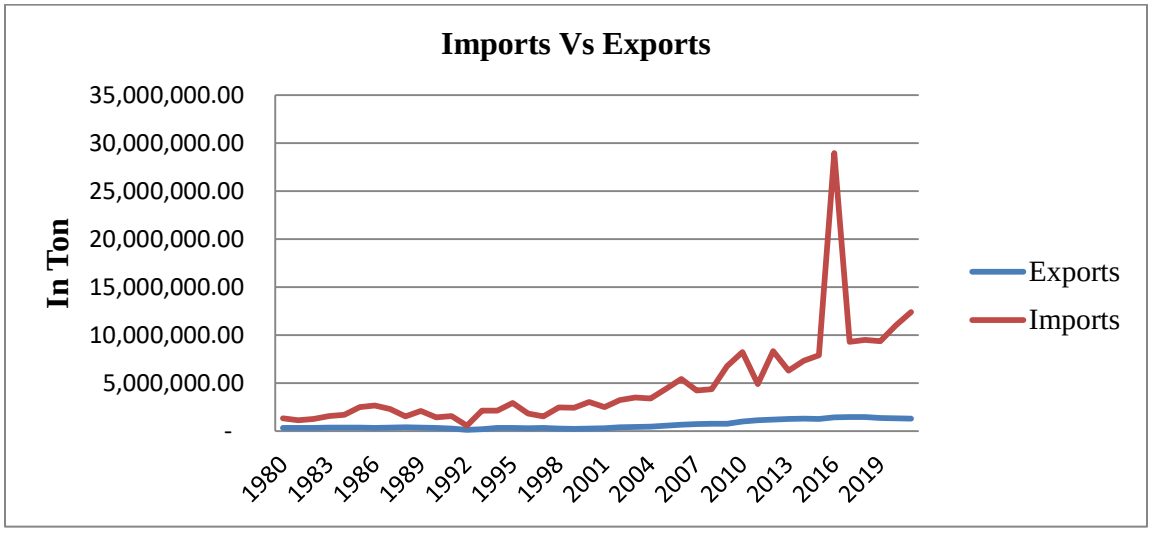


Source: NBE, 2021

Figure 4.1. Trends of Real Effective Exchange Rate

The fluctuations in the exchange rate are evident: The above figure shows that we can see that the exchange rate in Ethiopia is not stable. It slowly rose from 1980 up to 1984, but from 1985 up to 1990 is the graph was going to downward. In 1992 dramatically go to upward due to exchange rate devaluation, but after a few years, the graph shows that less downward until 2008, then after 2008 the graph was starting to go move up and downward slowly. Under the fluctuating exchange rate, the National bank of Ethiopia attempted to devalue the birr in 1992, thereby somewhat stabilizing exchange rates after long-term movement, but in the short-term not

stable as seen in the graph. In addition, after 1992, the National bank of Ethiopia additional attempted to devalue the birr in 2017, but until now Ethiopia's economy has not been stable as seen in the graph and actual. Since Ethiopia depends on the export of agricultural products and import of capital goods; devaluation deteriorates the trade balance even if increasing currency devaluation was expected to encourage the export sector and still the country's trade balance shows a continuous trade deficit (MOFED, 2010). The majority of the world's currencies are bought and sold based on flexible exchange rates, meaning their prices fluctuate based on the supply and demand in the foreign exchange market. Increased demand for a particular currency.



Source: NBE, 2021

Figure 4.2. Trends in Imports and Exports

The figure above show indicates the steady growth of both export and import following the 1992 devaluation. The growth rate of imports was relatively lower from1992. From 1993 through 2010, imports grew at a high rate while export grew slowly; the growth of the former exceeds that of the latter. Although both export and import grew, the trade deficit has been widening because the base for import growth is relatively larger than the export growth. Again in 2017 due to exchange rate devaluation, imports have decreased dramatically, but export growth rate is similar to the previous year. The increasing gap between imports and exports indicates that Ethiopia’s economy has a trade deficit. Moreover, the scarcity of foreign currency is becoming severe as the gap between imports and exports is widening.

However, a 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 the shortage of foreign currency reserves is worsening. Higher domestic inflation after devaluation is eroding the positive effects of devaluation. Moreover, lack of export diversification and low productivity of the agricultural sector was considered the bottleneck to lowering the effectiveness of devaluation.

Finally, Ethiopia's export is characterized by high commodity and geographic concentration, high susceptibility to external shocks, high dependence on agricultural export that in turn depends on vagaries of nature, high price and low-income elasticity of demand, and low supply response. On the other hand, imports intrinsically are highly-priced inelastic which are either necessities in production or consumption or very strategic commodities and are invariably required by the country.

Table 4.2. Summary Statistics of Variables

Statements	Observations	Minimum	Maximum	Mean	Std. Dev.
Exports	42	126,338	1,459,796.1	639,781	439,208
Imports	42	546,318	28,937,324	4,786,835	4,901,145
Real effective exchange rate	42	93.78449	344.5183	159.7521	52.65085
Real GDP	42	-11.1	13.9	5.9014	6.449087
Inflation rate	42	-11.8	55.2	9.5	13.096

The results indicate that the total volume of exports and imports had a mean of 639,781and 4,786,835 with a standard deviation of 439,208 and 4,901,145. Further, the real effective exchange rate had a mean of 159.7521 with a standard deviation of 52.65085; real GDP had a mean of 5.9014 with a standard deviation of 6.449087 while the inflation rate has a mean of 9.5 with a standard deviation of 13.096.

In addition, the real effective exchange rate (REER) ranges between 93.78 and 344.52. Import volume ranges between 546,318 and 28,937,324 in Metric tons. Export volume ranges between 126,338 and 1,459,796.1 metric tons. The real GDP ranges between -11.1 and 13.9, whereas the inflation rate ranges between —11.8 and 55.2.

4.2. Econometric Estimation

4.2.1. Unit Root Test

The first step in time series econometric analysis is to carry out a unit root test on the variables of interest. The test examines whether the data series is stationary or not. To conduct the test, the conventional Augmented Dickey-Fuller (ADF) test was employed with and without a trend.

