2024

Effects of exchange rate volatility on Kenya-China bilateral trade.

Miriti, Grace Kinya
Strathmore Business School
Strathmore University

EFFECTS OF EXCHANGE RATE VOLATILITY ON KENYA-CHINA BILATERAL TRADE

GRACE KINYA MIRITI

86378

A RESEARCH PROJECT PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE AWARD OF MASTER IN COMMERCE STRATHMORE UNIVERSITY

MAY 2024

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

Grace Kinya Miriti

APPROVAL

The dissertation of Grace Kinya Miriti was approved by the following:

Dr Farida Abdul

Strathmore Business School

Dr. Ceaser Mwangi

Executive Dean

Strathmore University Business School.

Dr. Bernard Shibwabo

Director, Office of Graduate Studies

ABSTRACT

Developing countries are often associated with trade deficits; Kenya is no exception. Since independence, Kenya has prominently experienced trade deficits, with Kenya's leading partner, China, accounting for over 30% of this trade deficit. Among the factors influencing a country's trade balance, exchange rates are considered fundamental in affecting the level of trade. Despite this, only a few studies have explored the effect of the volatility of exchange rates on trade and trade balance in Kenya, and even fewer studies have examined this relationship by considering Kenya and its leading trade partner, China. This study explored the impact of USDKES volatility and the ensuing implications for this bilateral relationship. Contrary to previous studies in Kenya, this study used disaggregated categorical commodity data to explore Kenya's exchange rate-trade balance nexus. The study was anchored on a positivist research philosophy and employed a descriptive correlational design. The study used the Garch (1, 1) model to model volatility. The ARDL was used to determine the short-run and long-run effects of the exchange rate volatility on imports, exports, and trade balance. The trade data used was for the period ranging from 2005 to 2022. The study's results pointed to an adverse effect of exchange rate uncertainties on imports from China and no significant impact on exports and the bilateral trade balance. The study recommends that the government employ exchange rate policies to reduce the trade deficit level. Additionally, exchange rate policies can promote economic growth in Kenya.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ARDL	Autoregressive Distributed Lag
Bop	Balance of Payments
CNYKES	Chinese Yuan Kenyan Shilling currency pair
ERV	Exchange Rate Volatility
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
KNBS	Kenya National Bureau of Statistics
M L	Marshall Lerner
MTNARDL	Multiple Threshold Nonlinear Autoregressive Distributed Lag
NACOSTI	National Commission for Science, Technology, and Innovation
OBOR	One Road One Belt
PPP	Purchasing Power Parity
RER	Real Exchange Rate
SAARC	South Asian Association for Regional Cooperation
SSA	Sub-Saharan Africa
TGARCH	Threshold Generalized Autoregressive Conditional Heteroscedasticity
USD	United States Dollar
USDKES	US Dollar Kenyan Shilling currency pair
VAR	Vector Auto regression

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENT

I am grateful to God for the strength, wisdom, and unfailing grace to keep going, even when I thought I could not do it. My sincere appreciation goes to my supervisor, Dr. Farida Abdul, for her guidance, advice, and effective response at each stage in the preparation and execution of this thesis. My heartfelt gratitude goes to my family for their support, prayers, and constant encouragement.

DEFINITION OF TERMS

Exchange Rate –"the rate at which one currency can be exchanged for another" (Kilicarslan, 2018). This study will refer to the value of KSH per US Dollar.

Exchange Rate Volatility – the unpredictable upward and downward movement of one currency against another (Ozturk & Cavdar, 2021).

Nominal Exchange Rate –"This is the price of one currency relative to another" **(**Kilicarslan, 2018).

Trade Balance –This is the difference in the monetary value of a country's exports against its imports (Kennedy, 2013).

Bilateral Trade –The exchange of goods between two countries to promote trade and investment (Li & Li, 2020).

Consumer Price Index -The average price change consumers pay overtime against a basket of goods (Chang et al., 2020).

Production Price Index measures the average price change domestic producers receive for their goods and services (Chang et al., 2020).

Gross Domestic Product "is the market value of all services and finished goods produced within a country's boundaries" (Gupta & Varshney, 2021).

Balance of Payments –This is a statement of all transactions between a country and the rest of the world. Bop transactions include exports and imports of goods, services, and capital and transfer payments, including remittances and foreign aid (Mugambi, 2017).

CHAPTER 1

INTRODUCTION

1.1 **Background of the study**

External trade is fundamental for all economies as trade can expand markets, create jobs, disseminate knowledge, and facilitate competition (Ogbonna & Ichoku, 2022). International /external trade refers to the exchange of services and goods between nations. Trade has grown tremendously globally, promoted by real domestic and foreign GDP, natural resource endowment, and exchange rates (Ogbonna & Ichoku, 2022).

Trade imbalances have been a common phenomenon in international trade (Nasir & Jackson, 2019). “A trade imbalance occurs when the value of exports is greater than that of imports (trade surplus) or when the value of imports exceeds that of exports” (trade deficit) (Kennedy, 2013). A trade surplus is often considered desirable as opposed to a trade deficit since trade deficits are often associated with economic weakness and point out a country's excessive foreign dependence at the expense of domestic production and jobs. Large trade deficits are also considered breeding grounds for financial crises that could damage the economy (Kennedy, 2013).On the contrary, trade surpluses are associated with foreign currency flows and job creation for the exporting country.

Since Independence, Kenya's trade balance has remained in deficit apart from 1964 and 1977, when Kenya recorded trade surpluses of $ 5.7 million and $ 18.1 million, respectively (Kennedy, 2013). This has been attributed to the lower value of exports than imports from abroad. As of 2005, Kenya's trade deficit stood at USD 2.36 billion. This amount has multiplied over the past years by five times to USD 12.4 billion as of 2021 (KNBS, 2022). This represents the highest level of the trade deficit in Kenya since independence.

Kenya exports primary goods, including agricultural products, cement, petroleum, iron, and steel. Its main export destinations are Pakistan, the United Kingdom, Uganda, South Africa, Tanzania, the USA, and the Netherlands (KNBS, 2022).On the other hand, its primary import goods include petroleum products, machinery, transportation equipment, motor vehicles, iron, and steel. These goods are primarily imported from China, India, UAE, Japan, Saudi Arabia, the USA, and South Africa (KNBS, 2022). The main currency used in international trade in

Kenya is the USD, with most payments for imports denominated in USD; thus, volatility in this currency affects the import bill.

1.1.1 Kenya-China Trade

China's presence in Africa has risen rapidly, supported by China's demand for raw materials and resource-rich countries (Sanghi & Johnson, 2016). China's journey in Africa began in 1979. Still, it intensified in the new millennium when Chinese companies were encouraged to expand internationally by the then-head of the National People's Congress in a policy labelled 'Go Out' (Mulinge, 2012).In the same stride, Africa's trade deficit has been rising recently, with a few African countries exporting to China (Guan & Sheong, 2020). This has caused an asymmetrical relationship between China and African countries importing machinery, vehicles, nuclear reactors, etc.

China has evolved over the years to emerge as a renowned force in world trade, specifically Kenya. This has majorly been attributed to its immense economic growth rate, averaging 10% annually over the last two decades, growth in GDP, and a tremendous population of over 1.3 billion, offering a vast domestic base for growth stimulation (Githaiga, 2021).

The first trade agreement between China and Kenya was instituted in 1964, after independence, with China being the fourth country to set up an embassy in the country (Githaiga, 2021). At this time, the trade between the two countries favored Kenya at an estimated Kshs 29.2 million (Patroba, 2012). This did not last long, as Nairobi accused Beijing of supporting a coup leading to the closure of the embassy in 1966 (Patroba, 2012). In 1978, President Moi’s government started rebuilding the country’s relationship with China, culminating in two technical cooperation and economic agreements (Patroba, 2012). In 1990, Kenya’s imports from China started rising, although with minimal exports to China (Githaiga, 2021). The growth in imports from China and other trade partners resulted from exchange rate liberalization, lowering of external tariffs, and favorable prices of Chinese goods. As of 2002, the trade value between China and Kenya reached Kshs 14.648 billion, with Kenya exporting Kshs 0.45 billion and importing Chinese goods worth Kshs 14.19 billion (Warui, 2010).

The relationship between China and Kenya was further enhanced by the Narc Government led by former president Mwai Kibaki in 2005 in a 'Look East' policy where Kibaki's visit to China

culminated in a five-part agreement covering infrastructure and energy, aviation services, and modernization of Kenya Broadcasting Corporation (Mulinge, 2012). Due to accelerated growth in the ICT sector in February 2006, the government eliminated all duties on computer imports, increasing goods from China (Warui, 2010).In 2011, imports from China amounted to Kshs248.276 billion, almost four times higher than in 2008, which stood at Kshs63.357 billion (Warui, 2010). In contrast, Kenya's exports remained low at Kshs3.6 billion.

In 2012, Kenya imported goods worth Kshs167 billion. After only three years, this amount had doubled to Kshs300 billion in 2015, making China the first country to export such an immense value by surpassing other leading players in the trade, e.g., India (Githaiga, 2021). However, similar growth was not present in exports to China, accounting for only 0.006% of China's world imports between 2015 and 2019 (Raga et al., 2021).

In the last five years, the import value has grown over 17.5% from Kshs390 billion in 2017 to Kshs459 billion in 2022. Despite not being among the top exporting countries to China, Kenya's leading import partner is China, with imports from China accounting for 22.6% of all imports (Li & Li, 2020). "China's exports to Kenya are mainly labor-intensive industrial manufactured goods, including boilers, electronic equipment, nuclear reactors, vehicles, iron, steel, etc. On the other hand, Kenya exports primary products, such as agricultural products and natural mineral resources, and sideline products, such as ores, raw hides, skin, etc. " (Li & Li, 2020).

