THE EFFECT OF EXCHANGE RATE VOLATILITY AND SELECTED MACROECONOMIC VARIABLES ON INTRA-EAST AFRICA COMMUNITY REGIONAL TRADE

BY

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A THESIS SUBMITTED TO THE SCHOOL OF AGRICULTURE AND NATURAL RESOURCES IN PARTIAL FULFILLMENT OF THE

REQUIREMENT FOR THE AWARD OF MASTER OF

SCIENCE DEGREE IN AGRICULTURAL ECONOMICS

AND RESOURCE MANAGEMENT

MOI UNIVERSITY

2021

DECLARATION

This thesis is my own creative effort and has never been offered for examination for award of a degree in any university

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DEDICATION

It is my humble duty to bestow this thesis to Heavenly God, gorgeous parents Daniel and Tecla Saina, Abraham, Joseph, Peter, Wilson, Philip, Evans, Steve, Solomon, mum Ann, Lilian, Julia, Mary, Salina. Aunt Elizepha, Helen, Dina, Ester and Christine. Uncles Edwin, Sammy and David. My beloved wife Naumy is not exceptional. My brothers: Isack, Pius, Joshua, Shaa, Mark, Kim, Noah, Wilson, Sambu, Hilary, kipketer, Maru, Eston, Tirops just to mention a few. Sis Joan, Jelas, Jane, Eusla, Cherono, Helen, Sarah, Lucy, Rose, Analine, Kosy, Edna, Jepkirui, Chepngetich, Jeptoo, Peris, Charity, Jeples. Cousins: Laban, Kk, Noah, Dess, Emmy, Isack, Nelly, and Evah to represent the many others. In-laws: Alphine, Naumy, Stela, Eusla, Charity, Ruth, Mercy, Deborah and Ilda. Nieces and nephews: Calestic, Calestus, Caroli, Colan, Camelyne, Brian, Victor, Faith, Glarys, Mercy, Sarah. Childrens: Abel, Darius, Chirii, Savior, Chia, Brook, Phineous among others. My friends: Edwin, Sila, Nathaniel, Fred, James, Elphas, Mercy, George, Rop, Korir, Bernard, Becky, Joan, Caleb, Amos, Wesley among many others. Your support, prayers and encouragement have motivated and made me who I am today thank you all.

ACKNOWLEDGMENT

This far is God. I would like to say immense acknowledgement to you and similarly direct my thoughtful appreciation to my supervisors Dr. Alfred Serem as well as Dr. Hillary Ndambiri for their immense guidance towards the finishing point of this thesis. I moreover encompass my sincere indebtedness for lectures of Moi University Faculty of Agriculture and Natural Resource Management. I will live to remember you for your time and willingness to instill knowledge of agricultural economics to me. You have done great job by transforming me into a focused and a visionary person. My colleagues' students and all well-wishers whose impact in my life is not measurable are not exceptional, thank you and may God Almighty Bless you all

ABSTRACT

Exchange rate is the charge of one nation's currency in terms of another nation's currency, how rapidly the exchange rate fluctuates is termed as volatility. In East Africa Community exchange rate volatility went up when the countries adopted the structural Adjustment Policies in the early 1980s. The question that remain unanswered is that of knowing whether exchange rate volatility hinders or promote trade. The specific objectives of the study were to determine the volatility of exchange rate, examine the effects of exchange rate, analyze the effects of money supply, determine the effects of inflation, examine the effects of population and evaluate the effects of foreign direct investment on Intra-East Africa community regional trade. The theory that guided the study is the traditional, risk-portfolio and political economy theories. Longitudinal research design was adopted in this research. The study used yearly panel data ranging from 2000-2017. The data for this study was sourced from World Bank, Food and Agricultural Organization (FAO) and World Integrated Trade Statistics (WITS). The Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model and fixed effect model were used in the study. To fix the collected data into these models, panel unit root tests were conducted to check for stationarity of the data. Unit root test results indicated that some of the variables were stationary at levels and upon the first differencing all variables were integrated of order one *I (1*) hence stationary. The first differenced panel data were then fitted into the GARCH model to measure volatility. The same first differenced panel data were also fitted into the fixed effect model which was shown by the Hausman test results to be more robust in testing the hypotheses. The arch/garch model results indicates significant positive volatility ($\beta_0 = 1.0908$, $p= 0.000$). The results from the fixed effect model showed that exchange rate ($\beta_1 = -0.0008$, $p= 0.000$), money supply ($\beta_2 = 2.9468$, $p= 0.000$), population ($\beta_3 = 2.6362$, $p= 0.000$) and foreign direct investment ($\beta_4 = 0.2018$, $p= 0.000$) significantly determines intra-EAC regional trade. Inflation was however found not to be significant ($\beta_5 = -0.0010$, $p= 0.312$) at 95% level. The study concluded that exchange rate volatility exists in the Intra-East Africa region. In addition, it was also concluded that exchange rate, money supply, population, and foreign direct investment have an influence on intra-EAC regional trade. The study recommends that EAC member states should formulate policies that ensures exchange rate stability in the region to ensure reduced volatility and unpredictable exchange rate. In addition, policies should also be put in place that guarantees sufficient money supply and encourages foreign direct investments.

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ACRONYMS

ADF	Augmented Dickey Fuller
ARCH	Autoregressive Conditional Heteroskedasticity
AU	African Union
DOLS	Dynamic Ordinary Least Squares
EAC	East Africa Community
ECOWAS	Economic Community of West Africa States
ERV	Exchange Rate Volatility
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GDP	Gross Domestic Product
LLC	Levin Lin and Chu
MYS	Money Supply
POP	Population
TRD	Trade
UNCTAD	United Nation Conference for Trade and Development
UNECA	United Nation Economic Commission for Africa
VIF	Variance Inflation Factor
WDI	World Development Indicators
WITs	World Integrated Trade statisticcs

CHAPTER ONE

INTRODUCTION

1.0 Overview

This section contains the introduction of the study, brief information about the newly revived EAC, problem statement, general and specific objectives, hypotheses, justification and the scope of the study

1.1 Introduction

The rising need besides prominence of intraregional line of work for many emerging nation state of the world has amplified the degree of the real properties of the variation in the mutual conversation rates amongst the neighboring developing countries (Jadresic *et al.,* 2001). Musyoki *et al* (2012) defined the rate of interchange as the charge of one nation legal tender in terms of another nation's legal tender, in their study also, volatility of exchange rate was termed as rapid or uncertainty of exchange rate fluctuation. Owing to severe macroeconomic disproportions in the early years of 1980s and 1990s, majority of the sub Saharan African countries EAC members included, went on board on changes to liberalize their markets. The transformations commenced enclosed exchange rate and global trade liberalization in concurrence with structural adjustment policy transformations (Maehle *et al.,* 2013) and (Mwangi *et al.,* 2014).

However, the question of alarm all along is the consequence of this recurrent increase in oscillating degree of exchange on the development of international trade. For the case in the advanced as well as the other technologically advanced economies, quite a lot of early studies have made available experimental confirmation on the affiliation in the middle of volatile exchange rate in addition to trade. In broad-spectrum, majority of these scholarships have contended that volatility of exchange rate affects international trade negatively.

Nevertheless, diminutive is celebrated about the extent this deduction may be true for EAC partner states considering their odd physical appearance together with stumpy exports volume which is dominated by primary and unprocessed commodities in the aggregate exports (Mehara *et al.,* 2015and Ma Fendgand *et al.,* 2014). For all intents and purposes, studies of the familiarity with East African Community republics have been very view due to principally inaccessibility of satisfactory Crossectional data

The results of these oscillation of exchange rate may possibly contain undesirable or encouraging impacts on trade. However, either of such results isn't appropriate as it upsurges uncertainty or jeopardy in worldwide transaction and as a result, it dampens or lowers trade (Auboin *et al.,* 2013). The elementary for their incongruity is that unanticipated exchange rate oscillation would drive many producers to improve and enlarge their exports since there is often a chance for higher earnings.

The history of volatile rate of currency exchange dates back at around 1973 during which Bretton Woods structure of immovable parities which had its headquarters in New Hampshire collapse. This fall resulted to the implementation of fluctuating currency charge regimes by economies of the world. Throughout these uncontrolled currency conversion systems, movements in money conversion rate has remained uncertain therefore resulting often in some unpredictable and undesirable effects on the balance of trader (Sosvilla-Rivero 1999). Some economies welcome this idea but others protested and warned about the negative effects or results that free volatile rate of exchange could have on a country's exports. Their thinking was aligned to the fact that unexpected variation of the exchange rates would cause undesirable influence of risk antipathetic producers and make them to alter or change sales to home markets which will negatively affect the overall level of trade.

Irrespective of this commendable interpretation, some economies contend that volatile exchange rates are advantageous for the country's exports (Ugbede *et al.,* 2013). The elementary for their incongruity is that unanticipated exchange rate oscillation would drive many producers to improve and enlarge their exports since there is often a chance for higher earnings. Consequently, the uncertain instability of the currency exchange will increase international trade in addition to encouraging a country's trade movements. Nevertheless policy makers and economist have come to an agreement on the need to rebalance their economies and are aware of the intrinsic worth of more bendable exchange rates, in practice the fear of bringing up export competitiveness seems to have undermine these other deliberations.

The above different standpoints have also been reinforced by the empirical literature which have resulted to unconvincing and diversified support in connection the effects of fluctuating rate of currency conversion on trade. Inspired by the deficiency of extensive literature for African countries, the drive of this research is to study whether exchange rate volatility impedes or motivates intra-East African Community trade.

1.2 East African Community (EAC)

The current East Africa Community stands a revival of the preceding collaboration amongst the 3 founding affiliate countries, Kenya, Uganda and Tanzania which had decline in 1977 because of different ideologies in political matters amongst these governments. The treaty for establishing the EAC was sign up in the year 1999 and arise into potency on July 2000 after it was endorsed by the presidents of these of three founding countries. The Rwandan Republic together with Burundian government assented to the agreement of EAC on July 2007 (Oluoch 2013). The new and young Republic of Southern Sudan assented to the agreement of EAC on April 2016 and come to be complete partners on August of the same year (EAC report, 2017b)

The intra EAC market has approximately 138 million consumers, GDP of approximately US$ 138 million (UNCTAD, 2012). The leading focus of the EAC is to bring together strategies as well as policies that promotes collaboration among its member states for their communal advantage in a comprehensive array of extents comprising governmental federation, monetary union, customs union and cultural affairs, establishment of a solitary market place and investment area in the region besides the bringing together policies that stimulate cross border trade, improvement of infrastructure, security, legitimate and judicial matters and enhancement of technological and human resource development (EACreport2011; Khana 2013). One of the significant accomplishment towards amalgamation on EAC is its Common Market decorum that provides for guidelines and procedures. According to the United States Trade representative, roughly ninety percent of all goods arriving East Africa Community the harbors of Mombasa and Dares-Salaam nowadays clear customs the moment on admission and checks. This has cut up transportation intervals beginning from Kenya to Uganda and finally to Kigali in Rwanda and Bujumbura in Burundi

The 2016 African Regional Integration Index Report by the African Union, AfDB and UN Economic Commission for Africa (UNECA) shows EAC as the most integrated region, based on the average score from the five criteria used. Based on the exports of regional communities, EAC has the second largest share of intra-REC exports of about 18% (UNCTAD, 2018).The time limit, vision and mission of each of EAC member countries is presented in table 1.1.

Table 1.1: Vision and Mission of each of the EAC member countries

COUNTRY	TIME LINE	VISION	MISSION
TANZANIA	2025	To attain a high quality life fastened on peace, stability, unity and good governance, rule of law, resilient economy and competitiveness.	To instill hard work, investment and savings, culture; knowledge based nation; infrastructure improvement; and Private Sector Development.
BURUNDI	2025	To achieve maintainable peace and Stability and accomplishment of global development commitments in line with MDGS	Poverty reduction, reconstruction and Institutional development
RWANDA	2020	To turn out to be a middle income economy by 2020	Modernization, HR development and Combination to regional and global state
KENYA	2030	To grow into a worldwide competitive and wealthy nation.	Attain Sectoral purposes including meeting regional and global obligations.
UGANDA	2035	Converting the public from peasant to new well-off Uganda.	To importance being given to acquaintance based economy.
EAC	2050	To attain a flourishing, modest, secure and politically united East Africa community	To broaden and excavate financial, governmental social and cultural amalgamation at regional and global heights

Origin: Adapted from 4th EAC Development Strategy 2011/2-2015/16

The main Organs of the EAC are the Summit, composed of Heads of State and Government of Partner States to provide strategic direction towards the realization of the Community's objectives; the Council of Ministers, which acts as the central decision-making and governing body of the Community; the Coordinating Committee, responsible for regional cooperation and coordination of sector-related activities; Sectoral Committees, responsible for conceptualizing programmes and monitoring

their implementation; the Secretariat, the executive organ responsible for initiating and coordinating the harmonization of policies and strategies relating to the development of the Community; the East African Court of Justice; and the East African Legislative Assembly. In addition, there are several semi-autonomous EAC Institutions which assist in implementing specific areas of the Community's mandate (*EAC Development Strategy 2011/2-2015/16*).

1.3 Problem Statement

Although quite a lot of studies have found the theoretical and empirical relationship between exchange rate volatility and international trade, disagreements still persist. The problem that remain unanswered is that of knowing if fluctuating currency conversion hinder or promote trade. The theoretical collected studies and experimental outcomes that are available for this study confirm this great disjoint. These empirical findings have been diversified, inconclusive and occasionally ambiguous. For instance Mougoue *et al.,* 2011; Mwangi 2014; Spronk *et al.,* 2011; Doganlar *et al.,* 2002, renowned that volatile exchange rate causes trade expenses which increases the cost of transaction and depresses the advantages from international trade. This is transmitted into the economy by means of trade fluctuation. Bahmani-Oskooee and Aftab *et al.,* (2017); Asteriou *et al.,* (2016) and Kim *et al.,* (2017) never discovered any significant link among fluctuating rate of currency conversion and trade while Wang *et al.,* (2017); Peng *et al.,* (2016); Vieira and Macdonald (2016) and Doyle (2001) found a positive connection between exchange rate volatility and international trade. On the other hand, there exist a divided view from theory. Risk portfolio theory hold the view that fluctuating rate of currency conversion is of great benefit to the global transaction because it leads to higher rate of return.