Table 4.3. Unit Root Test

At level				
Intercept			Trend and Intercept	
Variables	t-statistics	Probability	t-statistics	Probability
LREER	-1.785841	0.3821	-1.718519	0.7248
LRGDP	3.087665	1.0000	-1.436579	0.8348
Limp	-0.970341	0.7546	-4.719853	0.3625
LExp	-0.570533	0.8661	-1.944704	0.6132
LINF	-5.437314	0.0000*	-5.959413	0.0001*
At First Difference				
Intercept			Trend and Intercept	
	t-statistics	Probability	t-statistics	Probability
LREER	-6.52444	0.0000*	-6.473707	0.0000*
LRGDP	-1.849978	0.3516	-5.691615	0.0002*
Limp	-6.166102	0.0000*	-6.096856	0.0001*
LExp	-5.780829	0.0000*	-5.749102	0.0001*
LINF	-7.771728	0.0000*	-7.684704	0.0000*

Source: Computed by authors using E views 10 software

Note that at 1% levels of significance, the null hypothesis of a non-stationary is rejected. As the table above results show that the Augmented Dickey-Fuller (ADF) test statistic import (Imp), export (Exp), real gross domestic product (RGDP), and real effective exchange rate (REER) are non-stationary at levels except inflation rate (INF), but become stationary after the first differencing. Hence, the series such as REER, Imp, and Exp are all intergraded of order one I(1) with intercept and with the trend and intercept indicating that there are stationary at first differencing while INF are I(0). And RGDP with trend and intercept are stationary at a 1% level of significance; thus all variables, with the exception of inflation rate, are integrated of order one (INF). This implies that we can proceed to test for cointegration and long-run relationship.

4.2.2. Lag Length Selection Criteria

The VAR model's initial problem is determining endogenous lag periods. The larger the lag intervals for endogenous is the more it can entirely reflect the dynamic nature of the model. But in this case, more parameters were needed to be estimated to constantly reduce the model's degree of freedom. This is a contradiction in the selection of proper lag intervals for endogenous. There are many methods that can determine the optimal lag period for the VAR model. In comprehensive consideration of selecting lag intervals for endogenous, this paper adopted lag length criteria as shown in the table below.

Table 4.4. Lag length selection results for Exports

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-107.4123	NA	0.004138	5.863805	6.036182	5.925135
1	61.33153	293.0814	1.34e-06	-2.175344	-1.313456*	-1.868691*
2	80.16055	28.73904*	1.19e-06*	-2.324240*	-0.772842	-1.772264
3	91.53025	14.96013	1.65e-06	-2.080540	0.160368	-1.283242
4	110.0008	20.41478	1.69e-06	-2.210567	0.719851	-1.167947

LR: sequential modified LR test statistic, * indicates lag order chosen by the criterion (each test at 5 percent level). As the table above shows, lag length 2 was selected based on the lag length selection criteria of the Akaike information criterion (AIC). It can be found that the optimal lag order for the VAR model is two.

Table 5.4. Lag length selection result for Imports

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-117.8440	NA	0.006078	6.248413	6.419034	6.309630
1	29.12404	256.2520*	7.40e-06*	-0.467899*	0.385209*	-0.161811*
2	38.92375	15.07649	1.05e-05	-0.149936	1.385659	0.401022
3	54.02101	20.12967	1.18e-05	-0.103641	2.114441	0.692187

As the table above shows, lag length 1 was selected based on the lag length selection criteria of the Akaike information criterion (AIC). It can be found that the optimal lag order for the VAR model is one.

4.2.3 Cointegration Test

The Johansen co-integration test was conducted under the assumption of trend and intercept in the equation. Whether a trend is included in the model or not, it is identified by the unit root test or by the graph. Most of the time, the trace and maximum Eigen values statistics might yield conflicting results. To deal with this problem, Johansen (1990) recommends a sing on one of them to identify the number of co-integration vectors. But Khan (1999) shows that the trace tests are more robust than the maximum Eigen value statistic in testing for co-integration. The table below shows the result of trace statistics for co-integration tests.

Table 4.6. Cointegration Test for Exports

Hypothesized No.	Null	Alternative	Eigenvalue	Trace Statistic	5% Critical Value	prob.
None *	$r = 0$	$r \geq 0$	0.597421	55.45349	47.85613	0.0082
At most 1	$r \leq 1$	$r \geq 1$	0.297749	19.05893	29.79707	0.4887
At most 2	$r \leq 2$	$r \geq 2$	0.084453	4.920383	15.49471	0.8172
At most 3	$r \leq 3$	$r \geq 3$	0.034178	1.391040	3.841466	0.2382

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

As it is seen from the table export Johansens cointegration rank, the Trace test statistics indicate that one co-integrating equation at a 5% significance level. In other words, it acknowledges the possibility of only one co-integrating vector. Since the test statistic (55.45) is greater than the 95% critical value (47.86) of the trace statistics test, it is possible to reject the null hypothesis of one co-integrating vector. It implies that there exists a long-run relationship among the variables, and then the paper estimate the model by the VECM estimation method.

Table 4.7. Cointegration Test for Imports

Hypothesized No.	Null	Alternative	Eigenvalue	Trace Statistic	5% Critical Value	prob.
None *	$r = 0$	$r \geq 0$	0.532817	53.68191	47.85613	0.0129
At most 1	$r \leq 1$	$r \geq 1$	0.304167	23.24053	29.79707	0.2344
At most 2	$r \leq 2$	$r \geq 2$	0.183693	8.734682	15.49471	0.3905
At most 3	$r \leq 3$	$r \geq 3$	0.015284	0.616086	3.841466	0.4325

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

As seen from the table imports, Johansens cointegration rank the Trace test statistics indicates that one co-integrating equation at a 5% significance level. Since the test statistic (53.68) is greater than the 95% critical value (47.86) of the trace statistics test, it is possible to reject the

null hypothesis of one co-integrating vector. It implies that there exists a long-run relationship among the variables, and then the paper estimate the model by the VECM estimation method.