Previous studies exploring the Kenya-China bilateral relations have focused on infrastructure, political and socio-economic effects on Kenyan firms (Mulinge, 2012), the nature of trade in manufactured goods (Githaiga, 2021), development of bilateral trade in goods and future trends of trade potential (Li & Li, 2020), the liberation of agricultural trade and implications for Kenya- China relations (Kipkorir, 2020) and economic influence of China's presence in Kenya (Sanghi & Johnson, 2016).

While previous research has delved into different facets of the Kenya -China bilateral relations, the specific impact of volatility of exchange rates on Kenya-China bilateral trade remains relatively unexplored despite exchange rates being considered vital in the trade balance of a given country. This alludes to the concept that when a currency is lower in value than the currency of the trade partner, the goods are attractive to consumers in the other country, thus

increasing the value of exports (Nasir & Jackson, 2019). Adewuyi and Akpokodje (2013) argue that volatility of exchange rates significantly affects trade flows by influencing the export and import prices The escalating trade volumes in the recent past between the two countries and volatility in exchange rates in the recent years underscores the need for deeper understanding of trade dynamics. By focusing on exchange rate volatility, the researcher aims to shed light on a critical factor influencing the trade between the two nations and inform on risk management strategies, guide policy interventions and possibly unlock economic opportunities to enhance the bilateral relationship.

1.1.2 Exchange Rate-Volatility

The Bretton Woods fixed rate regime collapse in the 1970s facilitated the adoption of a floating rate regime broadly characterized by flexible exchange rates that are market-determined, unlike the fixed rate regime, where governments control exchange rates (Chang et al., 2020). "A fixed exchange rate regime is associated with changes in foreign reserves to limit the nominal exchange rate volatility. In contrast, a flexible exchange rate regime is categorized by volatile exchange rates and stable reserves" (Eduardo et al., 2016).

Achouak (2018) argues that an economy adopting a flexible exchange rate could experience unpredicted exchange rate volatility that could affect a country's economic and financial stability and subsequently cripple its economic growth. Other effects of volatility are experienced through key economic determinants such as investment, employment, and trade flows. Exchange rate volatility has become inevitable for countries adopting flexible exchange rate regimes (Kilicarslan, 2018). This has created interest in researchers intending to determine the impact of the volatility of exchange rates on different macroeconomic factors, including trade, GDP, economic growth, inflation, FDI, etc.(Chang et al., 2020).

Kilicarslan (2018) defines exchange rate volatility "as a situation where the value of currency changes with that of other currencies". On the other hand, Ozturk and Cavdar (2021) describe exchange rate volatility as "the fluctuations in currency conversion rates generally derived from short-term speculations, panic, and epidemics. In other words, the volatility of exchange rates is the unpredictable upward and downward movements of one currency against another currency". It follows that any sudden appreciation or depreciation of a currency would be deemed as exchange rate volatility (Giannellis & Papadopoulos, 2011).

Africa has experienced high exchange rate volatility since moving to the floating exchange rate regime in the early 1980s (Adewuyi & Akpokodje, 2013). This has been attributed to selling and buying pressures in the forex market (Emenike, 2018). The volatility of exchange rates increases uncertainty and risks and makes it challenging to predict exchange rates, especially in the short run. Thus, it is more challenging to formulate long-term macroeconomic policies and make portfolio and trade investment decisions. Additionally, it affects competitiveness and the macroeconomic foundations of developing economies. Empirical literature indicates that the volatility of exchange rates on economic activities is quite complex. "It depends on various factors, including expectations about exchange rate changes (unanticipated and anticipated), the form (depreciation and appreciation and by what magnitude), policy environment (fiscal and monetary policy stance, i.e., contractionary or expansionary), level of financial development and production of economy and degree of openness of the economy" (Emenike, 2018).

During the fixed rate regime era, Kenya, in tandem with other developing countries, frequently devalued the Kenya Shilling to minimize the real exchange rate's effects on its economy (Musyoki et al., 2012). Since adopting the floating rate regime in 1993, Kenya's exchange rate represented by USDKES has been characterized by volatility over the years, as indicated by the graph below.

Figure 1.1: USDKES Graph

Source: trading view

USDKES, the most dominant currency pair used in foreign transactions, especially merchandise trade, was employed in this study to explore the association among variables in the Kenya-China relationship.

1.1.3 Exchange rate volatility and trade

"The impact of exchange rate volatility on an economy is majorly felt through the effect on trade since it determines the import and export prices" (Adewuyi & Akpokodje, 2013). Several factors allude to the exchange rate uncertainty and trade association (Sharma, 2020). The instability of exchange rates and deviations of currencies from their equilibrium for prolonged periods often impose extra costs on trade; thus, the efficient resource allocation between various industries and activities in a country could be distorted as costs may interfere with international competition (Musyoki et al., 2012).

Theory points out a negative relationship between trade and exchange rate volatility. From empirical data, however, this does not always happen. Three schools of thought emerge about the trade- exchange rate nexus. One school of thought points out a positive relationship between high exchange rate volatility and trade volumes. This applies to risk lovers who assume risk and take advantage of the volatility to reap maximum returns. This orientation supports the risk–portfolio stance that associates high risk with high return. Latief & Lefen (2018), studying nations along the Chinese project One Belt One Road, concluded the presence of a positive association between volatility and trade flows. Similarly, Guan & Sheong (2020) established that a positive relationship existed between exchange rates and Africa's exports to China.

The second school of thought suggests that for risk-averse traders, trade flows are minimized due to exchange rate volatility (Banik & Roy, 2021). This is exemplified by risk-averse traders who shy away from high-risk trading obligations and gravitate towards those with low risk due to uncertainty associated with volatility (Senadza & Diaba, 2018). Guan and Sheong (2020), Gupta and Varshney (2021), and Heriqbaldi et al. (2022) conclude the existence of a negative relationship between imports and exchange rate volatility while Aftab (2012; Heriqbaldi et al.(2022), Sharma (2020) ,Sugiharti et al.(2020) find a negative relationship between exports and exchange rates.

Chang et al. (2020) and Oluyemi & Didi Isaac (2017) find no meaningful relationship between the volatility of exchange rates and trade. This stance is further propagated through studies by

Aftab (2017) ,Syed, et al. (2017) exploring the impact of exchange rate volatility on 60 export and 62 import industries participating in the Malaysia-Thailand Bilateral trade. The study concludes the insignificant effect of exchange rate volatility on most industries.

As with exchange rates and trade, the impact of exchange rates on the balance of trade is inconclusive among scholars. One thread of literature finds no meaningful association between the depreciation of a nation's currency and its balance of trade. This stance is supported by Lotfalipour & Bazargan (2014) and Musila (2018). Alsamara et al.(2022) and Wang (2018) conclude that the depreciation of a country's currency hurts its trade balance. The third literature thread establishes that depreciation improves a country's trade balance. This stance is supported by (Osoro ,2013; Mwito et al., 2021; Chiu ,2009).

It follows that studies exploring exchange rate volatility and trade balance do not yield consistent results. This variation in findings can be attributed to a number of factors. One notable aspect contributing to the disparity in results is contextual factors. The studies were conducted in varied contexts. Some researchers, like Chang et al. (2020) and Wang (2018), examined developed countries, while others, such as Heriqbaldi et al. (2022) and Latief & Lefen (2018), focused on developing nations. These diverse economic landscapes, along with the different policies implemented during the study periods, likely contributed to the discrepancies in findings across the studies.

Furthermore, the difference in methodologies employed by various researchers in their studies is noteworthy. For instance, Heriqbaldi et al. (2022), Chang et al. (2020), Masih (2018), and Alsamara et al. (2022) utilized the Nonlinear Autoregressive Distributed Lag (NARDL) approach. Chang et al. (2020) introduced the Mean-adjusted Threshold Autoregressive Distributed Lag (MTNARDL), while Aftab, Shah, et al. (2017), Sugiharti et al. (2020), and Wang (2018) opted for the Autoregressive Distributed Lag (ARDL) approach in their respective research endeavors. Finally, the inconsistency in findings can be attributed to the type of data used, whether aggregated Latief and Lefen (2018), Heriqbaldi et al. (2022) or disaggregated industrial data (Banik & Roy, 2021; Aftab, et al., 2017).

It was necessary to re-examine this relationship in the Kenyan context since countries vary in their economic foundations and policies employed at different times (Ogutu, 2014). Additionally, a review of previous literature posed an aggregation bias challenge. Past studies

in Kenya used aggregated bilateral trade data (Kiptui, 2018; Mwito et al., 2021; Osoro, 2013).To counter this bias, this study used disaggregated categorical commodity data and disaggregated bilateral trade data. Different categories/sectors are affected differently by exchange rate volatility. Hunegnaw & Kim (2017) and Masih (2018) established that currency depreciation ameliorated the trade balances of mining, manufacturing, technology, and consumer stables sectors while worsening those of healthcare and energy.

1.2 Problem statement

Trade deficits have been predominant in countries engaging in international trade (Kipkorir, 2020). Bilateral trade deficits have attracted economic and political attention from governments as they are perceived as evidence of unfair trading practices by trade partners (Mwito et al., 2021). As a developing country with the value of imports consistently rising with no equivalent export growth, Kenya's trade deficit has been growing yearly. As of 2005, Kenya's trade deficit stood at USD 2.36 billion (KNBS, 2006). This amount has multiplied over the past years by five times to USD 12.4 billion as of 2021 (KNBS, 2022) .

Trade between China and Kenya has grown over thirtyfold from $106 million in 2005 to $3.9 billion as of 2022. As these volumes have grown, so has Kenya's trade deficit, which stood at $12.4 billion as of 2021, with China contributing to a third of this deficit, accounting for $3.89 billion (KNBS, 2022). Reducing this trade deficit has been a salient topic in different forums involving the two countries. The data on the Kenya-China bilateral relationship is scarce Githaiga (2021), Kipruto (2019), Mulinge (2012),Sanghi and Johnson (2016), Sugiharti et al. (2020), and even fewer studies have explicitly focused on examining the effect of exchange rates on this bilateral relationship. From 2021 to 2022, the Kenyan shilling experienced the highest volatility against the US Dollar, from 101.33 in January 2021 to 123.42 as of December 2022. In the years spanning from 2005 to 2022, it has experienced 54.66 % depreciation from 79.80 in 2005 to 123.42 at the end of December.