The traditional or old-style thinkers hold the view that oscillating rate of money conversion hold back worldwide business transaction owing to high risk involved, an illustration is Clark (1973) who contended that a risk disinclined firm, fronting heightened exchange rate volatility, will condense their exporting activities, because there is greator uncertainty of future export earnings. Finally, the political theory which is based on infant industry argument, hold the view that international trade will shrink with uncertainty due to protective rules and laws.

In the advanced and the new developing countries, quite a lot of early studies have delivered experimental confirmation of the affiliation amid fluctuating currency conversion rate and trade. Most of these studies have concluded that exchange rate volatility hinders the international trade. Nevertheless, diminutive is celebrated approximately the extent this reasoning might possibly be factual for developing East African countries who's larger share of its trading commodities are the Agricultural products which are more vulnerable to money conversion rate volatility (Maskus 1986 and Pick 1990). This study thus seek out to deliver an answer to this disagreement by empirically instituting the effect of exchange rate volatility on intra-East Africa Community Regional trades.

1.4 Objective of the Study

The following are the general and specific objectives of the study respectively.

1.4.1 General Objective of the Study

The general objective of this research is to determine the effect of exchange rate volatility and selected macroeconomic variables on intra-East Africa community regional trade.

1.4.2 Specific Objectives

i) To determine the nature of exchange rate on Intra-East Africa regional trade.

ii) To examine the effects exchange rate volatility on Intra-East Africa community regional trade.

iii) To analyze the effects of money supply on Intra-East Africa community regional trade.

iv) To determine the effects of inflation on Intra-East Africa community regional trade.

v) To examine the effects of population on Intra-East Africa community regional trade.

vi) To evaluate the effects of foreign direct investment on Intra-East Africa community regional trade.

1.5 Hypotheses of the Study

H_1 Exchange rate is not volatile on Intra-East Africa community regional trade

H_2 Exchange rate does not significantly affect Intra-East Africa community regional trade.

H_3 Money supply do not affect Intra-East Africa community regional trade.

H_4 Inflation does not affect Intra-East Africa community regional trade.

H_5 Population does not affect Intra-East Africa community regional trade.

H_6 Foreign direct investment does not affect Intra-East Africa community regional trade.

1.6 Justification of the Study

Increasing globalization in the world presently has reinvigorated many nations towards outspreading their trades further than their geographical confines in order to benefit from operating business in a wide or large scale (Abor 2005). According to Murray

(2013), there is no solo country in the world which is self-sufficient and in a state of economic independence, therefore one country has to trade with several others so as to enjoy goods and services with a comparative disadvantage in its production

The understanding of the magnitude to which volatile currency conversion rate upsets trade is essential for the establishment and operationalization of money conversion rate and trade policies respectively (De Grauwe 1988 and Arize *et al.*, 2000).

For illustration, if by chance fluctuating rate of currency conversion causes a decrease in export volume, trade fine-tuning programmes that highlight export extension may perhaps become unproductive if the rate of converting currencies is not stable. The collected works on this topic reveals that oscillating rate of money conversion distorts the level of domestic allocative decisions; firm venture, foreign direct investments and trade balances. The study will also be of value to the current and future policy makers in the EAC as it will be responsible for fast-tracked, symphonic and balanced development of this region.

1.7 Scope of the Study

This study assessed the volatility of money exchange rate and its effects on intra-East Africa community regional business transaction by utilizing yearly panel data from 2000-2017. The reason why this period was selected is that East African Community treaty was sign up by the presidents of the founding nation in Arusha in the year 1999. The Treaty began to operate on July 2000 after the completion of its legalization procedures by the presidents of this uniting economies. Later Burundi and Rwanda assented to the EAC treaty on July 2007. (EAC report 2010). South Sudan was omitted from the study because it joined the community recently in the year 2016 a year before this study began.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This segment presents an overall look on the effects of instability of exchange rate in the world at large, pertinent literatures which have been studied empirically alongside with theories in line with researches that have shown linkage between exchange rate volatility and intra-regional trade.

2.1 Theoretical Review

This section discusses the theories which guided the study which include the following; traditional theory, risk-portfolio and political economy schools of thought.

2.1.1 Traditional School of Thought

This thinkers assumes that greater exchange rate unpredictability escalates threat then consequently diminishes international trade. Advocates of this theory contends that by increasing the risk concomitant with cross-border conversions, would make those who don't want to engage in risk activities and risk neutral traders to substitute possessions away from unstable markets abroad to the stable home markets effectually depressing worldwide business (Oyovwi 2012 and McKenzie, 1999). The developers of this thinking examines both the existence and the amount of risk which furthermore hang on other influences of production such as, the capability of firms to control, contract currency and trade in factors of production. The capacity of cross-border transaction as well as businesses in general are exaggerated by changeability of currency conversion rate via increased risk triggering them to react in a different way subject on whether they are risk disinclined, risk neutral or risk-loving to currency conversion rate unpredictability (Hooper and Kohlhagen 1978). In the case of risk neutral, unpredictability does not affect their decisions to export.

Baron (1976) concerted on mutual business transaction together with the end product of exchange on shipping organization judgments on values of production in unstable market which is inexpensive. He established that distributing companies face mutually value and capacity response risk respectively. With amplified uncertainty, the companies that avoid risk and takers full advantage shall upturn their prices the time goods are bought using foreign capital. He later concluded that lowering the firms risk will depend on the demand curve that a firm face. In conclusion, the traditional school of thought argue that trade across borders lowers with augmented uncertainty of profits owing to cost linked with higher exchange rate explosiveness triggering rerouting of undertakings of risk opposed and risk neutral to domestic markets with lower risk. The major impediment of traditional ideology is that it flops to perfect in what way risk are restrained by the firms in directive to upsurge efficiency.

2.1.2 The Theory of Risk-Portfolio

Away from the old-style way of thinking, the risk portfolio is established on the datum that the effect of an escalation in fluctuation in the rate of currency conversion rest on how convex is the utility function, which after all will be affected by the level in which the firm avoids the risk. According to the protagonist of this ideas, the greater risk signifies the higher rate of returns and thus increased level of trade. For that reason, intensifying risk for the reason that the oscillating exchange rate possibly will upsurge the volume of trade (De Grauwe, 1996). De Grauwe (1998) affirms that risk neutral persons are fascinated by higher profits and are not affected by adverse exchange rates and lowered outputs.

Cote (1994) pointed out that the hypothesis of repaginating risk does not extemporaneously tip to a presumption that exchange rate irregularity decreases the volume of trade. As a substitute, it is put up with the product hinge on the convexity

properties of the usefulness function, which therefore hinge on the amount of risk avoidance (De Grauwe 1988). For exporters, profits from exchange rate which are favourable will always outstrip the losses. He analyzes exchange rate risk view of divergence of portfolio in the modern world by holding that economic representatives will maximize their returns through distribution of their investments and engaging in risk fields that present prospect for higher profits. The further contended that, higher risk owing higher rate of volatility obstructs risk neutral merchants then again presents an opportunity for branching out thus heightening profits.

2.1.3 Political Economy School of Thought

This theory is based on infant industry argument. Here, economies manipulate international trade by imposing larger tariffs to imports from abroad. Countries impose higher taxes on certain types of imported goods and providing subsidies to domestic industries thus enabling them to lower their prices without losing money. This is done mainly by the elected officials in order to maximize their chances of winning the next election (Hillman 1982)

This theory holds that, trade will be lowered with uncertainty due to rules and regulations by individual countries to cushion its economy. Countries that have market determined currency conversion rate structures but are affected by misalignments in money conversion rate are victims to politicization and increase of protection on trade making trade movements to fall due to protectionist regulations on falling trades.

2.2 Empirical Literature Review

This section presents the empirical literature on the effect of exchange rate volatility, money supply, inflation, population and foreign direct investment, on worldwide transaction.

2.2.1 Exchange Rate Volatility and International Trade

Implementation of uncontrolled exchange rate coordination from the cessation of Bretton Woods has initiated a huge improbability in currency conversion rate. Mutually empirical together with speculative findings of volatile rate of exchanging currencies are not unswerving. A number of theoretical schoolwork back the negative proposition that oscillating currency conversation rates obstructs trade, Baron (1976). Other studies conclude in a different way that volatile exchange rate promotes global or trade across national borders Franke (1991), although a number of empirical results have yielded insignificant findings.

Njoroge, (2020) examined the effects of exchange rate volatility on exports, using a panel gravity model covering the period 1997 to 2019, to estimate pooled, and fixed and random effects models for a panel of 19 COMESA member countries. The study applied two alternative measures of exchange rate volatility, and the results revealed that exchange rate volatility tends to lower both intra and extra-COMESA trade. The study suggested that policy makers and economist in COMESA should focus more on exchange rate volatility when planning trade policies and strategies in member countries.

Eichengeen and Gupta 2012 studied the effect of volatile rate of currency conversion on service exports in unindustrialized nations by setting apart contemporary from old-style service. The study domino effect point out that actual rate of currency conversion exaggerated transfers of commodities and traditional services in the same way but affected modern service by greator proportion. The study concluded that money devaluation may possibly be engaged to be a tool as designed for advancement only in the small period of time since a country could not withstand a devalued currency indeterminately.

Hooper together with Kohlhagen (1978) in their theory stated that volatile exchange rate system hampers international trade. They argue that higher volatility results in greater charges for merchants who will thereafter reduce participating effort in foreign trade in order to avoid risk. On the other hand, De Grauwe (1998) suggested the otherwise, he argued that if exporters are adequately risk evaders, the amplified unpredictability will intensifies the anticipated marginal value of export income and therefore enhance exports

Asteriou, Masatci, & Pılbeam, (2016) investigated the effect of volatile exchange rate on international trade volumes for Mexico, Indonesia, Nigeria, and Turkey. The study used volatility predicted from GARCH models for both nominal and real effective exchange rate data. To detect the long-term relationship the study used the autoregressive distributed lag (ARDL) bound testing approach, while for the short-term effects, Granger causality models are employed. The study results showed that, in the long term, there is no linkage between exchange rate volatility and international trade activities except for Turkey, and even in this case, the magnitude of the effect of volatility is quite small. In the short term, however, a significant causal relationship from volatility to import/export demand is detected for Indonesia and Mexico. In the case of Nigeria, unidirectional causality from export demand to volatility is found, while for Turkey, no causality between volatility and import/export demand is detected.

Todani and Wanyama (2005) noted that exchange rate across East Africa Community has not been stable in relation to t United State currency, especially after the demise of Bretton woods which was the only structure of stable currency regime worldwide. The study also concluded that currency conversion rate became heightened further via introduction of SAPs in the early 1990s.

Adubi *et al.,* (1999); Musonda (2008) and Atingi-Ego *et at*., (2004) and Kihangire (2004) conducted a study on the influence of oscillating currency conversion rate together with over valuation of money conversion rate on export performance in Sub Saharan Africa. These studies discovered undesirable connection among the flow of exports and money conversion instability and recommended for implementation of strict, effective and efficient measures exchange rate policies.

Hassan *et al.,* (2015) reconnoitered the effects of rate of volatile rate of currency conversion on the capacity of exports from Bangladesh to United States. This study used the monthly Crossectional data from the year 1991 to 2012. The study engaged comprehensive variety of econometric techniques during the analysis. The study revealed an unwavering and substantial correlation in the long run between the study variables. The Cointegration modus operandi results confirmed that in the long run, a 1% rise in the rate of exchange leading to an increase of 2.32% in volume of export. The estimated error correction coefficient indicated that 36%deviation of export data was improved in the short run. Impulse reaction purpose of the study correspondingly asserts the positive association among the variables. In conclusion, causality examination put forward the presence of a unidirectional causation running from the rate of exchange to export volume.

Arize *et al.,* (2000) used a Johansen's multivariate method for long-run and error correction model to scrutinize the short-run changes to inspect actual rate of currency fluctuation on the exports of thirteen less technologically advanced economies using quarterly time series data from the year 1973 to 1996.The study outcomes publicized a negative but significant influence of instability on trade movements.

2.2.2 Exchange Rate and International Trade

It is referred to as the value of one nation's money in relations to another country's currency. Its influences on a nation has remained a debate among many policy makers and researchers all over the world since 1973. This rate of currency conversion is one of the central macroeconomic variables that determines macroeconomic policies in both the technologically advanced and emerging nations Eichenbaum *et al.,* (1995). Exchange rate regime that a country adopts determines the volume and the ease of doing business with another country (Wolf, 2002). This adopted regime is directly linked to the monetary policies in place. The static currency conversion system refers to a situation where the local money depends on the price of a different republic's money, whereas floating money conversion relies on the market forces of supply and demand.

Bahmani-Oskooee, & Gelan, (2018) studied a sample of twelve African countries to examine the impact of the real exchange-rate volatility on their trade flows. In order to distinguish the distinct impact of the real exchange-rate volatility on their exports and imports, both in the short-run and long-run, the study used the bounds-testing approach. The study found that while exchange rate volatility affects trade flows of many of the countries in our sample in the short run, the long-run effects were restricted only on the exports of five countries and on the imports of only one country. The level of economic activity in the world and at home were identified to be major determinants of exports and imports, respectively.

Andualem *et al*., 2017 did a study on the impacts of money conversion fluctuations on prices and trade in Ethiopia. The research utilized a novel decomposition and comprehensive customs data for the universe of Ethiopian firms and found two main results. For the first results, the study found that movements of Ethiopian money against the US dollar, matter more for worth and amount influences than do movements of the

Ethiopian money in contrast to trading economies' exchanges. The second findings was that rates of exchange rate-pass through, and subsequent trade capacity influences, contrast significantly through segments. This difference across sectors take place in ways that are reasonably in line with different obtaining and selling approaches for manufacturing firms comparative to firms in other segments of the state. Finally, the research suggested that, it is not wise to focus only on one subsector when assessing the impacts of currency movements, this is because the study results might deliver imprecise estimates of overall impacts on the economy.