4.2.4. Vector Error Correction Model (VECM)

A vector error correction model is a restricted VAR model that has co-integration restrictions built into the specification. It's meant to be used with co-integrated non-stationary series. The vector error correction specification restricts the long-run behaviour of the endogenous variables to converge to their co-integrating relationships while allowing a wide range of short-run dynamics. Through a succession of partial short-run modifications, the error correction term gradually corrects the departure from long-run equilibrium (Engle, and Granger, 1987).

4.2.4.1 The Long-Run Relationship between Trade and Exchange Rate

After confirming the existence of a long-run co-integration relationship among the variables, the next step is running the appropriate VEC model to find out the long-run coefficients. Two cases for both export and import equations were considered.

Table 4.8. Long-Run Output for Exports

Variable	Coefficients	Standard Error	t-statistics
LExp	1.000000		
LRGDP	-0.776345	0.08614	-9.01302
LREER	-0.848587	0.17468	-4.85806
LINF	0.318870	0.07096	4.49351
C	0.383053		

* Denotes significance at 5 percent level

Source: Computed by authors using Eviews 10 software

If the model contains a cointegration relationship among the variables, then we can proceed to VECM and equation for exports is:

$$LExp = 0.38 + 0.776LRGDP + 0.85LREER - 0.38LINF$$

From the result, real effective exchange rate, real gross domestic product, and inflation rate are the main determinants of exports because of their significance coefficient. Most of the explanatory variables in these results conformed to expected signs.

The coefficient of the real effective exchange rate (REER) variable appeared with a positive sign and was statistically significant at the 5 percent level. The positive sign of the real effective

exchange rate, there was a positive relationship between the real effective exchange rate (REER) and export trades. This suggests that a 1% increase in the real effective exchange rate will result in a 0.85 percent rise in export trade in Ethiopia in the long run, assuming all other factors remain constant. This means that the null hypothesis of exchange rate volatility not having a significant impact on export trades in Ethiopia is rejected and the alternative accepted. However, in the long run, the real effective exchange rate is positively related to export, in this case, it is positive, which resembles the findings of De Grauwe (1987), Cabalero, and Corbo (1989), Qian and Varangis (1992), Arize (1998), Ngigi (2004), Gertz (2008), Maana et al., (2010), etc. This can be characterized as follows: exchange rate volatility is not only a risk for a corporation; it can also be viewed as a profit opportunity, since an increase in volatility increases the chances of making huge profits (De Grauwe, 1992). When a country's REER rises, it means its exports are becoming more expensive and its imports are becoming less expensive. A weaker domestic currency encourages exports while raising the cost of imports; on the other hand, a strong domestic currency discourages exports while lowering the cost of imports. Some scholars believe that exchange rate volatility is a result of domestic growth limitations, international trade disequilibrium, and transitory problems resulting from interest rate differentials and other reasons, rather than a cause of foreign trade problems. Guisan (2005).

Moreover, the positive value of the coefficient for the real gross domestic product (RGDP) indicates that the link between real gross domestic product (RGDP) and export trades is positive. This result matched the theoretical hypothesis that a 1 percent increase in the real gross domestic product (RGDP) would result in a 0.78 percent rise in the value of exports. When a country exports things, it is selling them to a foreign market, such as consumers, enterprises, or governments. Exports bring money into the country, increasing the exporting country's GDP.

Again, in the long run, the coefficient of inflation is -0.32. This value is significant at 5% meaning that inflation as a variable has a significant impact on exports in the long run. Since the coefficient is negative, it indicates that a one percent rising in inflation will fall exports by 0.32 percent too in the long run. In a theoretical sense, export and inflation have an inverse relationship to each other. Inflation raises the price of products and services on the global market. Export of goods and services will increase only if the demand for domestic export in foreign countries is inelastic (Fleming, 1962; Mundell, 1963).

Table 4.9. Long-Run Output for Imports

Variable	Coefficients	Standard Error	t-statistics
LImp	1.000000		
LRGDP	-0.963842	0.10616	-9.07883
LREER	0.301978	0.19935	2.51485
LINF	-0.466676	0.08967	-5.20434
C	-2.218432		

* Denotes significance at 5 percent level

Source: Computed by authors using Eviews 10 software

Equation for imports is:

$$L\,\mathrm{Im}\,p = -2.22 + 0..96LRGDP - 0.3LREER + 0.47LINF$$

Table 4.8 shows that, real effective exchange rate; real gross domestic product and inflation rate are the main determinants of imports because of their significance coefficient. Most of the explanatory variables in these results conformed to expected signs.

The coefficient of the real effective exchange rate (REER) variable appeared with the expected sign (negative) and was statistically significant at the 5 percent level. In the negative sign of the real effective exchange rate, there was a negative relationship between the real effective exchange rate and imports. This suggests that a 1% increase in the real effective exchange rate will result in a 0.30 percent fall in imports in Ethiopia in the long run, assuming all other factors remain constant. This means that the null hypothesis of exchange rate volatility not having a significant impact on import trades in Ethiopia is rejected and the alternative accepted. A negative relationship implies that an increase in volatility depresses Ethiopia's imports, and can be explained as importers cannot adjust to exchange rate fluctuations at the time of occasion, which is consistent with Ethier (1973), Clark (1973), Hooper and Kohlhagen (1978), Cushman (1986), Peree and Steinherr (1989), Were et al., (2002), Kiptui (2008), etc. Similarly, the positive value of the coefficient for real gross domestic product indicates that the link between real gross domestic product and imports is positive. This result matched the theoretical hypothesis that a 1 percent increase in the real gross domestic product would result in a 0.96 percent rise in the value of imports. To be clear, buying domestic goods and services increases GDP because it increases domestic production, whereas buying imported goods and services has no direct effect on GDP. Finally, the positive sign of the coefficient indicated that the relationship between the inflation rate and imports was positive. This conclusion is consistent with theoretical expectations,

implying that if the inflation rate rises by a percentage point, imports will rise by 0.47 percent. This means that the null hypothesis of exchange rate volatility not having a significant impact on the inflation rate in Ethiopia, in the long run, is rejected and the alternative accepted. However, inflation leads to an increase in imports, as the money supply in the market increases, which increases the purchasing power of money.

4.2.4.2. The Short Run Relationship between Trade and Exchange Rate

Having already obtained the long-run and estimated the coefficients, the next step was the estimation of coefficients of the short-run dynamics that have important policy implications. Hence, an error correction term was estimated which incorporates the short-term interactions and the speeds of adjustment towards the long run.