While acknowledging the presence of numerous variables influencing trade imbalance, the selection of exchange rate volatility as a focal point is justified by its recognized significance in determining import and export prices, as highlighted by Adewuyi & Akpokodje (2013). Exchange rate volatility serves as a critical determinant of the competitiveness of traded goods, influencing the relative costs of imports and exports. Additionally from the J-curve theory , it

is evident that changes in the exchange rate i.e. appreciation and depreciation significantly affect the trade balance of a country (Wang, 2018).

In the Kenyan context, several studies have explored the impact of the exchange rate on imports, exports Otieno (2014), and trade balance (Kennedy, 2013; Kiptui, 2018; Mwito et al., 2021). Otieno (2014) finds mixed results in their study focusing on the impact of volatility on Kenya's exports, with volatility harming horticulture and coffee exports and positively affecting tea exports. Similarly, mixed results on the exchange rate–trade balance nexus emanate from studies by Kennedy (2013), and Mwito et al.(2021), who established that depreciation improves Kenya's trade balance while Kiptui (2018) concluded that depreciation negatively affected Kenya's trade balance with major trade partners .

These studies use aggregate import and export data across many countries. The use of aggregate trade data could result in an aggregation bias problem (Wang, 2018). This is because an insignificant impact with another trading partner could offset a significant effect of depreciation with one of Kenya's trading partners. The use of aggregate data assumes the uniformity of volatility across sectors and countries, which is not entirely accurate. Additionally, the USDKES has experienced the highest level of volatility in the period leading to 2022. Similarly, Kenya's trade deficit was at its highest level in history at the end of 2021. These recent fluctuations have heightened concerns about the potential impact of volatility on trade patterns and overall economic stability. Therefore, there was a need to examine this bilateral relationship.

This study used bilateral trade and categorical data to curb aggregation bias. Exploring the impact of the volatility of exchange rates on various categories of commodities captured the peculiarities of each category differently, considering the nature of the commodities categorized together. The economic categories studied are Consumer Goods, Fuel and Lubricants, Industrial Supplies, Food and Beverages, Machinery and other Capital Equipment and Transport Equipment. Information on distinct categories of imports /exports was vital in determining the commodity groups that contributed to Kenya's trade deficit and whether the depreciation or appreciation of USDKES would positively or negatively affect the trade balance. Additionally, exploring categorical data informed the effects of different exchange rate policies and the costs associated with currency appreciation/depreciation in the various major commodity categories. Developing countries are more prone to external and internal

disturbances than developed countries. Understanding better volatility of exchange rates and the sectorial impact on the trade balance could provide better economic stability (Lee-Lee & Hui-Boon, 2007)

1.3 Research Objectives

1.3.1 General Objective

The general objective of this study is to determine the effects of exchange rate volatility on the Kenya- China bilateral trade.

1.3.2 Specific Objectives

1. To investigate the effect of exchange rate volatility on imports from China.
2. To investigate the effect of exchange rate volatility on exports to China.
3. To determine the impact of exchange rate volatility on the Kenya- China bilateral trade balance.
4. To evaluate the effect of exchange rate volatility on categorical commodity trade balance in Kenya

1.4 Hypothesis

1. Exchange rate volatility does not significantly affect the volume of imports from China.
2. The volatility of exchange rates has no significant effect on the volume of exports to China.
3. The volatility of USDKES does not affect Kenya's bilateral trade balance with China.
4. The volatility of USDKES has no significant impact on the trade balance of different commodity categories in Kenya.

1.5 Scope of the study

The study focused on analyzing Kenya's import and export values to China from 2005 to 2022. This time frame was chosen due to the significant increase in China-Kenya relations starting from 2005, marked by former President Mwai Kibaki's "Go East" policy and the signing of five agreements with China (Mulinge, 2012). The period also witnessed a surge in trade volumes and collaborations between the two countries, and the availability of data for this time

frame further supported its selection. Spanning nearly two decades, the study aimed to capture long-term trends and fluctuations in trade dynamics, exchange rates, and economic policies, thereby enhancing the statistical robustness and validity of the analysis.

Similarly, the study examined exchange rates from 2005 to 2022, considering the broad economic categorical annual data encompassing the values of imports and exports over the same period. The categories studied included: Transport Equipment, Food and Beverages, Industrial Supplies, Machinery, and Other Capital Equipment. The currency pair investigated in the study was the USDKES (US Dollar to Kenyan Shilling), as it is the most predominant currency pair used in foreign transactions and provides a representative view of the foreign exchange market. Additionally, expressing the value of imports between Kenya and China in US Dollars helped eliminate ambiguity in converting to other currencies, such as the CNYKES (Chinese Yuan to Kenyan Shilling currency pair).

1.6 Significance of the study

1.6.1 Policy Makers

Through exchange rate adjustment, policymakers can design policies that suit China as Kenya's leading trading partner without generalization for the rest of the world. Developing the right policies unique to Kenya-China relations might help reduce the trade deficit between the two countries. This study will also inform the exchange rate policy formulation by alluding to the benefits and costs associated with currency movements in different economic categories.

1.6.2 Scholars

This study has contributed to the existing body of knowledge exploring the relationship between exchange rate volatility and its impact on trade balance in Kenya. Previous research on the trade-exchange rate nexus relationship is inconclusive and contradictory among scholars. Therefore, this study has contributed to the debate and provides insights into how the trade balance reacts to currency depreciations and appreciations and will be a reference tool for future researchers.

1.6.3 Traders

Traders are significant players in the foreign exchange market through their role as both exporters and importers. Therefore, they are affected by sudden changes in the foreign exchange markets. This study sought to inform traders on the effects of appreciations and depreciations of the USDKES on the value of trade, especially for traders exporting and importing from China. This information is fundamental in reducing prices among traders that are usually due to uncertainty in the market, with traders leaning into cautiousness, thus factoring in price volatility.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The J Curve and Balance of Payment theories were adopted to fully respond to the objectives and anchor the arguments presented in this study. The J-curve effect explains the trade balance-exchange rate nexus, while the Balance of Payments (BOP) theory elaborates on the relationship between volatility of exchange rates and balance of payments. The broad BOP theory involves all divisions, including current, financial, and capital accounts. Part of the current account is the trade balance; therefore, this theory can inform this study.

2.1.2 Balance of Payments Theory

Jacob Frenkel and Harry Johnson advanced the balance of payments theory in 1976 as part of the monetary approach to the balance of payments theory. It is also referred to as the demand-supply theory of exchange (Mugambi, 2017). According to this theory, the proposition of balance of payments comes from disequilibrium involving outflow and inflow of international money, such that a surplus balance of payments results in appreciation of the external value of a country's currency while a deficit in the balance of payments results in depreciation in the external value of the country's currency (Okoth, 2013).

The external value of a country's currency is dependent on the supply and demand of the currency. If demand for foreign currency is more significant than supply, the price of the foreign currency appreciates. When looking at exchange rates, there are demand and supply sides characterized by credit and debit sides, with either side involved with imports and exports of goods (Mugambi, 2017). The BOP is, therefore, either favorable or adverse depending on the shift in equilibrium of exchange rates. When exchange rates fall below equilibrium, there is a deficit in the balance of payments. Therefore, exports increase, thus eliminating the adverse balance of payments. The inverse is also true for the exchange rate appreciation above equilibrium (Okoth, 2013) .In other words, the depreciation of the exchange value of home currency leads to a rise in exports and a decline in imports. Thus, the BOP deficit gets reduced, and the exchange rate appreciates to approach finally the equilibrium rate of exchange where the BOP is also in a state of equilibrium.

Iyoboyi and Muftau (2014), exploring the impact of exchange rate depreciation on the balance of payments in Nigeria that depreciation of the Naira, improved BOP position in Nigeria due to the increase in net export balance. The study suggested that BOP position could likely be improved using exchange rate devaluation.

This theory attempts to determine the exchange rate through forces of demand and supply relating the rate of exchange to the BOP position. It is superior to PPP theory since it suggests that disequilibrium in the BOP could be adjusted through devaluations or revaluations of exchange rates. This theory has been criticized for its assumption of free international trade and perfect competition while countries impose different trade restrictions and market imperfections exist. Additionally, the theory does not explain what determines the internal value of a currency.

It is expected that depreciation/ devaluation of USDKES, will result in an increase in exports to China and a decrease in imports from China. This would improve the bilateral trade deficit which would subsequently cause an appreciation in the USDKES to the equilibrium rate and in the long term, the BOP would be in a state of equilibrium.

2.1.2 J- Curve Effect

The J curve theory is attributed to Magee (1973). This theory states that currency depreciation has a positive effect on exports and a negative effect on imports due to the price effect (Wang, 2018). “That is, exports become relatively cheaper in a country as measured in foreign currency, while imports, measured in domestic currency, become relatively more expensive. In the long term, the price effect leads to the volume effect” (Alsamara et al., 2022). Since exports are cheaper, their volume increases while the volume of the more expensive imports decreases (Bahmani-oskooee & Fariditavana, 2015). The volume of imports due to depreciation may not reduce immediately due to previous contractual obligations, and importers take time to find cheaper alternative sources of supply. Similarly, as much as exports are more affordable, foreigners may not adjust their purchases immediately.

It follows that a country's balance of trade will worsen in the short-term due to the price effects but correct in the long run if the volume effect correctly adjusts to the price effect(Wang, 2018). Immediately after devaluation, the trade balance deteriorates due to cheaper exports and more expensive imports. Over time, elasticities increase, and the trade balance improves when the

absolute values of a country's export and import price elasticity are greater than one, meeting the Marshall Lerner condition (Bahmani 2013). In the long run, the deficit is eliminated and is followed by a trade surplus (Adams & Metwally, 2021).