Gnangnon, (2020) aimed to contribute to the literature on the determinants of real exchange rate volatility by investigating the effect of Aid for Trade flows on real exchange rate volatility in recipient-countries. The study findings showed that over the full sample, Aid for Trade flows influence negatively the volatility of real exchange rate, with a lower reducing effect on least developed countries (LDCs) compared to Non LDCs. The channels through which this effect materializes include export product concentration, institutional and governance quality, foreign direct investment inflows and terms of trade volatility. The study results showed that Aid for Trade flows clearly matter for real exchange rate volatility.

Carmen Sandul *et al,* 2011 explored the influence of currency conversion rate on trades' capacity in Romania. The research engaged the vector autoregressive model during investigation, using quarterly data spanning from 2003Q2 to2011Q1. The study establish a negative connection for the first lag plus a positive one in the second lag. Allowing for the first lag as being significant, the study suggested that an upturn of the level of currency conversion rate has influence in subsiding exports volume. In addition, rendering to impulse-response function, variation in the money conversion rate possess significant impacts on exports after two eras.

Willem *et al.,* 2012 investigated in what way currency conversion rate variation upsets exports from Germany. The study outcomes from dynamic ordinary least squares estimation confirmed that the export elasticity for the unit labor cost-let down exchange rate equals 0.6.The findings from panel DOLS approximation showed that value elasticities were richly greater for consumption goods transfers than for capital goods exports and for exports to the Eurozone than for exports outdoor of it. The study findings implied that Germany's interior depreciation after 2000 added to an increase in trades to markets in Europe.

Linus Lugaiyamu *et al.,* (2015) developed a theoretical model to capture Tanzania's unique structure of imports and exports. The experimental analysis of the model was carried out and constructed on data from Tanzania and major trading associates concentrating on swinging exchange rate regime period from 1987 to 2012. The graphical analysis revealed that enormous constituent of actual money conversion rate oscillations was nominal exchange rate rise and fall.

Otieno and Mudaki *et al.,* (2011) deliberated on elements swaying real exchange rate and export sector presentation in Kenya and concluded that the real currency conversion rate positively influenced in the short-run, however those influences were established to be statistically inconsequential. As per their judgments, exchange rate instabilities had not reach disastrous extents whereby exportation is distorted sand thereby earnings, that is, there could exist an inception level at which exchange rate fluctuations detriment exports. A lot of questions have been asked concerning how exportation and devaluation of Kenyan currency because of the outcomes of positive affiliation of these variables.

Flavio (2016), studied on the connection among real effective exchange rate unpredictability together with exports, employing section scope of one hundred and six nations using data for 11 years and the appraisal method used is system GMM. The results also revealed that there is positive and negative effects of real effective exchange rate instability in illuminating the capacity of exportation only when oil exporting countries are included in the analysis, this means that exportation is impacted negatively when currency conversion rate is unstable. However if the countries that export oil are eliminated from the analysis, there is no significant confirmation associating the influence of instability of money conversion rate on exports.

Irene 2011 conducted an investigation on the affiliation amongst abroad currency conversion together with monetary earnings of Air Company in Kenya with the focus of instituting the association among overseas conversion and commercial remunerations of Kenya's Air transport company. The study results confirm the presence of a negative connection among dangers of foreign exchange together with commercial level of achievements. Volatile exchange rates influence on prices henceforth undesirable influence on incomes and expenditures denominate in foreign money.

Cote 1994 together with McKenzie1999 offered a thorough assessment of early experiential studies (mentioned in Zainal, 2004). This reviews indicated that the widely held empirics spawned diversified outcomes and were not capable to institute a logically significant connection between the measured exchange rate volatility and the level of trade across borders, whether on an aggregate or on a bilateral basis. Carter and Pick (1989) examine the US trade in agricultural goods. They established research on the pass-through effect of exchange rate changes on agricultural exports and imports,

and the net impact on the agricultural trade balance. They concealed the validation of the price effect of the J-curve; a devaluation top to a weakening in the agricultural trade steadiness.

Roderick *et al* (2015) scrutinized on the effect of exchange rate volatility on export earnings with orientation to Kenya's exports to Uganda. The study used secondary data in order to attain the specified investigation objective. The data was obtained from Kenya Revenue Authority, Kenya National Bureau of Statistics and Central Bank of Kenya. Export incomes were analyzed with the exchange rate volatility for the period of five years (2010-2014). Other variables of the study were interest rates and inflation rates. This was to comprehend how these factors affect export earnings to Uganda. The study used multiple regression technique in checking on the association among the income from exportation and volatility of exchange rate. The results of the study confirm that volatile exchange rate upsets Kenya's export incomes to Uganda.

Zhao (2010) investigated the effect of real currency conversion rate instability in New Zealand and her trading partners including; the US, Australia, UK and the Japanese government. The study used the quarterly data spanning from 1991 to 2007. In order to check if there was a long ru association among the variables under the study, Johansen test for cointegration was performed. The conventional unit root test for stationarity that is, Augmented Dickey Fuller and Philip Perron analysis was carried out. The study calculated the exchange rate volatility using the moving average for the standard deviation of the real exchange rate. The other variables included in the study were; foreign income and real exchange rate. The established the existence of a positive and statistically insignificant long run affiliation among the New Zealand's actual exports and mutual exchange volatility.

David *et al.,* (2011) studied the influence of a volatile rate of currency conversion in the sub-Saharan African nations. The study used the data from the chosen states from 1986 to 2005 and used the gravity model. The Hausman results found that fixed effect model was appropriate against the null hypothesis random effect. The study outcomes revealed that the net influence of a volatile exchange rate on a cumulative trade was positive from using both methods. From these findings, there was no clear sign of variation between the influences of a volatile exchange rate on unprocessed and manufactured exports as well as among those states that both members and non-members of ECOWAS.

Godfrey *et al.,* (2014*)* explored the long-run and short-run impacts of lower exchange rates on exports, imports and national productivity of Tanzania for annual recorded period dating from 1990 to 2011. The estimates of the co-integrating equations were attained by means of the Vector Error Correction models which allowed constraints to be incorporated to segregate the short run and long run performances of the designated variables. Their results showed that lower value of the currency (annual official exchange rate), has led to the increase in exports in the long run while imports have been deteriorating strenuously. Also this paper found that in the long-run, other things being equal, the national production is cumulative owing to the depreciate exchange rate in Tanzania which has lasted for more than twenty years.

Bahmani-Oskooee *et al.,* (2007) Applied the pooled mean group estimator of dynamic heterogeneous panel technique to data for eleven sub-Saharan Africa over the period the pooled mean-group estimator of dynamic unrelated panels technique to data for eleven Sub-Saharan African states over the period 1993 to 2004, the study findings brought into being that there is no significant influence of volatile exchange rate on imports. However, the study discovered that volatile exchange rate negatively affect

exports in the short-run, consistent with the above view, nonetheless a positive influence in the long-run.

Harriet *et al* (2017) scrutinized the influence of volatile rate of currency conversion on the EAC countries trade. This study used secondary data sourced from World Data Indicator, International Monetary Fund and Kenya National Bureau of Statistics. The study used historical design for the reason that it appropriated into account the trend of the data and the forecast of the future was correspondingly made probable. The study employed the profit maximization model to develop the theoretical framework. The maximum likelihood random effect estimation was employed in the study which tested obviously for non-normality of the exchange rate changes. The study findings confirm a statistically significant and negative connection among the oscillating rate of currency conversion and trade.

Bustaman *et al.,* (2007) investigated on the long-run and short-run impacts of volatile exchange rate on Indonesian exports of main concern commodities to the United States of America over the monthly period 1997-2005. Estimates of cointegration relations were found using ARDL bounds testing procedure. Estimates of the short-run dynamics were obtained using an error-correction model. The results showed significant positive and negative coefficients among the range of commodities. However, in the long-run, majority of commodities tend to support the traditional view that higher exchange rate of volatility leads to higher cost and to less foreign trade. The net effect of exchange rate improbability on production and exports depended on the amount of comparative risk aversion of the exporter of various commodities. This ultimately influenced the readjustment of resources by members.

Nabaweesi et al., (2017) analyzed the degree to which exchange rate volatility has impacted the trade steadiness in Uganda using yearly data ranging from 1990 to 2015. The study studied wide-ranging literature in line with the topic under study. The study findings confirm that volatile exchange rate influences negatively Uganda's trade balance, nevertheless this influence was not significant statistically. At the same time, balance of trade results confirm a positive correlation with volatile rate of exchange rate. In addition, exchange rate did not granger cause trade balance going by the Granger causality test. This is constant with the point that even though the country has experienced preeminent currency depreciation year in year out, it has not resulted into an improvement in the country's trade balance. Stable exchange rate therefore should be stimulated through attracting foreign direct investments.

2.2.3 Foreign Direct Investment and International Trade

Foreign direct investment (FDI) is the important part for an open and successful international trade and a major tool for development and prosperity. Foreign direct investment has the following benefits; technology transfer, human capital formation support, improvement of competitive business environment, contribution to international trade integration and improvement of initiative development. Economically, FDI can support the improvement of environment and social condition in the host country by relocating 'cleaner' technology, guiding to more socially responsible corporate policies thus mitigating the challenge global warming. All of these benefits contribute to higher economic growth, which is the main instrument for alleviating poverty in those economies.

In spite of the fact that foreign direct investment is advantageous to the host country, its impact on the economy is challenging to ascertain with correctness. Again, the benefits from FDI show a discrepancy from one country to another making tough to be

separated and measured (UNCTAD, 2006). The impact of FDI on host country international trade will differ, depending on whether it is seeking to be efficient, market-seeking, resource-seeking or strategic asset seeking. FDI can have a great contribution to economic growth in developing countries by supporting export growth of the countries. Output resulting from efficiency-seeking FDI is typically anticipated for export, and therefore the effect of such FDI is most likely to be an increase in exports from the host country.

Albulescu *et al.,* 2016 studied the influence of the collaboration concerning trade and FDI in the Central and Eastern European countries, concentrating mainly on Hungary, Czech Republic, Poland and the Republic of Slovakia. The study used a panel gravitational model for each country for the bilateral trade and FDI, considering its interactions with the other three economies that were included in the study, and with the 3 European Union leading profitmaking trading partners on the other hand. The study analyzed unalike surfaces of the trade – FDI nexus, resorting to a fixed effects model, a random effects model, as well as to an instrumental variable estimator, over the period spanning from 2000 to 2013.the study findings suggested that external Foreign Direct Investments tolerates the partnering states of the CEE commercial combination, whereas interior FDI partakes no substantial influence.

Jayakumar *et al.,* 2014 did a study inspecting if there exist an association amongst Foreign Direct Investment, Exports besides Imports in India. Also, the study exposed the importance of other causative factors of Exports and Imports performance .The study found a positive significant influence of FDI inflows on the export and import performance of India. The study results confirmed that the liberalization policies contributed to an increase of the FDI inflow into India.

Jing Xiao (2009) evaluated the influence of FDI inflow on foreign trade of China on the country level. The study used the longitudinal research method spanning from 1984 to 2007. The study used two distinct different models which were based on the gravity equation and refer to the econometric models of some preceding studies, to assess the effect of FDI inflows on exports and imports in that order. The rough calculation results found that there is a consistent association between FDI inflows and trade of China on both imports and exports.

George *et al.,* 2014 conducted a study on factors that influence the flows of FDI in Ghana, using time series data spanning from 1988 to 2011. The study used relevant econometric procedures and regression examination. The study findings took natural resources, infrastructure, exchange rate and openness of trade and as the most important causes of FDI in Ghana. The remaining macroeconomic variables, exampled by Gross Domestic Product and inflation, were also recorded to impact the flows FDI in Ghana. The study confirmed that economic liberalization was significant, implying that decision makers efforts in opening the economic undertakings may automatically render into significant flows of Foreign Direct Investment into the country.

2.2.4 Effect of Inflation on International Trade

Inflation is defined as a continued escalation of the general price level of a nationwide budget assumed either at the retail or wholesale level. The yearly rate of conversion in this price level, generally articulated in index numbers, is the inflation rate. Amadeo (2012) refer to it as times when the values of many business transaction carry on towards skyward. At such moments, the living average levels deteriorates as consumer prices increase the cost of living. According to various schools of thought is that inflation is a financial spectacle; therefore the decrease of inflation is fundamentally the objective of financial strategy.

This argument is grounded on the magnitude theory of currency, which proposes that inflation is firm exclusively by the alteration in the comparative stream of currency and merchandises. Inflation echoes a drop in the procuring power over unit of cash, that is, the money loses value during inflation. The effects of inflation in an economy can either be helpful or undesirable. Undesirable effects include the people holding money due to hesitation about forthcoming inflation. This ultimately discourages investment and savings, and if inflation is dissolute sufficiently, deficiencies of commodities as customers instigate advertise out of concern that prices would increase in the future. Positive effects occur when central banks of countries adjust real interest rates in order to mitigate against recessions and promoting investment in nonmonetary capital projects (Heise, 2019).

Sepehrivand *et al.,* 2016 investigated the effect of trade openness on D-8 Member economies. The study employed Romer theory and used the longitudinal research design and a panel data. The findings indicated that trade openness had a positive and significant effect on the inflation as the dependent variable. However, this findings did not conform to the Romer theory and implied that the effect of monetary policies on the global markets is very high and the amount of influence leads to fluctuation in consumption demands for domestic goods. Trade openness plays a vital role in reducing or decreasing the rate of inflation, this is according to new theories of growth. The reason is that, trade openness decreases the rate of inflation by increasing production efficiency and equitable resource allocation.

Rizwan *et al.,* 2018 examined the relationship between inflation, exports and imports in Pakistani economy. The study used month-to-month data of Consumer Price Index (the proxy of inflation), imports and exports data from 2001 to 2017. The study

employed the VECM model for analysis to check for the short-run relationship amongst the variables. Johansen cointegration technique was used to investigate the strength and direction of association amongst the variables under the study. Granger causality method was employed in the analysis also. The study findings revealed that in a long run 1% increase in imports and exports leads to a 0.63% and a 0.57% increase in the CPI (inflation) respectively. Nonetheless, the coefficient of predictable error correlation indicates that approximately 1.18% deviation of the rate of inflation through the long run level of equilibrium has been familiar all through.