Table 4.10. Short-Run Output for Exports

Variable	Coefficients	Standard Error	t-statistics
ECM(-1)	-0.217863	0.00398	-3.48895
D(LExp(-1))	-0.151840	0.20708	-0.73323
D(LRGDP(-1))	0.660642	0.57727	1.14443
D(LREER(-1))	-0.544889	0.22823	-2.38743
D(LINF(-1))	-0.037445	0.02663	-1.40636
C	0.004813	0.04366	0.11025

* Denotes significance at 5 percent level

Table 4.11. Short-Run Output for Imports

Variable	Coefficients	Standard Error	t-statistics
ECM(-1)	-0.607671	0.29838	-2.03658
D(LImp(-1))	-0.338031	0.22507	-1.50192
D(LRGDP(-1))	0.281981	1.35748	-0.20772
D(LREER(-1))	0.002457	0.52156	0.00471
D(LINF(-1))	-0.023445	0.06813	0.34414
C	0.093269	0.10490	0.88912

* Denotes significance at 5 percent level

Source: Computed by authors using Eviews 10 software

As table 4.9 and 4.10 above show that the coefficient of exports and imports the error correction term is significant at a five percent level of significance with an expected sign and reasonable magnitude (ECM = -0.217863 and -0.607671). The coefficient of the error correction term is negative and less than one. This result ensures that exports and imports converge to their long-run equilibrium. However, the speed of adjustment of the exports and imports to their own long-

run equilibrium is moderate, as shown by the adjustment coefficient. Every year, just over approximately 22 and 61 percent of the disequilibrium in exports and imports is adjusted.

4.2.4.3. VECM Residual Diagnostic Test

Up to this point, we have just found out that variables are integrated into order one. Therefore, a suitable model is a Vector Error Correction model. However, one step which should be taken before the discussion of the VECM (short-run and long-run model) is checking the robustness of our model. Hence, checking for normality of residuals, Heteroscedasticity, serial correlation and portmanteaus about the residual of the VECM is of interest.

Table 4.12. Diagnostic Test Outputs for Exports

Diagnosis	Test	Null hypothesis	$\chi 2$ -stat	Prob.
Autocorrelation	Lagrange-multiplier	No serial correlation	21.28908	0.1709
Normality	Jarque-Bera test	Residuals are normal	10.06238	0.2607
Heteroscedasticity	White	Homoscedasticity	186.2977	0.3582
Portmanteaus	AdjQ-test	No autocorrelation	19.04536	0.8967

Table 4.13. Diagnostic Test Outputs for Imports

Diagnosis	Test	Null hypothesis	$\chi 2$ -stat	Prob.
Autocorrelation	Lagrange-multiplier	No serial correlation	9.939826	0.8708
Normality	Jarque-Bera test	Residuals are normal	10.48497	0.2326
Heteroscedasticity	White	Homoscedasticity	108.2908	0.2684
Portmanteaus	AdjQ-test	No autocorrelation	21.33702	0.8110

As shown in both tables, the results of the diagnostic tests show that all models are correctly specified and the parameters are correctly estimated. The Model does not suffer from serial correlation, Heteroscedasticity, normality, and portmanteaus. Thus, the normality test implies that reject the null hypothesis for the Jaque-Berra normality test, which says that the residuals are normally distributed. Therefore, the entire diagnostic test of the residual and as observed all tests are passing the model we need.

4.3. Granger Causality

The Granger causality test is considered a useful technique for determining whether one-time series is good for forecasting the other. The concept of the Granger causality test is explored when the coefficients of the lagged the other variables are not zero. As table presents the pair-wise Granger-causality tests, which were obtained with two lags for each variable.

Table 4.14. Pair-wise Granger Causality Test Output for Exports

Pire wise Hypothesis	Obs	F-Statistic	Prob.	Decision	Type
LRGDP does not Granger Cause LExp	40	5.81883	0.0066*	Reject H0	Causality
LExp does not Granger Cause LRGDP		0.84376	0.4387	Accept H0	no Causality
LREER does not Granger Cause LExp	40	7.08390	0.0026*	Reject H0	Causality
LExp does not Granger Cause LREER		5.60006	0.0078*	Reject H0	Causality
LINF does not Granger Cause LExp	40	2.64726	0.0850**	Reject H0	Causality
LExp does not Granger Cause LINF		2.44671	0.1013	Accept H0	no Causality
LREER does not Granger Cause LRGDP	40	0.99090	0.3814	Accept H0	no Causality
LRGDP does not Granger Cause LREER		0.08378	0.9198	Accept H0	no Causality
LINF does not Granger Cause LRGDP	40	3.68608	0.0353*	Reject H0	Causality
LRGDP does not Granger Cause LINF		4.38222	0.0200*	Reject H0	Causality
LINF does not Granger Cause LREER	40	1.65483	0.2057	Accept H0	no Causality
LREER does not Granger Cause LINF		0.41121	0.6660	Accept H0	no Causality

Note :(*) denotes rejection of the null hypothesis at a 5% significant level
Note :(**) denotes rejection of the null hypothesis at a 10% significant level

The causality effect of exchange rates on the variables of international trade in Ethiopia reveals that real gross domestic product (RGDP), and real effective exchange rate (REER) cause exports, and exports cause a real effective exchange rate. However, exports do not Granger cause real gross domestic product. Bidirectional exports do not Granger cause inflation at a 5% significance level, but inflation cause at a 10% significance level. The reverse is not rejected, indicating that it is exports that cause inflation.

As shown from the table above, the real gross domestic product does not Granger causes exports to be rejected at a 5 percent level of significance. However, the reverse is not rejected, indicating that it is a RGDP that causes exports and not the other way round. This implies that RGDP significantly suggests something about the short-run behaviour of exports, while exports do not predict anything about the short-run properties of the real gross domestic product in Ethiopia.

Found bidirectional causality between real effective exchange rate (REER) and exports at the five percent level of significance. Therefore, this result indicates that causality runs real effective exchange rate vis-à-vis exports.