Empirical investigations have extensively examined the presence of the J-Curve effect across various jurisdictions and contexts. In their study, Sokeng and Ouyang (2019) investigated the presence of the J-Curve effect by analyzing the devaluation of the CFA Franc and its impact on Cameroon's trade balance. Their findings substantiated the existence of the J-Curve effect within the Cameroonian context. Similarly, Alsamara et al. (2022) corroborated the presence of this phenomenon in Algeria, where initial depreciation led to a deterioration of the trade balance before exhibiting improvements in the long run. Additionally, Bahmani-Oskooee and Fariditavana (2015) conducted an analysis on the trade balances of Canada, the USA, China, and Japan to test for the J-Curve effect. Their results indicated support for the J-Curve pattern in the cases of the USA and China. However, contrary to these findings, the J-Curve pattern was not validated for Japan and Canada. The theory has however been criticized for being a simplistic representation of real-world dynamics and neglecting factors such as income elasticity of demand, non-price factors and asymmetries in trade relationships.

Depreciation or devaluation of USDKES is expected to result in a decline in the balance of trade in the short term due to the price effect. In the long term, it improves if the volume effect successfully adjusts to the relative prices.

2.2 Review of Empirical Literature

This section reviewed past literature from the local and global contexts expressing the association between the volatility of exchange rates on imports and exports from multilateral relationships and bilateral relationships between countries. Additionally, past studies on the exchange rate trade balance nexus were explored on aggregated and disaggregated sectorial data. Finally, this section established gaps in previous studies on the specified research area.

2.2.1 Effects of Exchange Rate Volatility on Trade

"The literature on the relationship between exchange rate volatility and trade flows is mixed and relatively inconclusive. Several studies explored the effect of exchange rate volatility on trade, but theoretically, results are uncertain, while empirical results are divided" (Latief & Lefen, 2018). Three broad classifications are identified in the literature; the first strand points

out an adverse exchange rate volatility trade nexus, the second concludes a positive relationship between exchange rate volatility and trade, and the third strand identifies no meaningful relationship between the two.

Latief and Lefen (2018) studied the effect of exchange rate volatility on trade by considering seven developing countries along the Chinese project, One Belt One Road (OBOR). The countries under study were Bhutan. India, Bangladesh, Pakistan, Sri Lanka, Maldives and Nepal. Yearly panel data from 1995 to 2016 was investigated using the GARCH and TGARCH models to measure exchange rate volatility. The results from the GARCH model pointed to a positive relationship between international trade and exchange rate volatility for Bhutan, Nepal, and Maldives and a significant negative relationship for Pakistan. Similarly, employing a TGARCH model, Latief and Lefen (2018) concluded a positive relationship between exchange rate and international trade for Bhutan, Nepal, and Maldives. As opposed to studying all the countries along the OBOR, this study focuses on one country on this belt, Kenya and the primary initiator country, China.

On the contrary, a statistically significant and negative relationship between bilateral trade and exchange rate uncertainty was established by Banik and Roy (2021) through investigating the effects of exchange rates on South Asian Association for Regional Cooperation (SAARC) countries. Countries considered were Bangladesh, Afghanistan, Bhutan, Nepal, Maldives, Sri Lanka, and Pakistan. The effect of exchange rate volatility was evaluated using random effects, ordinary least squares, fixed effects estimation techniques, and a modified gravity model to investigate the impact of volatility of exchange rates from 2005 to 2018. The study used aggregated bilateral trade data; however, the authors suggested using disaggregated industrial or sector-wise data in future studies, as exchange rates could have different effects across different industries and sectors. Additionally, the authors recommended using policy incentives to hedge against volatility to promote bilateral trade relationships in the SAARC region. The current study uses ARDL to study the bilateral relationship and for an increased period.

Similarly, a negative effect on both exports and imports occurs in the study by Heriqbaldi et al.(2022), where they investigated the relationship between trade in Indonesia and exchange rate volatility. Bilateral trade data of Indonesia with its top trading partners, namely, USA, Netherlands, China, India, Malaysia, Singapore, South Korea, Germany, Australia, and Japan, was used. Quarterly data from 2006 to 2020 was analyzed using the Exponential Generalized

Autoregressive Conditional Heteroskedasticity (EGARCH) model to estimate Indonesia's exchange rate volatility. The nonlinear-ARDL method was used to evaluate the impact of exchange rate volatility on cross-border trade. In the long term, the real ERV negatively affected Indonesia's exports to South Korea, Singapore, Germany, and China; in the short run, all top trade partners apart from Singapore and the USA were affected. For imports, exchange rate volatility negatively and significantly affected imports from Australia, Malaysia, China, Germany, and Japan in the long run. However, a positive effect was established for imports from Australia in the short term. This current study focuses on the Kenya-China bilateral relationship.

Contrary to Heriqbaldi et al.(2022), Chang et al.(2020) , investigated the impact of exchange rate volatility on USA Imports from South Africa, Brazil, India, and Mexico and found an insignificant relationship between US imports and exchange rate volatility. The effects of extremely small and substantial impacts of exchange rates on trade flows were explored using the Mean-adjusted Threshold Autoregressive Distributed Lag (MTNARDL) model using monthly data from 1986 to 2018. The study concluded that exchange rate fluctuations had an insignificant effect on US imports from the four developing nations.

A few studies have investigated the trade exchange rate volatility nexus in Africa. Dada (2021) studies the asymmetric effect of exchange rate volatility on trade using data from 2005 to 2027 for 17 sub-Saharan African (SSA) countries. The two-step generalized method of moments was used to estimate panel data to cater to the endogeneity associated with panel data. The study revealed adverse shocks and positive shocks on exchange rate volatility, significantly and negatively impacted trade activities for SSA countries. However, the magnitude of positive exchange rate volatility on trade was lower than that of negative exchange rate volatility. The study further determined that the real exchange rate significantly and negatively affected trade. As opposed to exploring the effects of volatility on a group of sub-Saharan countries, the current study focuses on one East African country, Kenya.

Analyzing the determinants of bilateral trade between China and African countries Guan and Sheong (2020), real exchange rates were found to affect Africa's imports from China negatively and positively affect Africa's exports. The gravity model was employed in this study of 40 African countries in the 17 years from 1995 to 2015. This study will focus only on the bilateral relationship of China with Kenya.

Another study in Nigeria by Oluyemi & Didi (2017) , sought to determine the effects of exchange rates using monthly data from 1996 to 2015 for exports and imports in Nigeria. The Vector Auto Regression (VAR) model was used to analyze data. The study findings were that exchange rates had an insignificant positive impact on imports and an insignificant negative effect on exports, concluding that exchange rates could not be considered to have any significant effect on the volume of exports and imports in Nigeria. The current study focuses on more disaggregated data by investigating the broad economic categories.

To further curb aggregation bias, several studies have analyzed the trade and exchange rate nexus at a more disaggregated level by analyzing Industry level, sector-wise, and commodity-level data**.** Using monthly data over 13 years from 2000 to 2013, Aftab, Shah, et al.(2017) studied the exchange rate trade nexus, focusing on the bilateral trade between Malaysia and Thailand .62 export and 60 import industries were taken into consideration and subjected to analysis using the ARDL approach. The study concluded that exchange rates adversely affected two Malaysian exporting industries, i.e., instruments and apparatus, and 7 Malaysian importing industries. For other industries, there was no significant relationship between exchange rates and industries participating in the Malaysia-Thailand bilateral trade.

Using sectorial data**,** Aftab (2012) **,** investigated the impact of exchange rate volatility on Pakistani exports for seven years between 2003 and 2010 using quarterly data. The GARCH model was employed to model exchange rate volatility, while the Phillips-Perron test was employed to determine the unit root of the series. The bounds-testing approach suggested by Pearsan et al. was used to explore the relationship between the volatility of exchange rates and sectorial exports. The results indicated a negative relationship between exports and exchange rate volatility. "However, the volatility coefficient was insignificant in 3 sectors (i., animal or vegetable fats, oils, and waxes; ii. vehicles, aircraft, vessels, and associated transport equipment; and iii. arms and ammunition, parts) out of the 20 sectors investigated in this study" (Aftab, 2012)**.** The limitation of the study was the use of a small data set due to the non-availability of disaggregated data for extended periods. The current study uses a longer period of close to 2 decades to explore the exchange rate-trade nexus.

Commodity level data was analyzed by Gupta and Varshney (2021) to explore the influence of exchange rate volatility on US –India imports. Monthly import data of 45 commodities from 2002 to 2019 was used and considered the effect of the 2008 global financial crisis. The E-

GARCH model was used to model the real exchange rate volatility, while the Toda –Yamamoto causality method was employed to determine causality among the variables. The results indicated that the long-term impact of exchange rate volatility for most commodities resulted in a decrease in the import volume. The same was true for short-run effects, with exchange rates having a significant and negative effect on the volume of trade imports. According to this study, the most affected industry was the manufacturing industry. This study will estimate volatility using the Garch method and employ the ARDL model for analysis.

Similarly, Sharma (2020) investigated the exchange rate's effect on India's commodity exports. The panel data of over 100 products using monthly data for 2012 to 2017 was analyzed using the pooled mean group estimator and Mean Group estimator to establish the relationship among variables, while volatility was examined using the GARCH method. The study found adverse effects of the volatility of exchange rates on commodity exports in India in the long term, employing nominal and real exchange rates in the analysis; however, the volatility was more damaging in the latter than in the former. In the short term, using the nominal exchange rate, the results pointed to a negative relationship between exchange rate uncertainty and exports despite the theoretical argument that exporters could use hedging instruments to minimize the negative impact of volatility on exports in the short run.