2.2.5 Money Supply and International Trade

The term Money supply is referred to as the sum total of financial possessions obtainable in a country at a certain time period (Maryam 2019). They also include legal tender in circulation and demand for guarantees of monetary organizations. Monetary policy plays a critical role in bringing order in the financial sector. It ensures proficiency in the commercial sector and evolving an important environs for trade and industry growth. Economically, lower interest rate is good for economic atmosphere. A decrease in interest rate deliver communal neck and neck eventuality to take first-hand capital stock expenses as well as increasing the firm faith by making substantial investments in the on rise segment and generating huge profits. High interest rate lowers trade because it is regularly joint with high inflation (Ez, 2017).

Money has a resilient influence on economic motion because it is the only mode of exchange in business. This suggests that if there could be a rise in the supply of money, the outcome will be a decrease in interest rates thus high economic growth and development. Therefore, when there is excess money circulating in the economy, the customers are impressed and they will now allocate more. Manufacturers concede improving by gathering additional resources and intensify their manufacturing capacity.

As soon as the trade flourishes, the response for employment and investment goods thus increases. Stock market prices increase and firms issue more equity and debt. In this perspective, money supply continuous to expand. Prices begin to rise, if output growth meets capacity limits. People begin to expect inflation lenders demand higher interest rates consumer purchasing power decreases over the life of their loans.

Ez *et al.*, 2017 conducted a study on the effect of monetary policy variables on net export of Nigeria from 1981 to 2016. Financial policy variables are the main tools used by monetary authorities to regulate money supply and to control the level of prices as well as stimulating investments and growth of an economy. The study utilized the Auto Regressive Distributed Lag (ARDL) during the analysis. The study also engaged the following variables in the investigation: exchange rate, net export, total import, interest rate, foreign direct investment, total export and money supply. The findings from the ARDL model showed that there is both long run and short run relationships amongst the variables under the study. The outcomes also verified that money supply had a positive and insignificant effect on net export of Nigeria whereas total export had a positive significant effect on net export of Nigeria. Equally, the outcomes revealed that total import exchange rate, interest rate, and foreign direct investment had a negative insignificant effect on net export of Nigeria. In addition, the findings of the Pairwise Granger causality test designated that money supply had unidirectional relationship with net export with significant causality runs from money supply to net export. The results however, confirm that there is no significant causality between NEX and the rest of the variables under the study. The policy implication of this findings is that, any economic policy with the objective of increasing the supply of money and elevation of the total export of goods and services will cause an increase in net export of Nigerian economy.

Maryam *et al.*, 2019 carried out a study on the role of money supply as moderator in the relationship between economic growth and FDI in Pakistan. The study examined the impact of economic growth on FDI and money supply engaged as moderator using the data spanning from 1995 to 2017. The study employed secondary data which was sourced from the World Bank and analyzed by using the relevant econometric software. The study outcomes demonstrated that money supply plays a key role in strengthening the relationship of economic growth and FDI. Therefore, it is inferred that if the money supply is increased, there will be economic growth which attract foreign investors to Pakistan.

2.2.6 Population and Foreign Trade

A research by Mckoy 2004 concluded that population has a strong affinity to increase trade and the level of specialization by generating gains from specialization. Contrary to that, Dell`Ariccia (2005) found a negative population coefficient. For a negative relationship between population and trade movements, the study recommended that imports and exports are capital intensive in production. He deduces a negative GDP per capita constant in a way that the manufactured goods group which is subject to the estimation is not capital intensive but labor intensive. The effect of population on trade is also different depending on whether one is estimating it on the short run or the long run. It may have a positive impact on trade flows in the short-run, this is because a lot of products will be exported as a result of increase in labour force and also increase in the level of specialization.

For the long run estimation, the opposite happens. This means that as the population increases, the per capita income also reduces, making every individual poorer, resulting

to a decrease of both production and exports. From microeconomic point of view, the lower income per capita causes a decrease in the demand for imports as well.

Adel *et al.,* 2015 conducted a research to investigate the role of trade openness, investment and population in Syria and used the time series data from 1980 to 2010. Cointegration test results point out that the GDP is significantly and positively correlated to the trade openness, investment and population. Granger causality test findings designates a bidirectional short-run causality connections between trade openness, investment, population and GDP. There are also bidirectional long-run causality relationships between investment, population and GDP, and unidirectional long-run causality relationship running from trade openness to GDP. The findings of the study point out that population had the leading effect on the GDP, therefore the study suggested improvement of the quality of the human capital in the country, as well as refining the investment and opening up the Syrian economy to the global market.

Elif (2014) investigated bilateral trade flows and their determinants among six big OIC (Organization of the Islamic Conference) nations. The study used the panel data analysis and cross sectional research design. The study outspreads the original gravity model of bilateral trade with population and exchange rate volatility, and then uses the adjusted gravity model in panel data examination. The research showed how income and population of a country, distances between two countries and exchange rate volatility influences the bilateral trade flows between six big countries of the OIC. The study findings provides distinct prominence on the influence of the population on a country`s trade flows and methodologies to the issue of the size of population from a technical standpoint.

2.3 Conceptual Framework

The figure 2.1 displays the conceptual framework

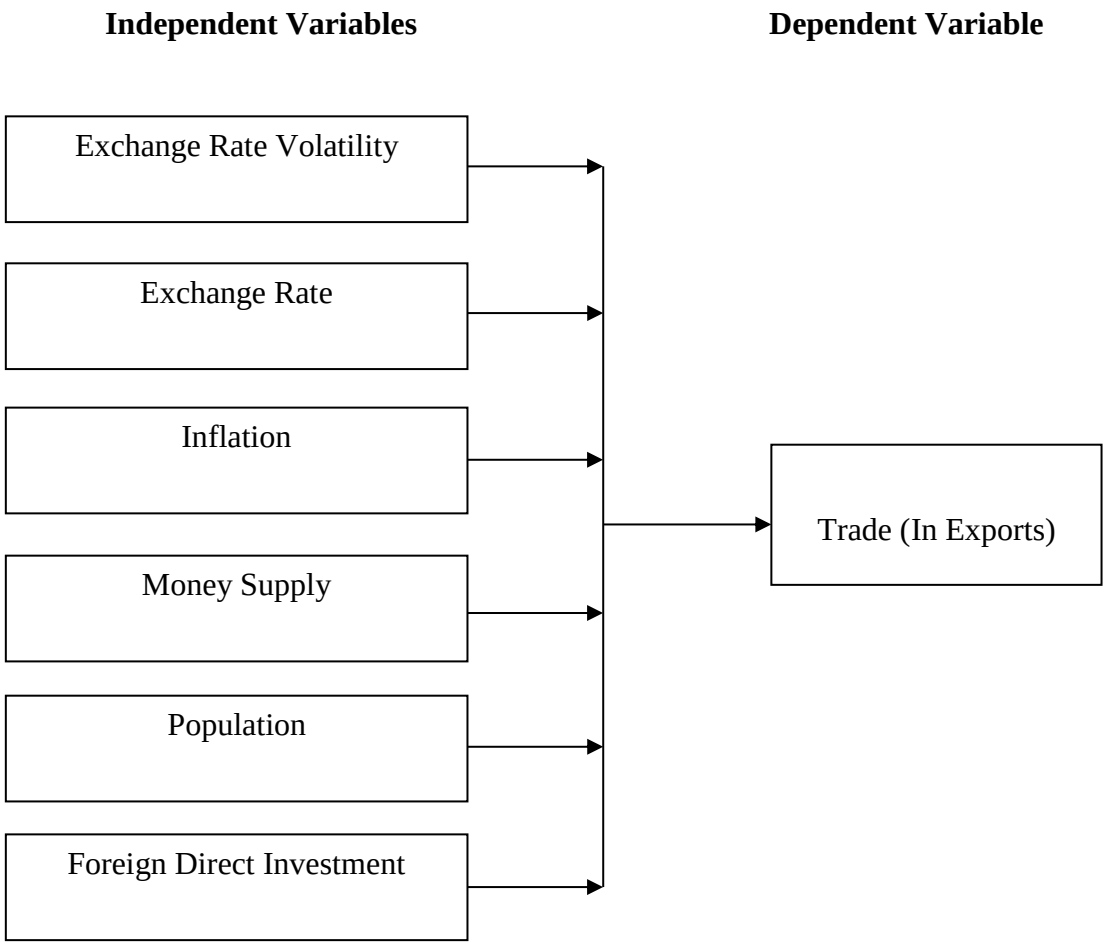

Figure 2.1: Conceptual Framework

Source: Author, 2019

To answer the research objectives, the researcher followed the above conceptual framework. Trade which stands for exports is the dependent variable, exchange rate volatility, exchange rate, inflation, money supply, population and foreign direct investment are the independent variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter provides the techniques and processes that were used to conduct the study. The research presumed the longitudinal research design. Panel data was employed in this research. Data analysis guide was used in collecting relevant data for the research on EAC member states. Multiple linear regression model was estimated to establish the nature of relationship between independents and dependents variables.

3.1 Research Design

Longitudinal design was used in the study. Longitudinal research scheme also known as panel research design is an observational research method in which data is gathered for the same subject continually over an extended period of time. Panel data methodology allows the testing and modifications of assumptions that are contained in cross-sectional analysis (Maddala, 2001; Baltagi, 2005). Panel data give more facts, more variability and competence in addition to apprehending and measuring effects that are not noticeable in cross-section examination.

The design is appropriate in tracing changes over time and to relate them to variables that might explain why the changes occur. Longitudinal research designs describe patterns of change and help establish the direction and magnitude of causal relationships. Measurements are taken on each variable over two or more distinct time periods. This allows the researcher to measure change in variables over time. Longitudinal research design allows the analysis of duration of a particular phenomenon under investigation. The design authorizes the measurement of differences or change in a variable from one period to another (that is the description

of patterns of change over time) as well as allows the prediction of future outcomes based upon earlier.

3.2 Study Area

The study was conducted in East Africa region which covers an area of approximately 1.82 million square kilometers with a population of approximately 196 million people as of 2017 (UN, 2019). It comprises of five countries, Republic of Kenya, the Republic of Burundi, the Republic of Rwanda, Republic of Uganda and the United Republic of Tanzania. The EAC is headquartered in Arusha, Tanzania and the official language is English (World Development Indicators, 2017).

3.3 Target Population

The research did target the selected East Africa Community member states. These are Kenya, Uganda, Tanzania, Rwanda and Burundi. These countries have similar social, economic and political characteristics. Moreover, they are members of the same economic bloc. The study omitted South Sudan due to unavailability of complete data because it became a full EAC member in 2016 (UNCTAD, 2018).

3.4 Sources of Data

The data for this study was sourced from World Bank, KNBS, WITS and Central banks of every member state under study.

3.5 Data Analysis

In this study descriptive statistics were employed in order to understand the nature of the data and also to check for outliers. Inferential statistics was used to test the research hypotheses using STATA econometric software.

3.5.1 Correlation Analysis

Correlation analysis is used to determine the existence of association and strength between variables. Such an analysis is done before conducting regression analysis or model estimation. Pearson (r) correlation coefficient is computed given the nature of the data and the need to test the strength of association that existed among the study variables.

3.5.2 Panel Unit Root Tests

A unit root is a situation where data is not stationary and to avoid reporting pointless and spurious outcomes that arise from regressing non-stationary data on one or more non-stationary data, variables needs to be converted to stationarity (Gujarati, 2004). A variable is considered to be stationary if its mean, variance and auto covariance remains constant irrespective of the point at which measurement is taken. Therefore, before commencing the analysis, panel data unit root test was conducted. Judge, Griffits, Hill Lutkepohl and Lee (1985) and Greene (2012) recommended use of different panel unit root test to check for consistency and robustness. Therefore, the study estimated the following panel unit root tests.

3.5.2.1 Im-Pesaran-Shin Unit Root Test

Im-Pesaran-Shin, (IPS) is an extension of the Dickey-Fuller (DF) test that is usually engaged in time series analysis. The classic DF test for panel data series is usually expressed in the following way;

$$\Delta Y_{it} = \varphi_i Y_{\mathrm{i,t-1}} + Z_{it}^{'}\gamma_i + \varepsilon_{it} \quad \text{3.1}$$

Where ε_{it} is a white noise series, $\varphi = 1$ indicates presence of unit root for, $0 < \varphi < 1$ implies stationarity (Im, Pesaran and Shin, 2003; Pesaran, Shin and Smith, 1997; Pesaran, Shin and Smith, 1999 and Pesaran and Smith, 1995).

3.5.2.2 Levin-Lin-Chu Panel Unit Root Test

The Levin-Lin-Chu panel data unit root test was also performed on the following model;

$$\hat{\rho}_{Yi}^{2} = \frac{1}{T-1}\sum_{t=1}^{T}\Delta Y_{it}^{2} + 2\sum_{L=1}^{\bar{K}}\omega\bar{K}L\left[\frac{1}{T-1}\sum_{t=2+L}^{T}\Delta Y_{it}\Delta Y_{it-L}\right] \quad \text{..... 3.2}$$

Where ε_t is a white noise series, when $\rho = 1$ it designates existence of unit root $0 < \rho < 1$ denotes stationarity (Choi, 2006; Phillips and Moon 1999 and Phillips and Moon, 2000).

3.5.2.3 Madala-Wu-Fisher Panel Unit Root Test

Unit root test in the investigated variables was conducted using Maddala-Wu panel unit test. This model follows the specification below;

$$\Delta Y_{it} = \phi_i Y_{i,t-1} + Z_{it}'\gamma_i + \varepsilon_{it} \quad \text{..... (3.3)}$$

Where ε_t is a white noise process, $\rho = 1$ indicates presence of unit root $0 < \rho < 1$ implies stationarity (Kwiatkowski, Phillips, Schmidt and Shin 1992 and Madala and Wu, 1999 and Hoechle, 2007). Harris and Tzavalis (1999) presented the critical values for panel data unit root test similar to Breitung panel unit root test (Breitung, 2000). Breitung and Das (2005) and Choi (2001) used these tests and establish that they were robust and consistent.