Table 4.15. Pair-wise Granger Causality Test Output for Imports

Pire wise Hypothesis	Obs	F-Statistic	Prob.	Decision	type
LRGDP does not Granger Cause LImp	40	5.59283	0.0078*	Reject H0	Causality
LImp does not Granger Cause LRGDP		1.60945	0.2144	Accept H0	no Causality
LREER does not Granger Cause LImp	40	2.14410	0.0463*	Reject H0	Causality
LImp does not Granger Cause LREER		1.22606	0.3057	Accept H0	no Causality
LINF does not Granger Cause LImp	40	0.74627	0.4815	Accept H0	no Causality
LImp does not Granger Cause LINF		2.14925	0.0317*	Reject H0	Causality
LREER does not Granger Cause LRGDP	40	0.99090	0.3814	Accept H0	no Causality
LRGDP does not Granger Cause LREER		0.08378	0.9198	Accept H0	no Causality
LINF does not Granger Cause LRGDP	40	3.68608	0.0353*	Reject H0	Causality
LRGDP does not Granger Cause LINF		4.38222	0.0200*	Reject H0	Causality
LINF does not Granger Cause LREER	40	1.65483	0.2057	Accept H0	no Causality
LREER does not Granger Cause LINF		0.41121	0.6660	Accept H0	no Causality

Note :(*) denotes rejection of the null hypothesis at 5% significant level
Note :(**) denotes rejection of the null hypothesis at 10% significant level

The results presented in the table above shows unidirectional causality between the variables; real gross domestic product (RGDP) and imports (Imp) as well as real effective exchange rate and imports (Imp). However, imports do not Granger cause real gross domestic product and real effective exchange rate. This means that exchange rate variation and gross domestic product Granger causes imports trade. In the same way, unidirectional imports Granger cause inflation.

4.4. Variance Decomposition Analysis

Variance decomposition analysis provides a way of determining the relative importance of shocks to each exchange rate fluctuation in explaining variations in the international. The following table shows the proportion of the forecast error variance decomposition in the exports and imports.

Table 4.16. Variance Decomposition Output for Exports

Period	S.E.	LExp	LRGDP	LREER	LINF
1	0.175002	100.0000	0.000000	0.000000	0.000000
2	0.293308	86.72598	7.369321	4.728925	1.175775
3	0.348981	83.85766	8.460889	6.049504	1.631948
4	0.391473	84.61635	7.884512	5.995068	1.504074
5	0.436051	84.76338	7.800832	5.973025	1.462760
6	0.476418	84.43433	7.932252	6.116354	1.517067

Source: Authors Estimation using e-view 9 Software

Variance decomposition in the above table reveals that at the one-year horizon, 100% of the variance in exports is explained by their shocks. For the second period, ahead forecast error

variance in the exports itself explains about 86.7 percent of its variation, while all its determinants explain only the remaining 13.3 percent. Out of this 13.3 percent, the real GDP explains about 7.4 percent, the real effective exchange rate (REER) about 4.7 percent and inflation 1.2 percent. In the third period, the exports explain about 83.8 percent of its own variation, while its determinants explain the remaining 16.2 percent. Out of this 16.2 percent, the real GDP explains about 8.5 percent, the real effective exchange rate about 6 percent and inflation 1.6 percent. Finally, at a 6-year horizon, 84.4 % of the variation in exports is explained by its own shocks while the impact of real GDP, REER, and inflation jointly explain the outstanding value of 15.6 percent.

Table 4.17. Variance Decomposition Output for Imports

Period	S.E.	LImp	LRGDP	LREER	LINF
1	0.425469	100.0000	0.000000	0.000000	0.000000
2	0.476274	98.01793	0.017065	0.091641	1.873367
3	0.555341	96.85582	0.132603	0.115817	2.895764
4	0.607958	95.72028	0.281814	0.143363	3.854541
5	0.658905	94.46215	0.369044	0.185068	4.983735
6	0.704459	93.24470	0.490553	0.220633	6.044119

Source: Authors Estimation using e-view 9 Software

Variance decomposition in the above table 4.16, 100% of the variance in imports is explained by their shocks. For the second period, ahead forecast error variance in the imports itself explains about 98 percent of its variation, while all its determinants explain only the remaining 2 percent. Out of this 2 percent, the inflation explains about 1 percent, while the remaining variables real gross domestic product and real effective exchange rate do not significantly contribute to the variation in the inflation. In the third period, the imports explain about 96 percent of its own variation, while its determinants explain the remaining 4 percent. Out of this 4 percent, the inflation explains about 2 percent, while the remaining variable real gross domestic product and real effective exchange rate do not significantly contribute to the variation in the imports.

4.5. Impulse Response Analysis

Fig below shows how exports and imports respond to the real effective exchange rate (REER), real growth domestic product, and inflation rate shock. The column represents one standard deviation shock, and the row shows responses to one standard deviation shock on the column.