In Indonesia, the effect of the volatility of exchange rates on commodity exports to the top five destinations, namely Japan, India, South Korea, China, India, and the USA, was analyzed by (Sugiharti et al., 2020). To model the exchange rate volatility, GARCH was employed, while to establish the relationship between volatility and exports, the ARDL was used on monthly data spanning from 2006 to 2018. The paper revealed that the volatility of exchange rates negatively affected Indonesian exports. Commodity exports to India, the USA, Japan, and South Korea, including chemicals, ores, pulp, and rubber, were significantly affected by exchange rate movements, while those to China were not. This study will focus only on the bilateral relationship between Kenya and China.

In the Kenyan context**,** Otieno (2014) explored the effect of real exchange rate volatility on exports to the European Union and the UK, namely tea, coffee, and horticulture. Volatility was modelled using the GARCH Method, while short-run and long-run relationships between variables were tested using the ARDL model. The results were mixed with real exchange rate volatility having a negative and significant impact on horticulture, a positive and significant

effect on tea exports, and insignificant and adverse effects on coffee exports. The study period was from 2005 to 2012.

2.2.2 Exchange Rate and Trade Balance

Similar to the trade exchange rate volatility nexus, the relationship between the balance of trade and the exchange rate varies among scholars. Exploring the effect of the exchange rate on the US-China bilateral trade under Chinese managed floating exchange rate system using the ARDL model approach Wang (2018), found that appreciation of the US Dollar against the Chinese Yuan had an insignificant effect on the US-China bilateral trade deficit. Similarly, the appreciation of the US dollar discouraged exports to China but did not considerably affect imports from China. The study employed quarterly data spanning 2005 to 2017.As opposed to studying two large economies, this study focuses on the bilateral relationship between the second largest economy in the world and the largest economy in East Africa.

A similar conclusion is arrived at by Lotfalipour and Bazargan (2014), who estimated the volatility of the real effective exchange rate effect on the balance of trade for Iran from 1993 to 2011. Using the panel data model and GARCH (1, 1), the study demonstrated an insignificant association between the balance of trade and the real effective exchange rate. They concluded that currency depreciation did not increase a country's trade balance. Other variables such as population, income per capita, production efficiency, and quality could be considered more adequate in improving the trade balance. The current study employs the nominal exchange rate in the analysis of the exchange rate-trade balance nexus.

Masih (2018) employed the Nonlinear ARDL model to explore the effect of the real exchange rate on the trade balance of the main sectors in Thailand. The sectors included in the study were consumer staples, consumer discretionary, Technology, Energy, Healthcare, and industrials. The study established that in the long run, the depreciation of the Thai Bhat improved the country's trade balance; however, different sectors were affected differently. Depreciation of the Thai Bhat improved the trade balance for consumer discretionary, technology, industrials, and consumer staples but worsened that of the healthcare and energy sectors. The difference between country and sector levels could be associated with the specific nature of markets and sectors. This study employed the ARDL model with slightly different economic categories.

Closer home, Alsamara et al.(2022) ,examined the impact of real exchange rates on the balance of trade in Algeria. The study used data from 1980 to 2018 and employed the Nonlinear ARDL method to analyze Algeria's trade balance with twelve principal trading partners. The results pointed out the presence of the J-curve effect in Algeria. Domestic currency depreciation worsened the trade balance in the short run due to changes in prices, with improvement in the long run due to changes in traded volumes. Additionally, the study revealed that an increase in the income of a trade partner increased Algeria's trade balance. This study employed disaggregated data by focusing on one bilateral relationship.

A disaggregated study by Ogbonna and Ichoku (2022) explored the effect of exchange rates on Nigeria's bilateral balance of trade with the USA, China, and Belgium. This study concluded that the depreciation of the Nigerian Naira negatively and significantly affected Nigeria's bilateral trade balance with China. In contrast, the appreciation of the Naira had a negligible but positive effect in the long term. For Belgium and the USA, the impact of the exchange rate on the balance of trade was insignificant. This paper employed the nonlinear autoregressive-distributed load (NARDL) model that decomposed the exchange rate into partial sum processes of positive and negative changes spanning the 1999Q1–2019Q4 period.

Alternately, Musila (2018) examined the dynamics of exchange rates on the balance of trade in Uganda. Using the bounds testing approach to cointegration and vector error correction model on quarterly data for 1993 to 2014, the paper revealed that depreciation had an insignificant effect on the trade balance in the long term. However, a mutually causal relationship existed between the real effective exchange rate and the trade balance in the short term. The study concluded that other policies besides the exchange rate policies had to be employed to alleviate the country's balance of trade. As opposed to use of the error correction model, the current study used the ARDL model which is considered appropriate for use of data that is stationary at level or stationary at first difference.

Using sectorial data, Hunegnaw and Kim (2017) explored the real exchange rate effect on sectorial trade balances, mining, agriculture, and manufacturing in 12 East African countries from 1970 to 2013. The study employed both nonlinear and linear ARDL models. From the linear model, real exchange depreciation improved mining and manufacturing trade balances while worsening the agricultural balance of trade in the long term. In the short run, exchange rate depreciation improved the trade balances for both the mining and manufacturing sectors.

Nonlinear ARDL results indicated the absence of significant asymmetric effects of real exchange rates on sectorial trade balances for mining and manufacturing in the long term.

In the Kenyan context Osoro (2013) investigated the significant trade balance determinants using annual data spanning 49 years between 1963 and 2012. The error Correction Model and Johansen cointegration approaches were used to explore trade deficits' short-term and long-term determinants. The identified factors were the exchange rate, FDI, and budget deficits. The exchange rate depreciation positively and significantly affected the balance of trade in the long term. In contrast, in the short run, it deteriorated initially and then adjusted upwards. This study upheld the Marshall Lerner condition, indicating depreciation improved Kenya's balance of trade.

Mwito et al. (2021) explored the presence of the J Curve effect by examining the impact of the real exchange rate on Kenya's balance of trade by analyzing the panel data of 30 bilateral trade partnerships. The Pooled Mean Group (PMG) method was used on data from 2006 to 2018. The results stipulated that simultaneous bilateral exchange rate depreciation positively impacted the trade balance in the long run; however, the trade balance was negatively affected in the short term. The current study curbs the aggregation biased posed by focusing on an important bilateral relationship and also taking into account disaggregated data in the form of economic categories.

Employing the Nonlinear ARDL approach, Kiptui (2018) explored the exchange rate dynamics of bilateral trade relationships. Kenya’s trade balances with key trading partners were examined for the period ranging from 1975 to 2013. The results indicated that Kenya's balance of trade responded more to a depreciating currency than an appreciating currency. In the long run, volatility adversely affected Kenya's trade balances with India, Uganda, China, the USA, and the UK. However, in the case of Tanzania, depreciation improved the bilateral trade balance between the two countries. Alternately, appreciation positively affected Kenya's trade balance with Uganda and India while remaining insignificant for other countries. The current study reduces aggregation bias through use of disaggregated data.

2.3 Summary of Knowledge Gaps

Table 2.1: Summary of Knowledge Gaps

Study	Country	Study Aim	Key Findings	How the current study fills the gap
(Latief & Lefen, 2018)	Seven countries along the One Belt One Road	To determine the effect of exchange rate volatility on trade	Exchange rate volatility improved international trade for Bhutan, Nepal, and Maldives and reduced that for Pakistan	The current study focuses on the bilateral relationship between China and Kenya to reduce aggregation bias
(Gupta & Varshney, 2021)	USA	Impact of exchange rate volatility on US Imports from South Africa, Brazil, India, and Mexico.	Exchange rate fluctuations had an insignificant effect on US imports from the four developing nations.	This study will explore the impact of volatility on both imports and exports.
(Guan & Sheong, 2020)	40 African countries	The determinants of bilateral trade between China and African countries	Real exchange rates negatively affected Africa's imports from China and positively affected Africa's exports.	This study will focus on the volatility of exchange rates on the trade relationship between East Africa's biggest economy and China.

(Otieno, 2014)	Kenya	The effect of real exchange rate volatility on exports, namely tea, coffee, and horticulture to the European Union and the UK	Real exchange rate volatility had a significant and negative effect on horticulture, a positive and significant impact on tea exports, and insignificant and adverse effects on coffee exports.	This study will focus on exports and imports from Kenya's largest importing country, China.
(Mwito et al., 2021)	Kenya	To determine the existence of the J Curve effect by examining the impact of the real exchange rate on Kenya's trade balance with 30 bilateral trade partnerships.	Bilateral exchange rate depreciation positively influenced the trade balance in the long run; however, the trade balance was negatively affected in the short run.	This study will focus on categorical commodity data.

2.4 Conceptual Framework

This section presents the dependent and independent variables investigated in this paper. The independent variables were exchange rates and exchange rate volatility, while imports, exports, and trade balance were the dependent variables.

Exchange rates and their volatility influence a country's economic performance by impacting its trade dynamics. A depreciation in the domestic currency is expected to make exports cheaper, which translates to an increase in export volume and improved trade balances. On the other hand, an appreciation in the domestic currency is expected to increase import volumes by making imports more affordable and reducing export volumes, leading to trade deficits. The study had one control variable, i.e., national income.

Although national income is not of specific interest in this study, it is an important variable that could influence the association between independent and dependent variables in this paper. GDP is used in this study as a control variable since empirical investigations, Khan and Hossain (2012), Alsamara et al. (2022) have identified GDP (domestic and foreign) as a determinant of trade balance levels among other variables such as exchange rates, exports and imports. Additionally, theoretical underpinnings, such as the gravity model of trade, highlight the pivotal role of GDP in shaping trade dynamics between nations. This model suggests that trade flows are positively correlated with the economic sizes.