3.5.3 Selection of Estimation Method

Hadri (2000) derives a residual-based Lagrange multiplier (LM) test where the null hypothesis is that there is no unit root in any of the series in the panel against the alternative of a unit root in the panel. This is the generalization of the KPSS test from

the time series to panel data. It is based on OLS residuals of Y_{it} on a constant or on a constant and trend. Following Hadri (2000) the following two models was used:

$$Y_{it} = R_{it} + \varepsilon_{it} \quad i = 1,2,\ldots,N;\ t = 1,2\ldots,T \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.1$$

And

$$Y_{it}\ R_{it} + \beta_i t + \varepsilon_{it} \quad i = 1,2,\ldots,N;\ t = 1,2\ldots,T \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.2$$

Where $R_{it} = R_{i,t-1} + \mu_{it}$ is a random walk $\varepsilon_{it} \sim IIND(0,\sigma_\varepsilon^2)$ and $\mu_{it} \sim IIND(0,\sigma_\mu^2)$ are mutually independent normals that are *IID* across *i* and over time *t*. Back substitution was used to get the following model that was estimated;

$$Y_{it} = R_{i0} + \beta_i t + \sum_{s=1}^{t} \mu_{is} + \varepsilon_{it} = R_{io} + \beta_i t + \upsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

Where $\upsilon_{it} = \sum_{s=1}^{t} \mu_{is} + \varepsilon_{it}$. The stationarity hypothesis was $H_0 : \sigma_\mu^2 = 0$ in which $\upsilon_{it} = \varepsilon_{it}$. The LM statistic is given by

$$LM_1 = \frac{1}{N}\left(\sum_{i=1}^{N}\frac{1}{T^2}\sum_{t=1}^{T} S_{it}^2\right)/\widehat{\sigma}_\varepsilon^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.4)$$

Where $S_{it} = \sum_{s=1}^{t} \hat{\varepsilon}_{is}$ are the partial sum of OLS residuals $\hat{\varepsilon}_{is}$ from equation 3.5 and $\hat{\varepsilon}_\varepsilon^2$ is a consistent estimate of σ_ε^2 under the null hypothesis H_0 (Greene, 2012). A possible candidate is;

$$\hat{\sigma}_\varepsilon^2 = \frac{1}{NT}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{\varepsilon}_{it}^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5)$$

.

To allow for Heteroscedasticity the procedure suggested by Hadri (2000) was used. The alternative LM test that allowed for heteroskesdacity across *i*, for instance $\sigma^2_{\varepsilon i}$ is as follows;

$$LM_2 = \frac{1}{N}\left(\sum_{i=1}^{N}\left(\frac{1}{T^2}\sum_{t=1}^{T} S_{it}^2 / \hat{\sigma}_{\varepsilon i}^2\right)\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (3.6)$$

The test statistic is given by $Z = \sqrt{N(LM - \xi_1)/\zeta}$ and is asymptotically distributed as $N(0,1)$ where $\xi = 1/6$ and $\zeta = 1/45$ if the model only includes a constant and $\xi = 1/15$ and $\zeta = 11/6300$ otherwise (Wooldridge, 2012, Newey and West, 1994).

3.5.4 Specification of the Model

This section of the thesis presents measurement of volatility by use of GARCH model, fixed and random effects model and their assumptions.

3.5.4.1 Measurement of volatility using the GARCH model

Under the GARCH model of Bollerslev (1986) the conditional variance depends not only on lagged disturbances, but also on its own lagged values. The GARCH (*p*,*q*) model was estimated to obtain the exchange rate volatility. In this case of study, first-order autoregressive (AR) processes of order one (1) is followed. The estimate time series data from GARCH model give good prediction of effective exchange rate volatility under study. In its simplest form, the GARCH model can be written as;

$$\sigma^2_{t=} \omega + \propto U^2_{n-1} + \beta\sigma^2_{t-1}\, d_{n-1} + \gamma\delta^2_{n-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.7$$

Where;

$\sigma^2_{t=}$ is the conditional variance of exchange rate for the previous year, $\propto, \beta$ and γ are the coefficience, μ^2_{n-1} is the mean square of the previous year and d_n takes the value of 1 for $\mu_t < 0$ and 0 otherwise.This is what is referred to as the general GARCH (*p*,*q*)

model, with p lagged terms of the squared error term and q terms of the lagged conditional variance (Gujarati *et al.*, 2009).

Concomitant correlation Generalized Least Squares regression with correlated turbulences was fitted into the data. Following Baltagi (2005), Arrelano (2003), Hsiao (2007) and Wooldridge (2010) the syntax that was programmed allowed for estimation in the presence of Autoregressive one (AR1) autocorrelation within panels and cross-sectional correlation and Heteroscedasticity. The equation from which the estimation model established is as follows;

$$Y_{it} = \beta X_{it} + \varepsilon_{it} \quad \text{..... (3.8)}$$

Where $i = 1,2,,\dots,5$ is the number of selected countries in East Africa. Y_{it} is either exports or imports. X_{it} are the independent variables. This is stated as;

$$\begin{bmatrix} Y_{1t} \\ Y_{2t} \\ Y_{3t} \\ Y_{4t} \\ Y_{5t} \end{bmatrix} = \begin{bmatrix} X_{1t} \\ X_{2t} \\ X_{3t} \\ X_{4t} \\ X_{5t} \end{bmatrix} \beta + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \end{bmatrix} \quad \text{..... (3.9)}$$

In equation 3-9, $Y_1, \dots, Y_5$ are the dependent variable for each country under study. $X_1, \dots, X_5$ is 5 by 5 matrix of independent variables, β is 5 by 1 matrix of parameters that were estimated and $\varepsilon_1, \dots, \varepsilon_5$ was a 5 by 1 matrix of random error term assumed to *IID.*$(0, \delta^2)$ that is a white noise process. The variance matrix of the disturbance terms is expressed as;

$$E[\varepsilon\varepsilon'] =$$

$$\begin{bmatrix} \sigma_{1,1}\Omega_{1,1} & \cdots & \sigma_{1,5}\Omega_{1,5} \\ \vdots & \ddots & \vdots \\ \sigma_{5,1}\Omega_{5,1} & \cdots & \sigma_{5,5}\Omega_{5,5} \end{bmatrix} \quad \text{..... (3.10)}$$

In these models, an assumption is made that the coefficient vector β is the same for all panels and consider a variety of models by changing the assumptions on the structure of Ω . Following Madala and Lahiri (2006) this amounted to assuming that Ω had the structure given by;

$$\Omega = \begin{bmatrix} \delta^2 I & 0 \ldots & 0 \\ \vdots & \delta^2 I & \vdots \\ 0 & 0 \cdots & \delta^2 I \end{bmatrix} \ldots\ldots 3.11$$

The assumptions of the data generating process is shown as follows;

PL1: Linearity

$$Y_{it} = \alpha + X_{it}'\beta + Z_i'\lambda + c_i + \varepsilon_{it} \ldots\ldots 3.12$$

Where $E(\varepsilon_{it})$ = 0 and $E(c_i)$ = 0.The model is linear in parameters $\alpha, \beta,\ \lambda$, effect c_i and error ε_{it}.

PL2: Independence

$\{X_i, Z_i, Y_i\}N_{i=1}$ *iid* (independent and identically distributed). Thesse explanations are independent transversely characters but not automatically across time. This is assured by indiscriminate sampling of characters.

PL3 Strict Exogeneity

$E(\varepsilon_{it} | X_{i,} Z_{i,} c_i = 0)$ (Mean independent). The idiosyncratic error term ε_{it} is assumed uncorrelated with the explanatory variables of all past, current and future time periods of the same individual. This is a strong assumption which rules out lagged dependent variables. PL3 also assumes that the idiosyncratic error is uncorrelated with the individual specific effect.

PL4: Error Variance

a) $V(\varepsilon_i|X_i,Z_i,c_{i)}) = \sigma_\varepsilon^2 I,\ \sigma_\varepsilon^2 > 0$ and finite (homoscedastic and no serial correlation)

b) $V(\varepsilon_i|X_i,Z_i,c_i) = \sigma_{\varepsilon,it}^2 > 0$, finite and

$Cov(\varepsilon_{it}, \varepsilon_{is}|X_i,z_i,c_i) > 0 \ \ \forall_s \neq t$ (no serial correlation)

c) $V(\varepsilon_i|X_i,Z_i,c_{i)}) = \Omega_u$, (X_i, z_i) is p.d and finite

The remaining assumptions are divided into two sets of assumptions: the random effects model and the fixed effects model.

The Random Effects Model

In the random effects model, the individual-specific effect is a random variable that is uncorrelated with the explanatory variables.

RE1: Unrelated effects

$SE\ (c_i|X_i, Z_i) = 0$

RE1 assumes that the individual-specific effect is a random variable that is uncorrelated with the explanatory variables of all past, current and future time periods of the same individual.

RE2: Effect Variance

a) $V(c_i|X_i, z_i) = \delta_c^2 < \infty$ (homoscedastic)

b) $V(c_i|X_i, z_i) = \delta_{c,i}^2(X_i, z_i) < \infty$ (heteroscedastic)

RE2a assumes constant variance of the individual specific effect.

RE3: Identifiability

a) *rank(W)* = *K* + *M* + 1 < *NT* and $E(W_i' W_i) = Q_{WW}$ is p.d. and finite. The typical element $w_{it}' = [1\ x_{it}'\ z_i']$.

b) *rank(W)* = *K* + *M* + 1 < *NT* and $E(W_i' \Omega_{v,i}^{-1}, W_i) = Q_{WOW}$ is a p.d. and finite. $\Omega_{v,i}$ is defined below.

RE3 this assumption is that the regression comprising a constant value are not seamlessly collinear, that all independent variables (constant value not included) have non-zero variance and not a lot of extreme numbers.

The formula for the random effect technique is as follows;

$$y_{it} = \alpha + x_{it}'\beta + z_i'\gamma + v_{it} \quad \text{..... 3.13}$$

Where $v_{it} = c_i + \varepsilon_{it}$. Assuming the PL2, PL4 and RE1 in the special versions PL4a and RE2a leads to

$$\Omega_v = V(v \mid X, Z) = \begin{pmatrix} \Omega_{v,1} & \cdots & 0 & \cdots & 0 \\ \vdots & \ddots & \vdots & \cdots & \vdots \\ 0 & \cdots & \Omega_{v,i} & \cdots & 0 \\ \vdots & & \vdots & \ddots & \vdots \\ 0 & \cdots & 0 & \cdots & \Omega_{v,N} \end{pmatrix}_{NT \times NT}$$

With typical element

$$\Omega_{v,i} = V(v_i \mid X_i, z_i) = \begin{pmatrix} \sigma_v^2 & \sigma_c^2 & \cdots & \sigma_c^2 \\ \sigma_c^2 & \sigma_v^2 & \cdots & \sigma_c^2 \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_c^2 & \sigma_c^2 & \cdots & \sigma_v^2 \end{pmatrix}_{T \times T}$$

Where $\sigma_v^2 = \sigma_c^2 + \sigma_\varepsilon^2$. This special case under PL4a and RE2a is therefore called the equicorrelated random effects model.

The Fixed Effects Model

According to the fixed effect technique, the individual-specific effect is a stochastic determinant that is permitted to be interconnected with the predicting variables.

FE1: Related effects

FE1 explicitly states the absence of the unrelatedness assumption in RE1.

FE2: Effect Variance

FE2 explicitly states the absence of the assumption in RE2.

FE3: Identifiability

rank ($\ddot{X}$) = $K < NT$ and $E(\ddot{x}_i^{'} \ddot{x}_i)$ is p.d and finite.

Where the typical element $\ddot{x}_{it} = x_{it} - \bar{x}_i$ and $\bar{x}_i = 1/T \sum_t x_{it}$

FE3 Here, the assumption is that the independent variables that change with time are not perfectly collinear, that they have non-zero within–variance (i.e. variation over time for a given individual) and not excess extreme values. Hence, x_{it} cannot include a constant or any variable that changes with time. The point of concern here is that only the parameters β but neither α and γ are identifiable in the fixed effects model.

Random Effects Estimation

The random effects estimator is the feasible generalized least squares (GLS) estimator stated as;

$$\begin{pmatrix} \hat{\alpha}\, RE \\ \hat{\beta}\, RE \\ \hat{\gamma}\, RE \end{pmatrix} = \left(W' \hat{\Omega}_v^{-1} W\right)^{-1} W' \hat{\Omega}_v^{-1} y \quad \text{.....3.14}$$

Where $W = \left[\iota_{NT} X\ Z\right]$ and ι_{NT} is a $NT \times 1$ vector of ones. The error covariance matrix Ω_v is assumed block-diagonal with equicorrelated diagonal elements $\Omega_{v,i}$ which depend on the two unknown parameters σ_v^2 and σ_c^2 only. There are many different ways to estimate these two parameters. For example,

$$\hat{\sigma}_v^2 = \frac{1}{NT} \sum_{t=1}^{T} \sum_{i=1}^{N} \hat{v}_{it}^2 \ , \quad \hat{\sigma}_c^2 = \hat{\sigma}_v^2 - \hat{\sigma}_u^2 \quad \text{.....3.15}$$

Where $\hat{\sigma}_u^2 = \frac{1}{NT - N} \sum_{t=1}^{T} \sum_{i=1}^{N} \left(\hat{v}_{it} - \bar{\hat{v}}_i\right)^2$ and $\hat{v}_{it} = y_{it} - \alpha POLS - x_{it}' \hat{\beta} POLS - z_i' \hat{\gamma} POLS$

and $\bar{\hat{v}}_i = 1/T \sum_{t=1}^{T} \hat{v}_{it}$. The degree of freedom correction in $\hat{\sigma}_u^2$ is also asymptotically important when $N \to \infty$.