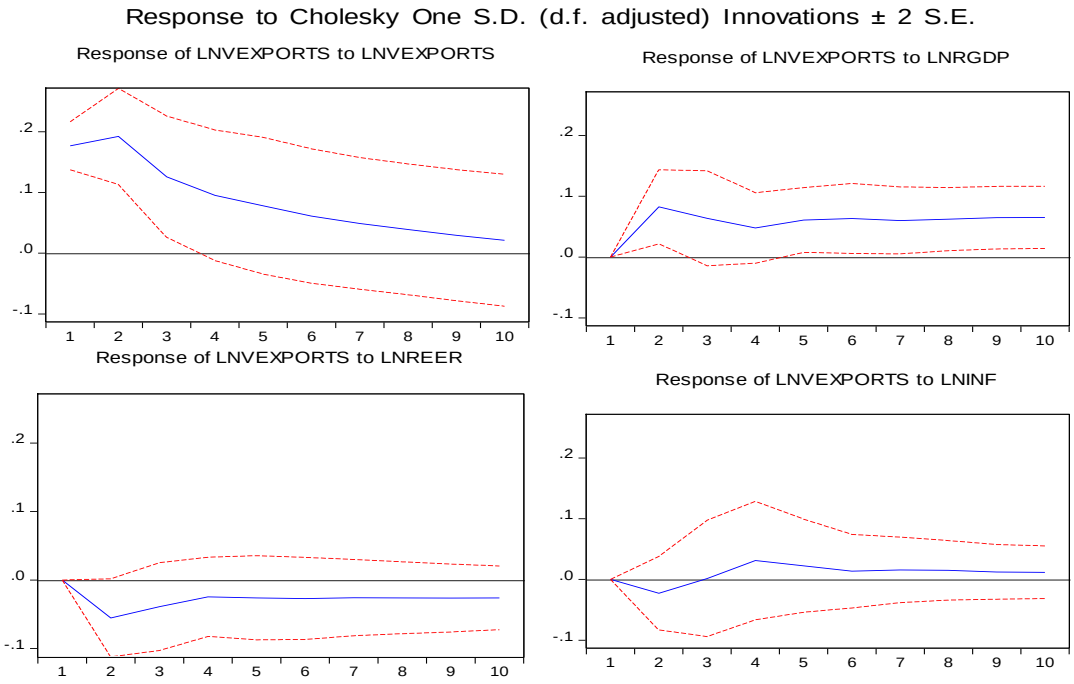


Figure 4.3. Impulse Response Output for Exports

The real gross domestic product shock has a positive impact on exports. The implication is that GDP increases when there is a trade surplus: that is, the total value of goods and services that domestic producers sell abroad exceeds the total value of foreign goods and services that domestic consumers buy (Guechari, 2012).

Real effective exchange rate shock has a negative impact on export trade. The implication is that when a country's exchange rate increases relative to other countries, the price of its goods and services increases. Imports become cheaper. Ultimately, this can decrease that country's exports and increase imports. Real effective exchange rate shock has a negative impact on export trade with the appreciation of the real effective exchange rate, the price of domestic goods increase. So exports seem expensive to foreigners as a result of a decrease in real export earnings. Again, inflation shock had a negative impact on exports at period three. But after period three, inflation had a positive impact on exports.

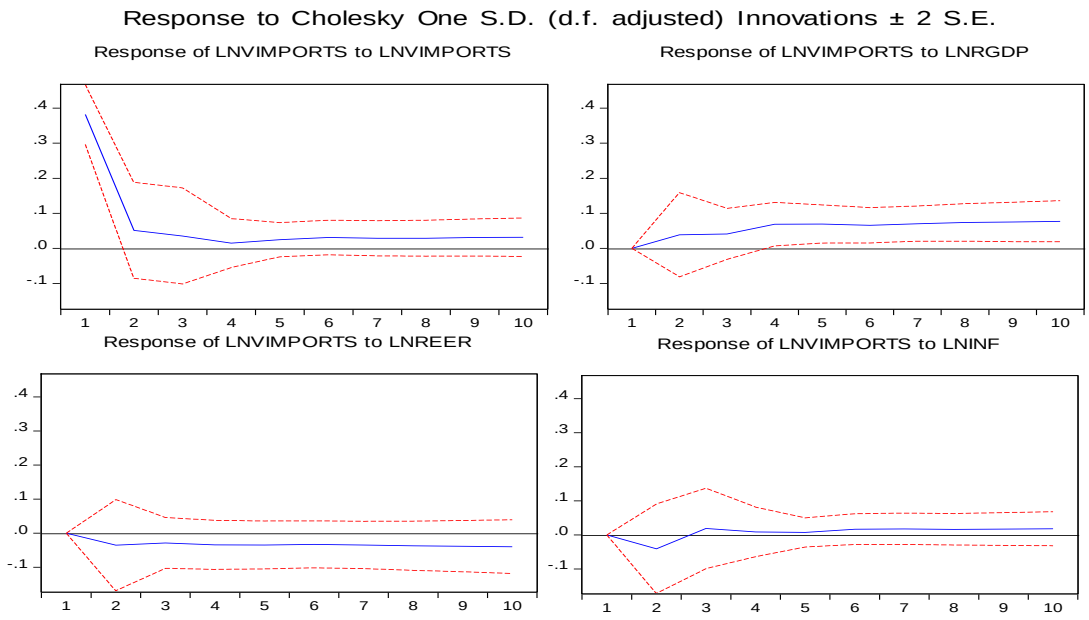


Figure 4.4. Impulse Response Output for Imports

The above figure shows that real gross domestic product and real effective exchange rate shock have a positive and negative impact on imports trade. The relative price of items at home is higher than the relative price of goods abroad when the real exchange rate is high. Import is more likely in this circumstance since foreign items are less expensive in real terms than domestic goods. Thus, when the real exchange rate is high, net exports decrease as imports rise. At the same time, the inflation shock had a negative impact on exports in period three. But after period three, inflation had a positive impact on imports. The price of imported goods will go up because they are more expensive to buy from abroad. Higher domestic demand.

In both figures, the real effective exchange rate shock has a negative impact on import and export trade. A fall in the exchange rate should reduce the terms of trade. This is because a decline in the exchange rate will make exports cheaper. The conditions of trade should improve when the exchange rate rises, as exports become more expensive and imports become less so. In addition, in both figures, inflation affects imports and exports primarily through their influence on the exchange rate. Higher inflation typically leads to higher interest rates, and this leads to a weaker currency. When compared to a currency with lower inflation, a currency with more inflation will decline. The impact of inflation on international trade can be summarized in a few words. When prices and costs rise rapidly in a country, things produced there quickly become more expensive than identical goods produced elsewhere.

CHAPTER FIVE

5. Conclusion and Recommendation

In this chapter, the summary of the findings, as well as recommendations, are forwarded which may be relevant to the policymakers and academicians as input for their policy and further research work on the area.

5.1. Conclusion

This study is to examine the impact of exchange rate fluctuations on international trade, specifically by using the framework of VAR and vector error correction mechanism, using annual data covering the period from 1980 to 2021. Based on the literature review, we find 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 the unit root test indicate that all variables have got a unit root at levels and become stationary at first difference. The result of the co-integration test, using the Johansen Maximum likelihood approach, indicates the existence of long-run relationships between the variables, in line with previous research in other countries. This means that exchange rate fluctuations on exports and imports move together in the long run.