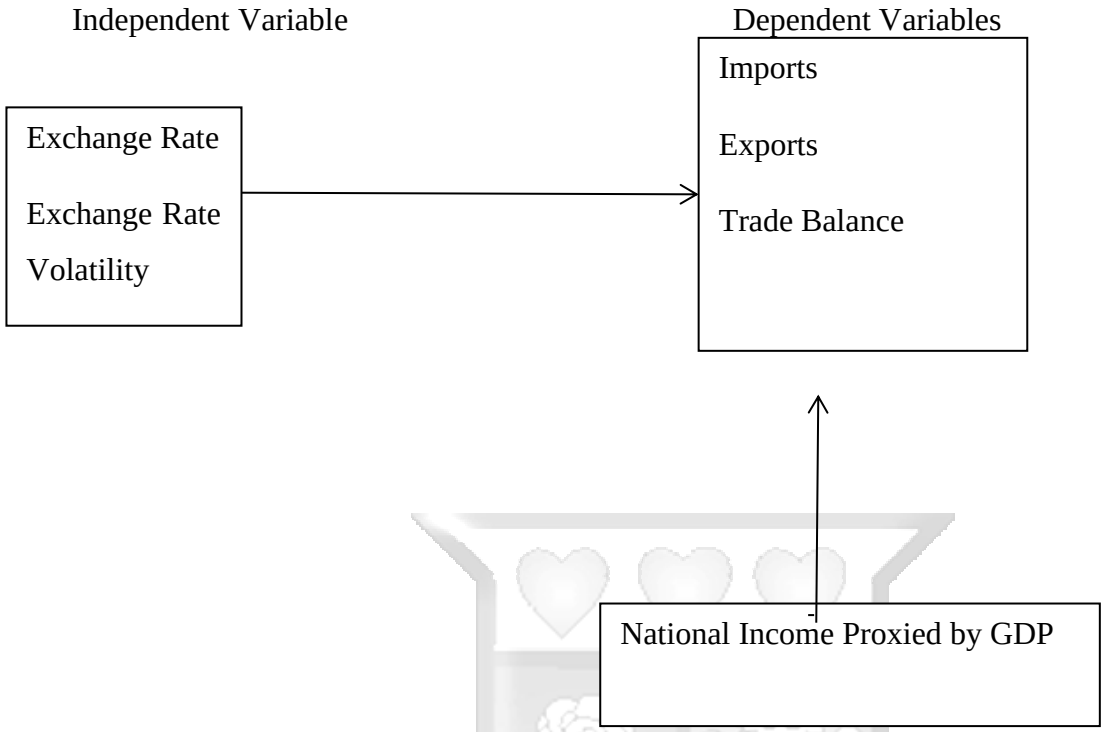


Figure 2.1: Conceptual Framework

2.5 Operationalization of Variables

Type of Variable	Variables	Indicators/Determinants	Measurement	Theories	Studies using the Variables
Independent	Nominal Exchange Rate (NER) Volatility	NER measured using GARCH	Ratio	Balance of Payments theory	(Senadza & Diaba, 2018) (Chang et al., 2020)
Dependent	Imports	Logarithmic value of imports in USD	Ratio	Balance of Payments theory	(Chang et al., 2020) (Heriqbaldi et al., 2022) (8 & Sheong, 2020)
	Exports	Logarithmic value of exports in USD	Ratio	Balance of Payments Theory	(Heriqbaldi et al., 2022) (Aftab, 2012)
	Trade balance	Log of the value of exports (USD)/ Log of the value of imports (USD)	Ratio	J- curve	(Gupta & Varshney, 2021) (Sugiharti et al., 2020) (Wang, 2018) (Musila, 2018)
Control	GDP	Log of GDP	Ratio	Balance of Payments	**(**Banik & Roy,2021) (Bahmani-oskooee & Fariditavana, 2015)(Masih,2018) (Alsamara et al.2022)

Table 2.2: Operationalization of Variables

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the research philosophy and research design employed in this study. Additionally, the data sources, method of data analysis, and ethical considerations of the study are described.

3.2 Research Philosophy

This refers to assumptions and a set of beliefs underpinning a research study. Research philosophy can be viewed from axiology (values employed in research), ontology describing the nature of reality, and epistemology referring to knowledge acquisition (Saunders et al., 2007). This study employed a positivist research philosophy. This philosophy is associated with objective realism, where a natural scientist interacts with observable social reality, and the study findings are often generalized (Cooper & Schindler,2003). The main objective was to evaluate the impact of exchange rate volatility on Kenya-China bilateral trade. This paper used data on exchange rates and trade as they exist naturally without the researcher's influence.

3.3 Research Design

Researchers use this blueprint for fulfilling research objectives and answering research questions. It could also be described as the master plan or structure for method/procedure specification for collecting and analyzing data (Adams et al., 2014)). This study used a descriptive correlational research design. This design allows the researcher to describe phenomena, situations, and the population proportion with these characteristics Cooper and Schindler(2003) and evaluate the study variables associated with the problem (Wilfred et al., 2014). This research design was justified by its suitability in implementing the quantitative approach in describing and establishing the relationship among study variables and the ability to draw accurate conclusions.

3.4 Population and Sampling

“A population refers to the collection of elements from which we intend to make some inferences” (Cooper & Schindler, 2003.) It could also be described as the universe of units from which a sample is drawn (Saunders et al., 2007). This was a case study of the Kenya-

China trade relationship from the total universe of trade partners, as China is Kenya's largest trade partner. Case studies involve empirical investigation of contemporary phenomena in real-life contexts (Saunders et al., 2007). The scope incorporated trade data and the value of exports and imports from China between 2005 and 2022, influenced by the increased activity and partnerships between the two countries through the Look East policy instigated by former President Mwai Kibaki's government in 2005. Additionally, for the same period, the import and export value of Kenya's main economic categories that is industrial supplies, transport equipment, fuels and lubricants, Food and beverages, machinery and capital equipment was analyzed. Since quarterly data was employed in this study, there were seventy-two observations for all the variables. The currency pair used in this study to model volatility was the USDKES pair for the corresponding period since it is the most predominant currency pair used in foreign transactions and was a good representative of the foreign exchange market.

3.5 Data Collection Methods

This study employed secondary data to explore the nexus of trade and the volatility of exchange rates. Data on exports and imports was obtained from Kenya National Bureau of Statistics, UN Comtrade, and the Direction of Trade Statistics (DOTS). The nominal exchange rate was retrieved from the CBK website and KNBS. In this study, nominal exchange was defined as the number of Kenyan Shillings per unit of the US Dollar. Domestic and foreign GDPs were obtained from the World Bank.

3.6 Data Analysis

The researcher employed the Augmented Dickey–Fuller test to test for non-stationarity and used different criteria to select the optimal lag orders for the different model specifications.

3.6.1 Estimation of real exchange rate volatility

This study used the GARCH (1, 1) based model of Bollerslev (1986) to estimate the nominal exchange rate volatility to ensure the best-fit model. The Garch Model was preferred since it computes volatility explicitly with time-varying conditional variance (Gupta & Varshney, 2021). "In addition, it surpasses other methods, such as the standard deviation approach (which is based on constant variance) and autoregressive conditional heteroscedasticity (ARCH) (which generally encounters negative variance in empirical applications)" (Dada, 2021)

The GARCH (1, 1) model is specified as

$$\sigma_t^2 = \alpha 0 + \beta_1 \sigma_{t-1}^2 + \alpha 1 \varepsilon_{t-1}^2 \quad (1)$$

3.6.2 Estimating the effect of exchange rate volatility on imports and exports.

Following Gupta and Varshney (2021) and Sugiharti et al.(2020), the bilateral export demand function is a proposed function of exchange rate volatility, bilateral exchange rates and income of trading partners and is expressed as

$$Ln\ EX_{i,t}^{ke} = \beta_0 + \beta_1 \ln GDP + \beta_2 \ln NER + \beta_3 \ln VOL_t + \varepsilon_t \quad (2)$$

Where $EX_{i,t}^{ke}$ represents the value of exports to China at time t

GDP Represents Kenya's National Income

NER represents the nominal exchange rate.

VOL_t Is the nominal exchange rate volatility at time t?

The ARDL model was employed to examine both the short-term and long-term effects of exchange rate volatility. The ARDL bounds tests specify the above equation as an error correction model Gupta and Varshney (2021), Sugiharti et al.(2020), Wang (2018) and is expressed as

$$\Delta \ln EX_{i,t}^{ke} = \beta_1 + \sum_{j=1}^{n1} \beta_2\ \Delta \ln EX_{t-j}^{ke} + \sum_{j=0}^{n2} \beta_3 \Delta \ln GDP_{t-j} + \sum_{j=0}^{n3} \beta_4 \Delta \ln NER_{t-j} + \sum_{j=0}^{n4} \beta_5 \Delta \ln VOL_{t-j} + \delta_1 \ln EX_{t-1}^{ke} + \delta_2\ \ln GDP_{t-1}^{*} + \delta_3\ \ln NER_{t-1} + \delta_4 \ln VOL_{t-1} + \varepsilon_t \quad (3)$$

Where β_1 to β_4 represent the coefficient estimation in the short run, while long-run effects are represented by δ_1 to δ_4

The advantage of using ARDL as opposed to other methods is that "ARDL has established regression techniques consisting of lag order of both explained and explanatory variables. Second, it is flexible with the variable of different order of integration, as the data series can be of I (0) and I (1) or a mix of mutually cointegrated orders. Third, the additional advantage

is that the ARDL regression model also generates an error correction model" (ECM) (Gupta & Varshney, 2021; Sugiharti et al., 2020)

3.6.3 Estimating the effect of the exchange rate on the trade balance.

Following (Wang, 2018), The model of Kenya's bilateral trade with China is represented as

$$\ln TB_t = \alpha + b\ln Yke_t + c\ln Yc_t + d\ln E_t + \varepsilon_t \quad (4)$$

TB represents the trade balance expressed as a function of exports/ imports. This measurement of the trade balance is unit-free (Wang, 2018)

$Y\ ke_t$ Represents Kenya's GDP

Yc_t – China GDP

E_t Nominal exchange rate (USDKES)

The above function represents the long-term relationship among variables. Equation 3 is specified in a short-run dynamic equation to investigate short-run effects by an error-correction model. As in the above method represented by equation 2, the study will use the ARDL version of the error-correction model, which takes the following form:

$$\Delta\ln TB_t = \alpha + \sum_{k=1}^{n}\beta_{0,k}\Delta\ln TB_{t-k} + \sum_{k=0}^{n}\beta_{1,k}\Delta\ln Yke_{t-k} + \sum_{k=0}^{n}\beta_{2,k}\Delta\ln Yc_{t-k} + \sum_{k=0}^{n}\beta_{3,k}\Delta\ln E_{t-k} + \delta_0\ln TB_{t-1} + \delta_1\ln Yke_{t-1} + \delta_2\ln Yc_{t-1} + \delta_3\ln E_{t-1} + \mu_t \quad (5)$$

The above ARDL model was also used to model the economic categories' trade balance, with TB representing the category trade balance with foreign income. Yw_t Represents world GDP.