Random effects model: the study cannot generate small sample properties for the Random Effect estimator. The Random Effect estimator is dependable and asymptotically normally distributed under PL4, RE1, RE2 and RE3b when the number of individuals $N \to \infty$ even if *T* is fixed. It can consequently be approximated in samples with many individual observations *N* as;

$$\begin{pmatrix} \hat{\alpha}\, RE \\ \hat{\beta}\, RE \\ \hat{\gamma}\, RE \end{pmatrix} \underset{|\backslash}{A}N \left(\begin{pmatrix} \alpha \\ \beta \\ \gamma \end{pmatrix}, A\text{var} \begin{pmatrix} \hat{\alpha}\, RE \\ \hat{\beta}\, RE \\ \hat{\gamma}\, RE \end{pmatrix} \right) \quad \text{.....3.16}$$

Assuming the equicorrelated model (PL4a and RE2a), $\hat{\sigma}_v^2$ and $\hat{\sigma}_c^2$ are consistent estimators of σ_v^2 and σ_c^2 respectively. The $\hat{\alpha}\,RE$, $\hat{\beta}\,RE$ and $\hat{\gamma}\,RE$ are asymptotically efficient and the asymptotic variance can be consistently estimated as;

$$\hat{A}\,\text{var}\begin{pmatrix}\hat{\alpha}\,RE\\ \hat{\beta}\,RE\\ \hat{\gamma}\,RE\end{pmatrix}=\left(W'\hat{\Omega}_v^{-1}W\right)^{-1} \quad \text{.....3.17}$$

Allowing for arbitrary conditional variances and for serial correlation in $\Omega_{v,i}$ (*PL4c* and *RE2b*), the asymptotic variance can be consistently estimated with the so-called cluster-robust covariance estimator treating each individual as a cluster. In practice, it is better always use cluster-robust standard errors for the RE estimator because of uncertainty about equicorrelated errors.

Fixed effects model: under the assumptions of the fixed effects model (FE1, i.e. RE1 violated), the random effects estimators of α, β, and γ are biased and inconsistent, because the variable c_i is omitted and potentially correlated with the other regressors.

Fixed Effects Estimation

Subtracting time averages $\bar{y}_i = 1/T\sum_t y_{it}$ from the initial model

Yields the within model

$$\ddot{y}_{it}=\ddot{x}_{it}'\beta+\ddot{u}_{it} \quad \text{.....3.18}$$

Where $\ddot{y}_{it}=y_{it}-\bar{y}_i$, $\ddot{x}_{itk}=x_{itk}-\bar{x}_{ik}$ *and* $\ddot{u}_{it}=u_{it}-\bar{u}_i$. Note that the individual – specific effect c_i, the intercept α and the time-invariant regressors z_i cancel.

The fixed effects estimator or within estimator of the slope coefficient β estimates the within model by OLS

$$\hat{\beta}_{FE} = \left(\ddot{X}'\ddot{X}\right)^{-1}\ddot{X}'\ddot{y} \quad \text{.....3.19}$$

The parameters α and γ are not estimated by the within estimator. Random effects model and fixed effects model: The fixed effects estimator of β is unbiased under PL1, PL2, PL3 and FE3I in small samples. Additionally, assuming PL4 and normally distributed idiosyncratic errors, it is normally distributed in small samples. Assuming homoscedastic errors with no serial correlation (*PL4a*), the variance $V\left(\hat{\beta}_{FE} \mid X\right)$ can be unbiasedly estimated as

$$V\left(\hat{\beta}_{FE} \mid X\right) = \hat{\sigma}_u^2 \left(\ddot{X}'\ddot{X}\right)^{-1} \quad \text{.....3.20}$$

Where $\hat{\sigma}_u^2 = \ddot{u}'\ddot{u}/\left(NT - N - K\right)$ and $\hat{\ddot{u}}_{it} = \ddot{y}_{it} - \ddot{x}_{it}'\hat{\beta}_{FE}$ .Note the non-usual degrees of freedom correction. The usual z- and *F*-tests can be performed.

The FE estimator is consistent and asymptotically normally distributed under PL1-PL4 and FE3 when the number of individuals $N \to \infty$ even if *T* is fixed. It can therefore be approximated in samples with many individual observations *N* as

$$\hat{\beta}_{FE} \underset{\approx}{A} N\left(\beta, A\text{var}\left(\hat{\beta}_{FE}\right)\right) \quad \text{.....3.21}$$

Assuming homoscedastic errors with no serial correlation (PL4a), the asymptotic variance can be consistently estimated as;

$$\hat{A}\text{var}\left[\hat{\beta}_{FE}\right] = \hat{\sigma}_u^2 \left(\ddot{X}'\ddot{X}\right)^{-1} \quad \text{.....} \ 3.22$$

Where $\hat{\sigma}_u^2 = \hat{\ddot{u}}'\hat{\ddot{u}}/\left(NT - N\right)$. Letting for Heteroscedasticity and serial correlation of unidentified form (PL4c), the asymptotic variance $A\text{var}\left[\hat{\beta}_k\right]$ can be consistently

estimated with the so-called cluster-robust covariance estimator treating each individual as a cluster for large samples can be executed.

In practice, the idiosyncratic errors are often serially correlated (violating *PL4a*) when $T > 2$. Bertrand, Duflo and Mullainathan (2004) show that the usual standard errors of the fixed effects estimator are drastically understated in the presence of serial correlation. It is therefore advisable to always use cluster-robust standard errors for the fixed effects.

3.5.4.2 Heteroscedasticity across Panels

The variance for each of the panels differs in many cross-sectional datasets. The heteroscedastic model is specified by including the panels (heteroscedastic) option. It is also common to have data on countries, states, or other units that have variation of scale which take up the following form:

$$\Omega = \begin{bmatrix} \delta_1^2 I & 0 \ldots & 0 \\ \vdots & \delta_2^2 I & \vdots \\ 0 & 0 \cdots & \delta_5^2 I \end{bmatrix} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3.23$$

Equation 3.23 ensures that regression result have spherical disturbance and no autocorrelation.

3.5.5 Linear Regression Analysis

To investigate or examine the specific hypotheses of this study, the researcher used multivariate regression analysis (Generalized Least Squares method) with the reason of isolating the main properties of how each of the predictor variable influences the dependent variable. This method has been employed beforehand by Ramli and Haron (2017).

3.5.5.1 Specification of the Econometric Model-Static.

$EXP_{it} = \beta_0 + \beta_1 EXR_{it} + \beta_2 INF_{it} + \beta_3 MYS_{it} + \beta_4 FDI_{it} + \beta_5 EXRV_{it} + \beta_6 POP_{it} + + \varepsilon_{it}$ .... (3.24)

By log linearizing equation 3.24, it becomes;

$logEXP_{it} = \beta_0 + \beta_1 logEXRV_{it} + \beta_2 logEXR_{it} + \beta_3 logMYS_{it} + \beta_4 logINF_{it} + \beta_5 logPOP_{it} + \beta_6 logFDI_{it} + \varepsilon_{it}$ 3.25

Where EXP_{it} are the addition of trades from one country to another measured in USD, EXR_{it} is the exchange rate of each country measured in USD, INF_{it} is the inflation in Rate, MYS_{it} is the money supply in USD, FDI_{it} is the foreign direct investment in USD, $EXRV_{it}$ is the exchange rate volatility in USD, POP_{it} is the population growth of a particular member country in millions , ε_{it} is the error term, β_0 is the intercept, $\beta_1 - \beta_6$ are the parameter estimates t is the time trend, and i is cross-sectional units.

3.5.5.2 Post-diagnostic Tests of the Study

The following diagnostic tests for checking the goodness of fit of the model were conducted: Multi-Collinearity test, Normality Test and Heteroskedasticity tests.

3.5.5.3 Normality Test

In order to understand whether data was drawn from a normally distributed sample population, Shapiro-Wilk normality test was performed. This test was proposed in the year 1965. It calculates a W statistic that examines whether a random sample,$X_1, X_2, \dots, X_n$ was drawn from a normally distributed data. When the resulting p –value is less or equal to 0.05, this examination discards the null hypothesis of normality. Shapiro Wilk test is praised for exhibiting high power when compared with

the other normality tests. Thus the results obtained from this test are good even with small number of observations.

This test is calculated as follows;

$$W = \frac{\left(\varepsilon_{i=1}^{n}\, a_i\, x_{(i)}\right)^2}{\varepsilon_{i=1}^{n}\left(x_i - \frac{-}{x}\right)^2}$$

Where $x_{(i)}$ are the ordered values α_i constants generated form the means of variances and covariance of the ordered statistics and n is the sample size.

3.5.5.4 Multi-Collinearity Test

Multicollinearity occurs when there are high correlations between the predictor and other predictor variables in the model. If not checked, this problem can cause an increase the variance of the coefficient estimates, making the estimates to be very sensitive to minor changes in the model. Therefore, this test makes it hard to gauge the effect of predictor variables on predictant variable.

3.5.5.5 Heteroskedasticity test

Heteroskedasticity is a term used in statistics especially in the setting of linear regression or for time series analysis, to define the case where the variance of errors in the model are not constant for all observations. The basic assumption in modeling is that the variances are homogeneous and that the errors of the model are identically distributed. If it is doubted that there is heterogeneity, then it is therefore necessary to perform a test for heteroskedasticity. This study performed Breusch-Pagan test for heteroskedasticity.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

In this section summary statistics, correlation analysis, unit root test, inferential statistics are discussed.

4.1 Summary Statistics

Descriptive statistics of the study variables are presented in the table 4.1. This was done in order to show the sample characteristics, to check and remove outliers in the data and to show the missing values.

Table 4. 1: Summary of Descriptive Statistics

Variables	Obs	Mean	Std. dv	Min	Max	Kurtosis	Skewness
EXP(USD)	85	1812.065	1931.746	30	6127.07	2.5355	0.9332
POP(MNS)	85	1.99e+07	1.59e+07	4898400	5.56e+07	1.9863	0.7196
INFL	85	6.2725	6.8233	-5.036	38.9450	8.5020	1.9999
FDI(USD)	85	299.1947	402.3655	-4.79	1491.277	4.0478	1.4606
EXRT(USD)	85	1079.744	784.7609	67.3176	3420.098	3.0588	0.6227
MYS(USD)	85	4.03e+12	5.58e+12	1.08e+11	2.29e+13	5.4204	1.8506
ERV(USD)	83	0.2030	0.1333	0.0770	0.3983	0.3731	0.1778

*OBS denotes observation, STD.DV denotes standard deviation, MIN is minimum while MAX indicates maximum

Source: Authors' own Compilation from STATA Corp, 2013

From the table 4.1, exports had a mean of USD 1812.065 million and a standard deviation of USD 1931.746. Population recorded an average of 19,900,000 million individuals with a standard deviation of 15,900,000 million this value indicated that majority of its values lies almost closer to its mean. Inflation on the other hand indicated an average rate of 6.2725 a minimum rate of -5.036 and a maximum rate of 38.9450. Foreign direct investment had a mean of 299.1947 USD. Its standard deviation is 402.3655 indicating greater variation from its mean. Exchange rate indicated a mean of

1079.744 USD percent, a minimum of 67.3176 USD percent and a maximum of 3420.098 percent. Money supply recorded and annual average of USD 4,030 million. Money supply also showed a standard deviation of 5,580 million which denotes that there is greater variability from its mean value.

Exchange rate volatility showed a maximum of 0.3983 USD and a minimum of 0.0770 USD. Its mean value is 0.2030. Skewness measures the degree and direction of asymmetry. A symmetric distribution such as a normal distribution has a skewness of 0, and a distribution that is skewed to the left, e.g., when the mean is less than the median, has a negative skewness. From the results in the table above, trade, population and exchange indicated a relatively normal distribution. Kurtosis is a measure of the heaviness of the tails of a distribution. The values for asymmetry and kurtosis between -3 and +3 are considered acceptable kurtosis for a standard normal distribution (George and Mallery 2010). Trade, foreign direct investment and exchanged showed a relative standard normal distribution given that its values lied closer to the 3.

4.2 Correlation Analysis

The table 1.2 shows the Pearson Correlation Coefficients (r) of the study variables. The diagonal matrix shows that correlation of the variable with itself is perfect unity or one. The off diagonal shows the pairwise correlation among variables. It is clearly showed that the all variables have a correlation of between -1 and 1 which resonate with the economic theory. The correlation coefficient was used as a measure of the direction and the strength of linear relationship between the paired variables.

Table 4. 2: Correlation Matrix

	TRD(exp)	POP	INF	FDI	EXT	MYS	ERV
(exp)	1.0000						
	(0.0000**)						
POP	0.2463	1.0000					
	(0.0002**)	(0.0062**)					
INF	-0.0692	-0.5001	1.0000				
	(0.0004*)	(0.0013*)	(0.0000*)				
FDI	0.5700	0.0517	-0.1487	1.0000			
	(0.0036**)	(0.0035**)	(0.0021**)	(0.0000**)			
ERT	-0.1705	0.6984	-0.3563	0.0849	1.0000		
	(0.0005*)	(0.0062**)	(0.0003**)	(0.0000*)	(0.0000**)		
MYS	0.4671	0.8298	-0.3709	0.2600	0.6514	1.0000	
	(0.0025**)	(0.0045*)	(0.0005**)	(0.0000**)	(0.0025*)	(0.0003**)	
ERV	0.2183	0.6400	0.4372	0.0813	-0.4448	-0.4082	1.0000
	(0.0000*)	(0.0024**)	(0.0002**)	(0.0046*)	(0.0032**)	(0.0000*)	(0.0055**)

** denotes the variables that are statistically significant at 5% level of significant while * shows the variables that are significant at 1%.

Source: Authors own compilation from STATA Output, 2019

The results indicated that exports and population showed a positive correlation with Pearson correlation coefficient of 0.2463 while trade and inflation indicated a negative correlation of -0.0692. Export and exchange rate indicated a negative correlation coefficient of approximately -0.1705 and this showed that a devaluation of a currency affects trade negatively and this suggests that imports from foreign countries will be more expensive. Trade and money supply indicated a relatively strong correlation of 0.4671. On the other hand, exchange rate volatility and trade recorded a strong positive correlation of 0.2183.