The evolution of the real effective exchange rate in the Ethiopian economy over 41 years (1980-2021) is not steady, according to this analysis. Because the real effective exchange rate trend is up and down during those times. The National Bank of Ethiopia sought to depreciate the birr in 1992 in response to the fluctuating exchange rate, thereby stabilizing exchange rates after long-term movement, as shown in the graph. Furthermore, after 1992, the National bank of Ethiopia additional attempted to devalue the birr in 2017, but until now Ethiopia's economy has not been stable as seen in the graph and actual. Also, imports grew at a high rate while export grew, slowly. Although both export and import grew, the trade deficit has been widening because the base for import growth is relatively larger than the export growth. The increasing gap between imports and exports indicates that Ethiopia’s economy has a trade deficit.

The empirical finding reveals that in the long run, the real effective exchange rate and real gross

domestic product coefficients have a positive significant effect on exports, whereas the inflation rate has a negative significant effect on exports in Ethiopia. At the same time, the long-term impact of the inflation rate and real gross domestic product on imports is positive, whereas the long-term impact of the real effective exchange rate on imports in Ethiopia is negative. The study found that an increase in the exchange rate, or devaluation, of Ethiopia's currency, is favourable associated with exports, whereas an increase in the exchange rate indicates a long-term negative impact on imports. Based on the findings, there is evidence that the exchange rate is the main factor affecting international trade in Ethiopia, as it positively and negatively affects export as well as import flows. Export growth slowing could lower the number of foreign exchange revenues available to fund development initiatives. A drop in imports, on the other hand, could have an impact on domestic production and consumption. It could also have a detrimental impact on Ethiopia's balance of payments.

The coefficient of the lagged error correction term is the crucial economic interpretation in the error correction term, according to the short-run estimation result (ECT). It indicates that in the long term, the model converges to its equilibrium state in the situation of shock and disequilibrium. According to the export and import estimation results, 22 and 61 percent of the disequilibrium is adjusted each year. Changes in volatility are positively related with exports and adversely associated with imports in the near run. This relationship may be deemed natural, as importers are unable to instantly adjust the volume of their trade-in in response to exchange rate swings.

In Ethiopia, the causation effect of exchange rates on international trade variables demonstrates that real GDP and real effective exchange rate cause exports, and exports cause a real effective exchange rate. Exports, on the other hand, have no effect on actual gross domestic output. At a 5% significance level, bidirectional exports do not generate inflation, but they do induce inflation at a 10% significance level. The converse is not disputed, implying that exports are the source of inflation. Simultaneously, there is unidirectional causality between the variables of real GDP and imports, as well as real effective exchange rate and imports.

According to variance decomposition, the shocks account for 100% of the variation in export and import during a one-year period. Over a six-year period, shocks account for 84.4 and 93.2

percent of the volatility in export and import, respectively. These findings suggest that changes in the real effective exchange rate, as well as those of exports and imports, are partially explained by shocks at the end of six years. According to impulse response analysis, export and import to the real effective exchange rate were negative for all 10 periods.

In Ethiopia, exchange rate variations have a long-term positive and considerable effect on exports and a negative and significant effect on imports. This was in line with the findings of Were et al., (2002) and Kiptui (2008) whose study on Ethiopia's imports performance revealed that the exchange rate had a profound effect on Ethiopia's imports performance.

5.2. Recommendations

The following recommendations are made based on the study's findings:

i. The impact of currency rate fluctuations on Ethiopian exports and imports necessitates strategy mediations. To assist limit its impact, monetary and fiscal policies should be considered. This is because financial shocks frequently amplify exchange rate volatility.

ii. As opposed to the current practice, policymakers should work to increase the volume of exports by diversifying market destinations by focusing on local and regional markets. This can be accomplished by promoting regional and export markets while maintaining constant quality standards. Innovative techniques to meet the standards, as well as smallholder farmer help, are required.

iii. Because of increased pricing for foreign goods, a weak native currency can drive up inflation in a country that is a significant importer. This may prompt the central bank to hike interest rates in order to combat inflation while also supporting the currency and preventing it from falling quickly.

iv. Greater exchange rate stability and trade circumstances that support domestic output in the economy were promoted by the exchange rate and trade policies. This will boost agricultural exports and cut down on imports. To do this, the government must provide effective infrastructure services, particularly for the provision of power and other forms of energy.

Reference

Adeleye, J. O., Adeteye, O. S., & Adewuyi, M. O. (2015). Impact of international trade on economic growth in Nigeria. *International Journal of Financial Research, 6(3), 163.*

Adeniran J. O, Yusuf. S.A and Adeyemi Olatoke. (2014). "The impact of exchange rate luctuations on the Nigerian economic growth: *An empirical investigation''*

Adsuyi and Odeloye, 2013, Exchange Rate Volatility and Economic Activities of Africa's Sub-Groups. *The International Trade. Journal , Volume 27, 2013 - Issue 4*

Arize, A. C., Osang, T. and Slottje, D. J. (2004). Exchange-rate volatility and foreign trade: Evidence from thirteen LDCs. *Journal of Business and Economic Statistics, 18 (1), 10-17.*

Arthur, (2003) and M. Griffin, R. Pustay, M. (1998). A Managerial Perspective, Addison Wesley Longman, Melbourne: *International Business*

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

Baron, D. P. (1976). "Flexible Exchange Rate, Forward Markets, and the Level of Trade". *American Economic Review 66: 253 – 26.*

Baum, F.C. and Caglayan, M., 2006. Effects of exchange rate volatility on the volume and volatility of bilateral exports. *Working paper November 2006, Boston College*

Brooks, C. (2008). Introductory Econometrics for Finance. *p. 491*.

Chipili, J.M. 2010. "Macroeconomic effects of exchange rate volatility in Zambia*". Department of Economics, University of Leicester, PhD Thesis.*

Chit, M., Rizov, M. & Willenbockel, D. (2010). Exchange rate volatility and exports: New

empirical evidence from the emerging East Asian Economies, World Economy, 33: 239-263.