3.7 Research Quality

Validity refers to the accuracy of a measurement i.e. the degree to which the researcher measures what they are supposed to measure while reliability refers to the degree to which an

instrument measures the same way every time it is used under similar conditions with similar subjects (Adams et al., 2014).To ensure research quality, the researcher carried out tests for heteroscedasticity and autocorrelation tests to ensure regression was not spurious. Secondary data was obtained from renowned organizations such as the IMF, World Bank and KNBS to ensure credibility. This ensured that the data obtained was at par with global standards. Additionally, since the ARDL model is sensitive to structural breaks and time series data, which is sensitive to worldwide events, there was a need to check for the stability of the coefficients to ensure reliability. CUSUM and CUSUMSQ tests were used to determine the stability of the model coefficients in both the long-run and short-run.

3.8 Ethical consideration

"Research ethics refers to how a researcher goes through the research process, from formulating and clarifying the research topic, research design, gaining access to data, data collection process to storage and analysis of data responsibly and morally "(Saunders et al., 2007). To address potential ethical issues, the researcher sought approval to carry out the study from the National Commission for Science, Technology, and Innovation (NACOSTI) and the University's Internal Review Board. For data confidentiality and access concerns, the research used publicly available data and legal means to acquire data and create accounts required to access certain websites.

3.9 Summary of Research Methodology

The chapter provides the framework for analyzing the volatility of exchange rates on Kenya-China trade flows and the different economic categories in Kenya. Volatility is estimated using the Garch (1,1) model. The export, import, and trade balance functions are defined, and the ARDL bounds cointegration approach is elaborated with the Error Correction Model (ECM) specification. The chapter also discusses the data sources and collection procedures. Additionally, it specifies the diagnostic tests, such as heteroscedasticity, serial correlation, etc., to ensure that the specified model is not spurious, and the results can be used to make conclusions regarding the set objectives.

CHAPTER 4

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

The main objective of this study was to determine the effect of exchange rate volatility on Kenya-China bilateral trade. Quarterly import and export data and USDKES rate was analyzed from 2005 to 2022 as represented by the seventy-two observations for each variable using E Views software. First, the results from the diagnostic tests, i.e., serial correlation and heteroscedasticity, are indicated. Then, test results from the unit root test and lag selection for the different objectives are shown. These findings are essential in the implementation of the ARDL model. Next, the results from the F-bounds tests for the four objectives are presented, pointing to either short-term and/or long-term relationship among variables. The coefficients from the short-run and long-run cointegration are then presented. Finally, the stability test results for the models are reported in the appendix section.

4.2 Descriptive Analysis

Table 4.1 describes statistics for the variables in the study, namely Exchange Rate (USDKES), Imports and Exports to China, Kenya-China Trade Balance, and GDPs for Kenya and China. Between 2005 and 2022, the USDKES exchange rate averaged 90.47. Throughout this 17-year period, the exchange rate fluctuated between its lowest value of 62.65 and its highest value of 121.96, indicating significant variability in the value of the Kenyan Shilling against the US Dollar. The average amount of imports from China was 586.76 million USD, while average exports to the country were 20.92 million USD per quarter with the lowest level being exports of 3.84 million USD. China exported goods valued over 28 times the value it imported from Kenya. Imports were nearly symmetrical, as indicated by (0.10), which lies between the 0.5 and -0.5 values, while exports were highly skewed to the right, as indicated by the 1.23 value above 1. The trade balance in this paper was expressed as a function of Exports/Imports and ranged between 0.02 and 0.08, with the mean at 0.04. The average GDP for China from 2005 to 2022 was 2.4 billion USD, over 150 times the average for Kenya, which averaged 15.2 million US Dollars.

Table 4.1: Variables descriptive statistics

	Ex Rate	Exports USD	Imports USD	Trade Balance	Kenya GDP USD	China GDP USD
Mean	90.47	20.92M	586.76M	0.04	15.2 M	2.40B
Std Dev	15	16.92M	334.97M	0.02	8.1M	1.23 B
Min	62.65	3.84M	51.26M	0.02	3.6 M	0.488B
Max	121.96	71.78	1,135.75	0.08	29.2M	5.09B
Skewness	0.04	1.23	-0.1	1.06	0.14	0.18
Kurtosis	-1.13	0.75	-1.43	0.16	-1.32	-1.01

Source: *Author (2023)*

4.3 Modelling Volatility

The study used quarterly Nominal USDKES rate for the period 2005 to 2022. This data was obtained from the Kenya National Bureau of Statistics. To model volatility using Garch (1, 1), the USDKES log returns (R_t) were represented as below:

$$R_t = \log \frac{E_t}{E_{t-1}} \quad (6)$$

Where $E_t$represented the USDKES at a given time (t) and E_{t-1} indicated the previous day's rate. An ARMA process of order (1, 0) was selected to specify the model since it had a lower AIC of -281.53 than the AIC of order (2, 0) at 281.36. Below are the optimal parameters to estimate volatility from the Garch (1, 1) model. From the p values, Omega and alpha 1 were found to be insignificant in fitting the model. From Table 4.2, mu, ar1, and beta are significant, as indicated by their P-values below 0.05. From the results in Table 4.2., all values are significant except the alpha1 and Omega, as represented by their probability values of 0.999 and 1.000, respectively.

Table 4.2: Garch Model Coefficients

	Estimate	Std. Error	t value	Pr (>|t|)
mu	0.006	0.003	2.056	0.040
ar1	0.165	0.081	2.033	0.042
omega	0.000	0.000	0.000	1.000
alpha1	0.000	0.018	0.001	0.999
beta1	0.985	0.027	36.977	0.000

GARCH Model: GARCH (1,1); Mean Model: ARFIMA (1,0,0)

4.4 Diagnostic Tests

To confirm the internal validity of the estimated ARDL and the ECM models, the researcher had to identify the model's validity and whether the results could be used to make inferences. Tests for serial correlation and heteroscedasticity were carried out to confirm validity.

4.4.1 Serial Correlation Test

The Breusch – Godfrey LM test, based on a null hypothesis of no autocorrelation, was used to determine whether the error terms (or variables) were uncorrelated. The Breusch-Godfrey test is conducted for two lags. In all cases, the chi-square statistic is significant at a 5% level of significance as indicated by the probability values, i.e., 0.604, 0.082, and 0.813, which are higher than 0.05; hence, the null hypothesis is not rejected. Further, the study carried out serial correlation tests on economic categories, and the results for all the variables were above 0.05; thus, the null hypothesis was not rejected. These results indicate the absence of serial correlation among residuals. The study, therefore, concludes the absence of serial correlation among the variables in the models. This means the model had no identifiable connection between error term values.

Table 4.3 Breusch-Godfrey Serial Correlation

Ho: No serial correlation at up to 2 lags

Model	**Probability**
Import Function	0.6041
Export Function	0.0815
Trade Balance Function	0.8134
Economic Category	**Serial Correlation**
Consumer Goods	0.435
Food and Beverages	0.875
Fuels and Lubricants	0.592
Industrial Supplies	0.321
Machinery	0.104
Transport Equipment	0.627

4.4.2 Heteroscedasticity Test

The Breusch-Pagan test was employed to check for heteroscedasticity.

H_o: Residuals are homoscedastic.

H_a: Residuals are not homoscedastic (heteroscedastic)

From the Breusch Pagan Godfrey test (Table 4.4) for Heteroscedasticity, the probability values for the import function, export function, and trade balance function are 0.877, 0.560, and 0.330 respectively, and higher than 0.05; hence, the null hypothesis is not rejected. This concludes that the residuals are homoscedastic at a 95% confidence level. Further, the heteroscedasticity test for economic categories showed P Values higher than 0.05, and thus the presence of homoscedasticity. These results imply that the variance of the errors is constant across observations. In other words, the variance of the errors is not a function of explanatory variables in the models.

Table 4.4: Breusch-Pagan-Godfrey Test

Model	**Probability**
Import Function	0.877
Export Function	0.560
Trade Balance Function	0.330
Economic Category	**Heteroscedasticity**
Consumer Goods	0.248
Food and Beverages	0.856
Fuels and Lubricants	0.956
Industrial Supplies	0.866
Machinery	0.209
Transport Equipment	0.430

4.5 Times Series Analysis

4.5.1 Unit Root Test

Unit root tests consider both the null hypothesis that there is a unit root and the alternative hypothesis that the time series is stationary. In a unit root test, the trend in the data is a unit root. For ADF tests, the null hypothesis of non-stationarity will be rejected if the test statistic is greater than the critical value from at the required level of significance.

Table 4.5, using natural logarithm values of the variables, only three variables: Exchange rate volatility, Imports and GDP of China were stationary at 5 % significance level thus we rejected the null hypothesis that the series was non-stationary. To make the other variables stationary, they were differenced. At first difference, all the variables had a P value below 0.05, representing stationarity, concluding the series was integrated of order 1. Outside the need to

be sure none of the variables are 1(2) or higher, the ARDL cointegration does not require testing of unit root; however, for the model to be effective, ARDL allows a mix of 1(1), 1(0) variables.

Table 4.5 also indicates that at level, Food and Beverages was stationary as indicated by the p-value of 0.024, which is less than 0.05. At first difference, the remaining variables were all stationary, and none was integrated of order 2, thus confirming that the ARDL model was appropriate for analysis.