Population and inflation recorded a negative and strong negative correlation of -50.01 percent. Foreign direct investment and population showed a positive correlation of 0.0517. This indicates that as population increase the foreign investment in EAC member countries tend to increase. Exchange rate and population showed a strong positive correlation of 69.84 percent. Population and money supply had very strong positive correlation of 82.98 percent while exchange rate volatility and population indicated a positive correlation. Inflation and foreign direct investment indicated a negative correlation coefficient of -14.87 percent. As inflation rate increases it makes

goods and services expensive and this discourages foreign investors hence a reduction in foreign direct investment. Inflation and exchange rate showed a negative correlation. Inflation and money supply indicated a negative correlation of -37.09 percent. Inflation and exchange rate volatility indicated a negative correlation coefficient of 43.72 percent. Foreign direct investment and exchange rate showed a positive correlation of 0.0849. This correlation coefficient was expected because as the currency is devalued it makes goods and services in a country cheaper hence encourages foreign direct investment. Foreign direct invest and money supply was found to have a positive correlation of 26 percent while foreign direct investment and exchange rate volatility indicated a positive correlation. This shows that the exchange rate which is determined by market forces influences the decisions of foreign investors positively. Exchange rate and money supply recorded a strong positive correlation of approximately 66 percent. Exchange rate and money supply had a positive correlation of 0.6514 while it indicated a negative correlation with exchange rate volatility of r = -0.4448. Money supply with exchange rate volatility recorded a negative relationship exchange rate volatility with a correlation coefficient of -0.4082. These correlation results are very important because it shows the strength of linear relationship among the dependent and the independent variables in one figure. The above correlation results of Intra-EAC regional trade reduces the range of uncertainty because most likely, the prediction based on correlation are near to reality and are relied on.

4.3 Panel Unit Root Tests

Stationary in panels or time series data is an important feature. Estimating panels containing unit roots leads to reporting of spurious and meaningless regression results. Stationarity implies that the mean and the variance of each variable do not change over time or rather changes within a certain interval. Therefore, the first thing before

estimation was to find whether the series contain unit root or stationary. This research used Madala-Wu-Fisher, Levin-Lin-Chu and Im-Pesaran-Shin panel unit root tests.

4.3.1 Madala-Wu-Fisher Test

Maddala, Wu and Fisher (1999) developed a unit root test that works well with an unbalanced panel data. The null hypothesis of this test is that all panels contain a unit root while the alternative hypothesis is that the data is stationary.

Table 4. 3: Madala-Wu-Fisher Test

Variable	Z	P value	Remarks	Z	P value	Remarks
EXP(USD)	-0.7432	0.2287	Unit root	-4.4438	0.0000*	*I(1)*
POP(Miln)	6.6191	1.0000	Unit root	-9.9484	0.0000*	*I(1)*
INF(Rate)	-1.5217	0.0640	Unit root	-3.4032	0.0003*	*I(1)*
FDI(USD)	0.1006	0.5217	Unit root	-2.3733	0.0088*	*I(1)*
ERT(USD)	1.4248	0.9229	Unit root	-2.6646	0.0039*	*I(1)*
MYS(USD)	-4.1894	0.0001*	Stationary	-4.1894	0.0000*	*I(1)*
ERV(USD)	0.3551	1.0024	Unit root	1.9800	0.0465*	*I(1)*

*indicate significant at 5 % percent level of confidence.
Source: Authors' Own Compilation from STATA Corp, 2013

Fisher test for panel unit root using an Augmented Dickey-Fuller test was applied for each of the univariate series. The results indicated that trade (p – value 0.2287 > 0.05), population (p – value 1.000 > 0.05), inflation (p – value > 0.05), foreign direct investment (p – value 0.5217 > 0.05), exchange rate (p – value > 0.9229), had unit root while money supply had no unit root in their levels (p – value 0.0001 < 0.05). Results also show that the variables became stationary on their first difference.

4.3.2 Levin-Lin-Chu Test

From the results presented in the figure above it is shown that all the variables (trade, population, foreign direct investment, exchange rate, money supply and exchange rate

volatility contain unit root at level. Inflation rate was found to contain no unit root at levels.

Table 4. 4: Results of Levin – Lin - Test

	Variables Levels			First difference		
Variable	Z inverse normal	P value	Remarks	Z	P value	Remarks
XPT(USD)	0.1957	0.5776	Unit root	-5.6771	0.0000*	*I(1)*
POP(Mln)	1.6035	0.9456	Unit root	-3.1340	0.0000*	*I(1)*
INF(Rate)	-3.6177	0.0001*	Stationary	-3.1340	0.0000*	*I(0)*
FDI(USD)	0.6785	0.7512	Unit root	-9.2666	0.0000*	*I(1)*
ERT(USD)	2.2365	0.9875	Unit root	-4.3296	0.0000*	*I(1)*
MYS(USD)	0.8544	0.8036	Unit root	-3.2680	0.0000*	*I(1)*
ERV(USD)	0.3551	1.0024	Unit root	1.9800	0.0465*	*I(1)*

H_{01} Panels contain unit roots
H_{02} Panels are stationary
** denotes the variables that are statistically significant at 10% level of significant while * shows the variables that are significant at 5%.

Source: Authors' Own Compilation from STATA 13.0 output, 2019

The use of non-stationary variables in regressions might lead to spurious results and therefore it was necessary to use differenced variables. One of the approach of dealing with spurious regression is testing whether each of the multiple series are *I(1)* and if so the computed differences or other data transformations before entering the variables into the regression (Granger 2003).

Upon first difference all the variables were stationary at 5 percent level of confidence hence suitable for running regression. The LLC bias-adjusted test statistic $t* \delta = -4.0277$ is significantly less than zero ($p < 0.05$), so the null hypothesis of a unit-root was reject (that is, that $\varphi = 0$ in favor of the alternative hypothesis)

4.3.3 Im-Pesaran-Shin Test

The results in table 4.5 shows the Im-Pesaran-Shin panel unit root test. The IPS test tests the presence of unit root across panels and usually based on Augmented Dickey-Fuller (ADF) statistics averaged across groups. IPS test has superior test power to

analyze long-run relationships in panel data, and usually applied to test for unit root for both balanced and unbalanced data (Baltagi 2005). From table 4.5, it is clearly indicated that the trade, population, inflation, foreign direct investment, exchange rate, money supply and exchange rate volatility all have unit root at levels as indicated by p-value greater than 0.05.

Table 4. 5: Results of Im-Pesaran-Shin Test

	Levels		First difference		
Variable	Z	P – value	Z	P - value	Remarks
XPT(USD)	0.0323	0.4871	-3.7555	0.0001*	*I(1)*
POP(Mln)	7.0036	1.0000	-17.718	0.0007**	*I(1)*
INF(Rate)	-2.8994	0.0019	-5.6291	0.0000*	*I(0)*
FDI(USD)	0.6040	0.7271	-4.4076	0.0000*	*I(1)*
ERT(USD)	2.2872	0.7271	-3.1497	0.0008*	*I(1)*
MYS(USD)	1.4478	0.9872	-2.4972	0.0063*	*I(1)*
ERV(USD)	0.7315	0.4666	3.8812	0.0000*	*I(1)*

** denotes the variables that are statistically significant at 5% level of significant while * shows the variables that are significant at 1%.

Source: Authors Survey Data, 2019

Upon first difference it was noted that the trade, population, inflation, foreign direct investment, exchange rate, money supply and exchange rate volatility had a (p value- 0.0000 < 0.0500) hence the null hypothesis was rejected in favor of alternative hypothesis that panels contain no unit root and hence stationary.

4.4 Estimating Exchange Rate Volatility

To measure volatility, the study employed or utilized the generalized autoregressive conditional heteroskedasticity (ARCH/GARCH) which was presented by Engel (1982), later modified to Bollerslev's (1986). This family models have been discussed about by and large in the literature and a common conclusion is that they are more efficient and effective in generating proxies for variables that are not stable due to their ability to clasp persistence in shocks which are observed mostly in financial time series. In addition, this models when compared with others are praised to be more flexible when

they are linked to lengthy time series data because they allow more exact evaluation of the parameters that are exploited (Matei 2009).

The findings of the arch/garch model is shown in the table 4.6. The coefficient of exchange rate volatility is positive and statistically significant at 5% $\beta = 1.0908$ and($P = 0.000 < 0.05$. It implies that a one percent increase in exchange rate volatility in EAC, trade increases by 1.0908 percent. These findings can be interpreted in a way that if traders are risk opposed, the high volatility of exchange rates upsurges the predicted marginal utility of export earnings therefore improving exports. These findings conform to risk-portfolio theory with the conjecture that higher risk implies higher returns. Thus, increasing risk due to fluctuating exchange rates could rather increase the volume of trade (De Grauwe 1996).

Table 4.6: Results of ARCH/GARCH Family Model

ERV(USD)	Coef.	Std Err	Z	P>|Z|	95% Conf.	Interval
Cons	0.9379	0.0012	75.61	0.000	0.0936	0.0922
ARCH						
ARCH						
L1	1.0908	0.2590	4.22	0.000	0.5837	1.5978
GARCH						
L1	0.0007	0.0013	0.57	0.569	-0.0018	0.0033
Cons	2..23e-06	9.53e-06	0.23	0.815	-0.00001	0.00002

Source: Authors own compilation; Stata output 2019

4.5 Hausman Test for Model Selection

To decide whether to use fixed or random effects model, Hausman test was conducted. The null hypothesis for this test tests if the difference in coefficients are not systematic, Green (2008). This means the individual effects are uncorrelated in other words the random effects model is appropriate.

Table 4. 7: Hausman Tests Results

	Fe (b)	**Re (B)**	**difference(b-B)**
POP(MLNS)	2.6362	0.9740	-3.0408
INF(Rate)	-0.0010	-0.0260	0.0250
FDI(USD)	0.2018	-0.0140	0.2158
EXT(USD)	-0.0008	-0.0014	0.00060
MYS(USD)	2.9468	0.8700	2.0862
ERV(USD)	3.5675	5.8752	-2.3078

*b = consistent under H_0 and H_a; obtain from Panel Regression, B= inconsistent under H_a; efficient under H_0; obtained from Panel Regression. Test: H_0; difference in coefficients not systematic. Chi2 (6) = (b-B) = 71.16. Prob.> chi2 = 0.000

From the Hausman test results presented in table 4.7, the p-value is 0.000 which is less than 0.05. The study therefore rejects the null hypothesis and accept the otherwise. This means that the country specific effects are correlated with the independent variables and hence this study used the fixed effect (FE) model to test for study's hypotheses.

4.6 Regression Results of Fixed Effects

The crucial difference behind random effects model is that, unlike the fixed effects model, the difference across entities is assumed to be random and uncorrelated with the independent variables under the study (Green, 2008). Based on the Hausman test in table 4.7 Prob > chi2 = 0.000 the null hypothesis that random effects are better than fixed effects was rejected and fixed effects was adopted. The random effects regression is shown on appendix I.

Table 4.8: Regression Results for Fixed Effects Model

Regression Results for Fixed Effects Model					Number of Obs =78 F(6;55) =114.57 Prob>F =0.000 R square =0.5971	
EXPORTS(USD)	Coef.	Std. Err	T	P>|t|	[95%	Conf. Interval]
POP(Mlns)	2.6362	0.8842	2.98	0.004	8.7230	4.4001
INF(Rate)	-0.0010	0.0130	-0.08	0.9361	0.0265	0.0244
FDI(USD)	0.2018	0.0426	4.74	0.000	0.1183	0.2852
EXT(USD)	-0.0008	0.0001	-5.64	0.000	-0.0011	-0.0005
MYS(USD)	2.9468	0.3025	9.74	0.000	2.3407	3.5530
ERV(USD)	3.5675	0.7918	4.51	0.000	1.9809	5.1540
CONS	-42.3022	2.5015	-16.91	0.000	-47.3153	-37.2891

Source: Researcher's own compilation, 2019

4.7 Diagnostic Tests

Before testing the hypotheses, the study performed normality test, multi-collinearity test and heteroskedasticity test to test the fit of the model. The reason or the importance of conducting such test is to give good results suitable for inferential analyses and forecasting.

4.7.1 Normality Test

This was done in order to know whether data was drawn from a normally distributed population

Table 4. 9: Normality Test using Shapiro-Wilk test

Independent Variables	W	V	Z	Prob>z
POP(Mlns)	0.8136	1.252	0.839	0.086
INF(Rate)	0.8107	3.446	0.491	0.454
FDI(USD)	0.7573	1.655	-0.043	0.198
ERT(USD)	0.9407	1.510	-0.261	0.23
MYS(USD)	0.6891	2.078	0.396	0.406
ERV(USD)	0.7160	0.078	1.586	0.112

Source: Author's Own Computation, 2019

Shapiro-Wilk test recommends that when the p-value is greater than 0.05 then data is normally distributed. If the contrary happens, that is p value less than 0.05 then the data has significantly strayed from the normal distribution (Lomnicki, 1961) and (Jarque & Bera, 1987). A quick glance at table 4.9, the Shapiro-Wilk test shows that the sampled data was normally distributed.

4.7.2 Multi-Collinearity Test

If independent variables in regression model under the study are correlated, then there is multicollinearity (Flavio Vilela Vieira Ronald MacDonald, 2016).

Table 4. 10: Multi-Collinearity Test using Variance Inflation Factor (VIF)

Independent Variables	**VIF**	**1/VIF**
POP(Mlns)	6.02	0.1661
INF(Rate)	1.44	0.6951
FDI(USD)	1.24	0.8096
ERT(USD)	2.02	0.4941
MYS(USD)	4.22	0.2367
ERV(USD)	1.91	0.5244
Mean VIF	**2.81**	

Source: Authors' Own Computation Stata Output.

It is thus a kind of disturbance in the data, and if present it might lead to unreliable statistical inferences. Also if present in the data, it makes it difficult to assess the relative significance of the autonomous variables in explaining the variation caused by the dependent variable. To check for the impact of collinearity among the variables, Variance Inflation Factor (VIF) was employed. The Variance Inflation Factor (VIF) is 1/Tolerance, it is constantly greater than or equal to one. There is no prescribed VIF value showing the existence of multicollinearity. Variance Inflation Factor values that goes beyond 10 are frequently considered as indicating multicollinearity. Table 4.9

shows the VIF values for independent variables. The average VIF value was found to be 2.81 < 10 implying that there was no collinearity between the variables under study.

4.7.3 Testing for heteroskedasticity

Heteroscedasticity implies that the assumption of homoscedasticity (constant variance) is violated. It occurs when the size of the error term differs across values of an independent variables (Andualem Telaye Mengistu Eduardo Montero and Alexander Segura 2017).