Chowdhurry, T. (2005). Exchange Rate Volatility and the United States Exports: Evidence from Canada and Japan". *Journal of Japanese International Economies, 19: 51-71.*

Clark and Peter B. (1973), "Uncertainty, Exchange Risk, and the Level of International Trade", *Western Economic Journal, 11 (September): 302-13.*

Coric, B. & Pugh, G. (2010). The effect of exchange rate variability on international trade: A regressive analysis. *Centre for research on emerging economies 42(20) pp 2631- 2644.*

Cote, A., 1994. Exchange rate volatility and trade: *A survey, working paper May 1994, Bank of Canada*

De Grauwe, P. and Franke (1988). Exchange rate variability and the slowdown in growth of international trade. *IMF Staff Papers, 35, 63-84.*

Dell'Aricca, G., 1999. Exchange rate fluctuations and trade flows: Evidence from the European Union. *IMF Working papers September/December 1999, International Monetary Fund*

Dennis Brown (2019) the Effect of Exchange Rate Fluctuation on Foreign Trade in Nigeria: *International Journal of Scientific Research and Engineering Development-– Volume 2 Issue 1, Jan-Feb 2019*

Dickey D, Fuller WA. Distribution of the estimates for autoregressive time series with unit root. *Journal of the American Statistical Association. 1979;74:427- 431.*

Either, W. (1973)."International Trade and the Forward ExchangeMarket*", American Economic Review, 63: 494 – 503.*

Fang, W., Yihao and Miller, S. M. (2006). "Export Promotion through Exchange Rate Changes: Exchange Rate Depreciation?" *Southern Economic Journal, 73(2):611-626.*

Franke, G., (1991), "Exchange rate volatility and international trading strategy", *Journal of International Money and Finance, 10 (2), 292–307.*

Gertz, G., (2008). Kenya's Trade Liberalization of the 1980s and 1990s: Policies, Impacts, and Implications. *Background Paper for the Report on the Impact of the Doha Round on Kenya Published by Carnegie Endowment for International Peace.*

Getachew (2020). Determinants of Exchange Rate in Ethiopia: A Graphical Approach: *International Affairs and Global Strategy www.iiste.org ISSN 2224-574X (Paper) ISSN 2224-8951 (Online) Vol.84, 2020.*

Granger, C. (1986). Development in the study of co-integrated Economic Variables. *Oxford Bulletin of Economics and Statistics 48(3),355-369*

Gujarati, D. N. (2003). Basic Econometrics Fourth Edition. *The Mcgrow Hill Companies Inc.New York.C*

Hooper, P. & Kohlhagen, S.W. (1978). The effect of exchange rate uncertainty on the prices and volume of international trade. *Journal of International Economics, 8 (4), 483-511.*

https://www.smartcapitalmind.com/what-is –exchange rate –volatility,htm,(2021).

Jayasuriya D.P.S.H. & Perera S.S.N. (2016). Analysis of Factors Affecting USD/LKR Exchange Rate, Symposium on Statistical & Computational Modeling with Applications.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control, 12(2-3), 231-254.*

Kandil, Magda(2015). “Exchange Rate Fluctuations and the Macro economy: Channels of Interaction in Developing and Developed Countries”. *Eastern Economic Journal, (forthcoming).*

Kiptui, M. (2008). Does exchange rate volatility harm exports? Empirical evidence from Kenya’s tea and horticulture exports, CSAE Conference Oxford, 2008.

Lequiller and Blades (2006) “Globalization, Exchange rate Volatility and foreign trade performance in Nigeria”: *An empirical analysis, a mimeograph submitted to the University of Nigeria, Nsukka.*

Lutkepohl, H. (2005).New introduction to multiple time series analysis. *Springer Science and Business Media.*

Nergiz Dincer and Magda Kandil (2009). The effects of exchange rate fluctuations on exports: a sectoral analysis: *article in journal of international trade and economic development* ·

Minot N, Ngigi M (2004). “Are Horticultural Exports a Replicable Success Story”? Evidence from Kenya and Côte d’Ivoire. Environment and Production Technology Division and Markets, Trade and Institutions Division. *International Food Policy Research Institute. 2033 K Street, NW Washington, DC 20006 U.S.A*

Moccero, D.N. and Winograd, C., 2006. Real exchange rate volatility and exports: Argentine perspectives. *4th Annual conference of the Euro-Latin study network on integration and trade, 20-21 October, Paris*

Mohan, (2009).”The Impact of Exchange Rate Volatility on International Trade”: Reduced Form

Estimates Using the GARCH- in-Mean Model, in: *Journal of International Money and Finance. Lendrum, T (1995), The Strategic Partnering Handbook, McGraw- Hill. Crossref.*

Mwanza, J. (2011). The Impact of exchange rate volatility on international trade flows. Journal of Economic Surveys, 13, 1, 71–106.

Oaikhenan, H. E., & Aigheyisi, O. S. (2015). Factors Explaining Exchange Rate Volatility in Nigeria: Theory and Empirical Evidence. *Effect of Monetary Policy on the Banking System Stability in Nigeria, 53(2), 47.*

Ojukwu, (20110 and Mahoney, D. Trigg, M. Griffin, R. Pustay, M. (1998).”International Business”: *A Managerial Perspective, Addison Wesley Longman, Melbourne.*

Otieno, B. and Mudaki, K. (2011). Factors influencing real exchange rate and export sector performance, School of business and economics, *department of economics, Moi University*

Sharma, P. 2020. A Trend Analysis of Current Account Deficit and Its Determinants in India. *International Journal of Scientific Research in Engineering and Management IJSREM, 44.*

Solomon Tonkei (2015). The effect of foreign exchange rate fluctuations on export earnings: evidence from flower industry in Kenya.

Sudhir Pasricha(2020). The effect of exchange rate fluctuations on international trade of India

Takaendesa, P., Tsheole, T., & Aziakpono, M. (2005). Real exchange rate volatility and its effect on trade flows: New evidence from South Africa. *A Paper Presented at the Biennial*

Conference of the Economic Society of South Africa, September 7-9, 2005, Durban, South Africa.

Todani, K.R. and Munyama, T.V., 2005. Exchange rate volatility and exports in South Africa. Annual forum 2005, Trade and uneven development: *Opportunities and challenges, South Africa*

Udoka and Ubom 2003. "Econometric Models and Economic Forecast". *Singapore McGrw- Hill in Ed. 4.*