Table 4. 11: Testing for heteroskedasticity

EXPORT(USD)	**Coef**	**Std. Err**	**t-statistic**	**p>|t|**
POP(Mlns)	0.5650436	.3343453	1.69	0.092
INF(Rate)	-0.092293	.0913799	-1.01	0.312
FDI(USD)	0.0535493	.0431849	1.24	0.214
MYS(USD)	0.9145073	.1786147	5.12	0.000
ERT(USD)	-0.0001466	.0001577	-0.93	0.353
ERV(USD)	2.0784009	.9362166	2.22	0.026
Cons	-4.951228	3.215083	-1.54	0.124

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, Ho: Constant variance

Chi^2 (1) = 0.21, Prob > chi2 = 0.6506

The impact of violating the assumption of homoscedasticity is a matter of degree, increasing as heteroskedasticity rises (Greene, 2012). From table 4.10, the results indicate that there is no heteroskedasticity because the p value is greater than 0.05. Therefore, the null hypothesis of constant variance is accepted.

4.8 Hypothesis Testing

The first hypothesis that exchange rate is not volatile on Intra-East Africa regional trade was rejected because the coefficient of exchange rate volatility is positive and statistically significant at 5% ($\beta = 1.0908$) and ($P = 0.000 < 0.05$). It implies that a one percent increase in exchange rate volatility in EAC trade increases trade by 1.0908 percent. This finding can be taken to mean that if traders are risk opposed, the high

volatile rate of exchange upsurges the predicted marginal utility of export earnings consequently enlightening exports, as a result increasing foreign trade.

And so, results are approving that the EAC merchants are risk takers and not risk opposed. This finding conforms to study by Buitron (2013) and the risk-portfolio theory with the conjecture that participating in higher risk trade would lead to higher returns by traders. Thus, increasing risk because of highly volatile or fluctuating exchange rates possibly will increase the volume of trade rather than decreasing (De Grauwe, 1996). In his study De Grauwe (1988) disintegrated the results of exchange rate fluctuation into exchange and earnings effects. For exchange effect, he debated that the risk opposed traders will decide to decrease their exports volume because of the deterioration in their anticipated marginal utility from the export incomes. In place of the incident of earnings effect, merchants resolve to intensify their exports in an effort to prevaricate a decrease in their export earnings. The study finally recommended that if earnings effects supersede the exchange effect then there would be positive relationship amid exchange rate unpredictability and trade movements.

The second hypothesis of the study stated that exchange rate does not significantly affect Intra East African trade. The regression results from the fixed effects model showed that exchange rate is vital determinant of Intra East African Trade (coefficient of -0.0008, p – value 0.000 < 0.05). The coefficient showed that a unit change in exchange rate results to a decrease in Intra East African trade by 0.0008 units. This hypothesis was rejected and the study concluded that exchange rate affects Intra East African trade. The reason is that an increase in exchange rate oscillation would lead to a reduction in foreign trade because there are costs which are associated with variability in the exchange rate, and these lowers the incentives to trade. In addition, the negative exchange rate coefficient implies that depreciating the value of exchange rate will cause

a reduction of international trade because the cost of imports will rise. This results conforms to the findings by Ferto *et al.,* 2014; Hooy *et al.,* (2015), and also it opines with theoretical viewpoint, which held the view that the rising and falling of exchange rate are a significant source of macroeconomic improbability.

The hypothesis that stated that money supply does not have an effect on Intra East African trade was rejected by the study. Results indicated that money supply has a positive and significant effect on Intra East African trade (coefficient of 2.9468, p – value 0.000 < 0.05). It was therefore concluded that money supply affects Intra East African trade and that a unit increase in money supply leads to 2.9468 units increase in Intra East African trade.

This affiliation concerning the supply of money and trade is because an increase in supply of money raises the income level. Owing to higher income per capita, individuals feel better-off and this motivates them to venture in production. Due to high production, more merchandises will be availed for the domestic market and the surplus exported to foreign markets. Again, Manufacturers will demand raw materials and when the business flourish, more laborers will be employed with a good per capita income leading to high quality lifestyle. Importation of products that a country has a comparative disadvantage in production will not pose any challenge because individuals are well off. This study conclusion conforms to the study findings by Maryam *et al.,* 2019, Onyeiwu (2012), Anowor and Okorie, (2016) whose results concluded that increasing of currency backup ratio leads to better economic atmosphere and higher economic improvement. The study findings also agrees with the Monetarists' theory of demand of money which appealed that amount of money in movement standardizes the capacity of merchandises and services traded in a country. Consequently, it has positive affiliation with the position of the country in foreign trade

because unrestricted market economy leads to resilient self-adjustment inclinations. However, despite the fact that money supply increase trade, studies by Precious *et al.,* (2014), and Qureshi *et al.,* (2017) found a negative coefficient of money supply in trade.

The fifth hypothesis stated that population has no significant effect on Intra East African Trade. The study results indicated that population has positive and significant effect on Intra East African Trade (coefficient of 2.6362 p –value 0.0040 < 0.05) at 5% level of significance. Based on fixed effect regression results, this hypothesis was rejected. Therefore, the study concluded that population is a significant determinant of Intra-East African trade. Population had a positive coefficient of 2.6362 which is significant implying that population positively affects the trade in the EAC. The study interprets this positive population effect that the more the population in EAC, the larger the market and that exports into EAC are labour intensive. Larger population means more supply of labour force, improved labour specialization and more laborers implies more production and more goods for both domestic and foreign markets. Moreover, population increase may lead to increased demand for imported goods as well. The study results conform to the study by Mohsen, *et al.,* 2015 .On the contrary, studies by Nuroglu (2010) and Ambetsa *et al.,* (2019) found a negative coefficient for population in trade among the EAC member states. They interpreted the negative coefficient in a way that a higher population means a higher dependence ratio and finally condensed income per individual which makes people to be poor leading to low production and finally decline of international trade. Moreover, these researchers recorded that members of EAC are affiliates of other trading blocks in Africa where there is widespread norm of non-tariff barriers among member countries that distracts the smooth run of trade.

The study sought to determine whether inflation has significant effect on Intra East African trade. The fixed effect regression results was reported to be insignificant. Thus the study failed to reject the null hypothesis.

The sixth hypothesis stated that foreign direct investment does not significantly determine Intra East African trade. As was expected, results indicated that foreign direct investment has positive and significant effect on Intra East African trade (coefficient of 0.2018, p – value 0.0000 < 0.05). It was therefore concluded that foreign direct investment was significant determinant of Intra East African trade. The study interprets this positive FDI coefficient in EAC as driven by the progressive liberalization of foreign investment and trade policies, politically stable environment and availability of factors of production or resource endowment in the region. Also, the already established industries have diversified their products leading to diversified exports. This is because International firms contemplate quite a lot of aspects in advance before selecting a destination for investment Wu *et al.*, (2018). This result conformed to the previous studies by Cadman *et al.*, (2015), Wang and Liu (2017) and Muema (2013). These investigators concluded that FDI is vital for developing countries as it avails human capital development, technological progress and competition in markets. Altogether these resources are essential to optimize the level of economic development. Member states of the EAC have been devaluing their currencies and in doing so, many investors from abroad have been attracted by this incentive and have come to the region Madura (2011). Again, the study opines with the World developing report (2006) which concluded that globalization and regional integration agreements have changed the level and pattern of FDI and also it has reduced the trade costs. On the opposite, Ambetza *et al.*, 2019 got a negative coefficient of FDI in EAC regional trade. The study argued that common FDI admittances in the EAC region are hooked on non-regional

exporting segments of Information Communication Technology, infrastructure and mining which take a lot of time before their effect become positive and impact trade.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Overview

This is the final chapter of the study. It contains the summary of the following test analysis that were conducted: descriptive statistics, stationarity test, correlation test and fixed effect model. Last but not least, this chapter presents the major conclusion, policy recommendation, limitations of the study and the suggestions for future studies.

5.1 Summary of the Findings

The main focus of this study was to evaluate the exchange rate volatility and its effect on intra East Africa Community regional trade, employing panel/longitudinal data spanning from 2000-2017. To accomplish this objective, the study obtained the total trade by using data from the difference between total imports and exports of all five trading economies. The specific objectives were; to determine the effect of population, foreign direct investment, inflation, exchange rate and money supply on intra-East Africa Community regional trade.

Trade proxied by exports had a mean of 1812.065 million USD and a standard deviation of 1931.746(USD), population had an average of 19,900,000 (USD) and a standard deviation of 15,900,000(USD). Inflation had indicated an average rate of 6.2725, a minimum rate of -5.036 and a maximum of 38.9450. FDI had a mean of 299.1947(USD) and a standard deviation of 402.3655 indicating greater variation from its mean. Exchange had a mean of 1079.744 %, a minimum of 67.3176 (USD) and a maximum of 3420.098 (USD). Money supply recorded and annual average of 4,030Miln, (USD). Money supply also showed a standard deviation of 5,580, (MilUSD) which denotes that there is greater variability from its mean value. Exchange rate volatility showed a

maximum of 0.3983 percent and a minimum of 0.0770 percent. Its mean value is 0.2030. Skewness measures the degree and direction of asymmetry

5.2 Stationarity Analysis

Before regressing the panel data, unit root analysis was conducted to check for stationarity in order to avoid the problem of spurious regression which distorts the results. This was necessary because panel data is a collection of time series data over a long period of time and this data are known to have a common characteristic of non-stationarity. Following the recommendation by Griffits, Hill Lutkepohl and Lee (1985) and Greene (2012) of using different panel unit root test to check for consistency and robustness, the study performed Im-Pesaran-Shin, Levin-Lin-Chu, and Madala-Wu-Fisher tests.

The results of Madala-Wu-Fisher Panel Unit Root Test reported in table 1.3 showed that trade, population, foreign direct investment, money supply and exchange rate volatility had unit root at levels. Inflation rate became stationary at levels hence no unit root. This results confirm the hypothesis of this test that all panels contain a unit root against the alternative hypothesis that the data is stationary. Upon the first difference, all the remaining variables became stationary and suitable for regression.

Levin -Lin- Chu panel unit root test showed that all the variables under the study (trade, population, foreign direct investment, exchange rate, money supply and exchange rate volatility) contain unit root at level except the Inflation rate that was found to be stationary at levels. After the first difference, all the variables that had unit root became stationary and ready for regression.

The results of the Im-Pesaran-Shin panel unit root test indicated that all variables had unit root at levels as indicated by p-value greater than 0.05 therefore under the null

hypothesis that all panels contain a unit root. Upon first difference it was noted that the trade, population, inflation, foreign direct investment, exchange rate, money supply and exchange rate volatility stationary had a (p value- 0.0000 < 0.0500) hence the null hypothesis was rejected in favor of alternative hypothesis that panels contain no unit root hence stationary

The study performed Hausman test to decide on whether to use random effect or fixed effect model to test the hypotheses. The null hypothesis of Hausman is that random effect is appropriate against alternative fixed effect model. Hausman test rejected the null hypothesis and used the fixed effect model.

5.3 Conclusion

The study had hypothesized that exchange rate is not volatile on Intra-East Africa regional trade, however the arch/garch family results rejected the null hypothesis because the coefficient of exchange volatility is positive and statistically significant at 5% level of significance. It implies that a one percent increase of exchange rate volatility in EAC trade increases trade by 1.0908 percent.

The hypothesis that exchange rate does not significantly affect Intra-East Africa regional trade was rejected by the study. The results are interpreted in a way that an increase in exchange rate variability would lead to a reduction in foreign trade because the risk averse traders will reduce their trading activities and opt for less risk business.

The hypothesis stated that population has no effect on Intra East African Trade. However, regression results confirm that population has a positive and significant influence on Intra East African Trade, therefore this hypothesis was rejected. It was concluded that population is a significant factor of Intra- East African trade regional trade.

The hypothesis that population does not affect Intra-East Africa regional trade was rejected because population had a positive coefficient and very significant at 5%. This means that the more the population increases, the more intra-EAC trade.

The study failed to reject the hypothesis that hypothesis that Inflation does not affect Intra-East Africa regional trade. Although it had a negative coefficient, it was not statistically significant. Following the regression result from fixed effect model, the hypothesis that foreign direct investment does not affect Intra-East Africa regional trade was rejected by the study. This is because foreign direct investment has positive and significant effect on Intra East African trade.

The study had hypothesized that money supply does not have an effect on Intra East African trade. However, results indicated that money supply positively influences Intra East African trade. It was therefore concluded money supply affects Intra East African trade and that an increase in money supply leads to increase in Intra East African trade.

5.4 Policy Implications

There is need for partner states of EAC to enact and implement laws and policies that are geared towards stabilization of exchange rates in order to attract and encourage foreign investors and to create a conducive environment for investment.

From the findings, population has come out to be a significant factor for foreign trade. The study results showed that exports into EAC are labour intensive. This thus means that the respective governments in the cooperation should ensure exporters interest are kept intact and that they should be given incentives for instance reduce the cost of inputs to produce more. Rules on access and ownership of land should be streamlined this will pave way for more production and more surplus for exports. The health of the citizens should be guaranteed to ensure the workforce are healthy and if in case they became

sick, they are able to access medical services and continue being productive in farming. EAC member states should formulate policies that helps to streamline the functions of their financial markets to ensure efficiency in issuance of credit and foster financial development.

EAC partner states should formulate policies that strengthen their institutional framework in order to guarantee a well-functioning market. Reason is that a weak institution changes laws frequently causing inefficiencies in public administration. Weak public institutions hinder the inflows of FDI.

5.5 Suggestion for Further Studies

In light of increased globalization where the vast and extensive world is being contracted into a small village, a study on the impacts of liberalization of exchange policies in all trading blocs in Africa eg AMU, COMESA, SADC, WAEMU among others should be conducted. Such a study would be of help in closing the extreme gap between the advanced and the emerging economies in Africa.

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APPENDIX

Appendix I: Random Effects Regression Results

Regression results for random effect model				
				No of obs=78
				Wald =411.35
				p>chi2 =0.0000
				R =85.28
EXP(USD)	Coeff	Std. Err	Z	P>|Z|
POP(Milns)	0.9740	0.3357	2.90	0.004
INF(Rate)	-0.0260	0.0145	-1.78	0.075
FDI(USD)	-0.0010	0.0455	-5.74	0.000
EXT(USD)	-0.0014	0.0002	-9.34	0.000
MYS(USD)	0.8700	0.1800	4.78	0.000
ERV(USD)	5.8752	0.9270	6.34	0.000
CONS	-33.9338	3.3031	-10.27	0.000