Table 4.5: Variables Unit Root Test

Variable	Level (P Value)	First Difference (P Value)	Comment
Ex Rate	0.956	0.000	Stationary (at 1st difference)
Ex Rate Volatility	0.001		Stationary (level)
Exports	0.827	0.001	Stationary (1st difference)
Imports	0.015		Stationary (level)
Trade Balance	0.136	0.0001	Stationary (1st difference)
Kenya GDP	0.363	0.000	Stationary (1st difference)
China GDP	0.001		Stationary (level)
Economic Category	**Level (P Value)**	**Probability at 1st Difference**	**Comment**
Consumer Goods	0.091	0.009	Stationary (1st difference)
Food and Beverages	0.024		Stationary (level)
Fuels and Lubricants	0.754	0.002	Stationary (1st difference)
Industrial Supplies	0.983	0.003	Stationary (1st difference)
Machinery	0.789	0.0002	Stationary (1st difference)
Transport Equipment	0.512	0.0001	Stationary (1st difference)

4.5.2 Lag Selection

As with tests for stationarity, lag selection is crucial as it determines the results from the fitted model. In this study, the optimal lag of the Vector Autoregressive was determined using four different criteria: Schwarz Information Criterion, Final Prediction Error (FPE), Schwarz, Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion. The Optimal lag lengths are determined using minimum values of AIC, SC, FPE, or HQ estimates to estimate the correct ARDL F-statistic.

To examine the impact of exchange rate volatility on imports from China, all four information criteria suggested a lag order of 1, as indicated by the asterisk.

Table 4.6: Imports Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1116.895	NA	0.000	-33.724	-33.591	-33.672
1	1579.404	854.940	0.000	-47.255*	-46.591*	-46.992*
2	1591.386	20.696	0.000	-47.133	-45.939	-46.661
3	1605.653	22.914	0.000	-47.080	-45.355	-46.399
4	1619.671	20.814	0.000	-47.020	-44.764	-46.129
5	1641.977	30.417*	0.000	-47.211	-44.425	-46.110
6	1655.086	16.288	0.000	-47.124	-43.806	-45.813

Similarly, for the second objective, checking for the effects of volatility on exports to China, the results from the four information criteria suggested a lag order of 1, as seen below.

Table 4.7: Exports Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1116.895	NA	0.000	-33.724	-33.591	-33.672
1	1579.404	854.940	0.000	-47.255*	-46.591*	-46.992*
2	1591.386	20.696	0.000	-47.133	-45.939	-46.661
3	1605.653	22.914	0.000	-47.080	-45.355	-46.399
4	1619.671	20.814	0.000	-47.020	-44.764	-46.129
5	1641.977	30.417*	0.000	-47.211	-44.425	-46.110
6	1655.086	16.288	0.000	-47.124	-43.806	-45.813

For the third objective, investigating the effects of exchange rates on the Kenya-China trade balance, the lag length selected by three criteria, AIC, FPE, and HQ, was 5.

Table 4.8: China-Kenya Trade Balance Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	57.956	NA	0.000	-1.635	-1.502	-1.583
1	277.443	405.719	0.000	-7.801	-7.138*	-7.539
2	302.817	43.827	0.000	-8.085	-6.891	-7.613
3	314.467	18.711	0.000	-7.954	-6.228	-7.272
4	345.615	46.250	0.000	-8.413	-6.157	-7.521
5	395.275	67.718*	0.000	-9.433*	-6.646	-8.331*
6	407.527	15.223	0.000	-9.319	-6.001	-8.008

For the fourth objective, evaluating the effect of exchange rate volatility on categorical commodity trade balance in Kenya, the selected lag orders for the different economic categories are shown in Table 4.9.

Table 4.9: Economic Variables Lag Order Selection

Economic Category	Lag Order
Consumer Goods	2
Food and Beverages	1
Fuels and Lubricants	2
Industrial Supplies	2
Machinery	2
Transport Equipment	2

4.6 Data Analysis

4.6.1 Effects of Exchange Rate Volatility on Imports

To fulfil objective 1, the ARDL model incorporated the following variables: exchange rate, imports, exchange rate volatility, and Kenya's Gross Domestic Product.

Since none of the variables had a lag order of 1(2) or above and the optimal lag one was selected, the ARDL bounds cointegration approach was appropriate to determine the long-run relationship among variables.

4.6.1.1 Bounds Test for Cointegration

The F-bounds test establishes the presence or absence of long-run relationships among the variables and observations in the import model. If the computed F-statistic is greater than the upper bound, the null hypothesis of no relationship is rejected. This indicates the presence of a long-run relationship between the variables. In the case the computed F-statistic falls below the lower bound, the null hypothesis cannot be rejected, and the conclusion is that the presence of cointegration is insignificant. Finally, the test is considered inconclusive if the F-statistic falls in between the lower and upper bounds.

From Table 4.10, the computed F statistic, 9.738, was greater than the upper bound value of 4.35 at 5 % significance; thus, the null hypothesis of no level of relationship was rejected at 5 % level and, therefore, the existence of cointegration among variables. If the value was below the lower bound of 3.23 at 5 % confidence, we would have concluded that no long-run

relationship existed among variables and proceeded to check for the short-term association among study variables.

Table 4.10: Imports F Bounds test

Test Statistic	Value	Significance level	Lower Bound	Upper Bound
F Statistic	**9.738**	10%	2.720	3.770
		5%	3.230	4.350
		2.50%	3.690	4.890
		1%	4.290	5.610

4.6.1.2 Long Run Relationship

The existence of a long-term relationship between imports, exchange rates, and Kenya's GDP is established from the F Bounds test. The long-run coefficients of estimated variables are shown in Table 4.11. In the long run, all the variables, i.e., Exchange Rates, GDP and Exchange Rate Volatility, are statistically significant at a 5% significance level in influencing the level of imports as indicated by their P values of 0.006, 0.00 and 0.004, respectively that are below the probability value of 0.05. The coefficient of exchange rates implies that a 1 unit increase in exchange rates results in a 0.776 unit decrease in imports from China. Similarly, a 1 unit increase in GDP results in a 0.52 unit decrease in imports.

The r-squared and adjusted r-squared are 96.83% and 96.69%, respectively, indicating the model's explanatory power, as the independent variables in the study can explain 97% of the variation in imports.

Table 4.11: Imports Long Run Coefficients

Variable	Coefficient	Standard Error	t-statistic	Probability
Constant	16.651	1.785	9.328	0.000
Exchange Rate	-0.776	0.276	2.816	0.006
Exchange Rate Volatility	-4889290	399738.6	-12.231	0.000
Kenya GDP	-0.520	0.174	-2.992	0.004

Dependent Variable: Imports

4.6.1.3 Short-Run Relationship

From the short-run results, only Kenya's GDP was statistically significant in influencing the relationship between imports and exchange rate volatility. This is represented by the probability value of 0.040, which is lower than the probability value of 0.05. The coefficient ECT (-1) is negative and statistically significant at a 5% level of significance, as represented by its probability value of 0.00. The significance of the lagged error correction term signifies causality from variables in the model. The coefficient of the error term, -0.69, shows that around 69% of disequilibrium in imports in the short run is corrected quarterly. It takes less than a year to correct short-term disequilibrium and restore long-run equilibrium in imports from China. The probability of the error term is significant, thus concluding the existence of long-run Granger causality running from explanatory variables to dependent variables. A short-run relationship exists between Kenya's imports from China and Kenya's GDP such that a 1-unit change in GDP culminates in a decrease of 0.42 units in imports in the short term. Exchange rate volatility and Exchange rates are not important in influencing the level of imports from China in the short run; however, from Table 4.12, both have a negative impact on imports as indicated by their coefficients.

Table 4.12: Imports Short Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	-0.015	0.038	-0.402	0.689
D (Imports (-1))	0.036	0.128	0.279	0.782
D (EX Rate)	-0.337	0.616	-0.547	0.586
D (Ex Rate (-1))	0.445	0.626	0.710	0.480
D (Ex Rate Volatility)	-34986828	39536672	-0.885	0.380
D (Ex Rate Volatility (-1))	28799700	38752671	0.743	0.460
D (Kenya GDP)	-0.429	0.204	-2.097	0.040
D (Kenya GDP (-1))	0.084	0.197	0.427	0.671
ECT (-1)	-0.694	0.148	-4.678	0.000

4.6.2 Effects of Exchange Rate Volatility on Exports

To fulfil objective 2, quarterly data on exports, exchange rates, exchange rate volatility, and Kenya GDP was analyzed.

4.6.2.1 F Bounds Tests

The F-bounds test was conducted to investigate whether cointegration existed among the study variables. Table 4.13 indicates that the computed F statistic of 1.298 is below the critical lower bound of 3.23 at a 5 % level of significance. Hence, the null hypothesis of no level of relationship is accepted, and therefore, no long-term relationship exists among the study variables. Since there is no cointegration, the study examines the short-run dynamics among the study variables.

Table 4.13: Exports F Bounds Test

Test Statistic	Value	Significance level	Lower Bound	Upper Bound
F Statistic	1.298	10%	2.720	3.770
		5%	3.230	4.350
		2.50%	3.690	4.890
		1%	4.290	5.610

4.6.2.2 Short-Run Relationship

From the short-run model in Table 4.14, there seem to be no short-run relationships among the study variables, as indicated by their P Values at a 5 % level of significance. That is, the P values of 0.636 for Exchange Rates, 0.691 for Exchange Rate Volatility, and 0.710 for Kenya's GDP are above the Probability value of 0.05. The lagged value of exports affects the current level of exports, as indicated by the P value of 0.009, which is less than 0.05. Exchange Rates, Kenya's GDP, and Exchange Rate Volatility negatively impact exports in the short term, as indicated by their coefficients of -0.458, -24734770, and -0.119, respectively; however, they do not significantly influence this model.

Table 4.14: Exports Short Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	0.072	0.061	1.184	0.241
D (Export (-1))	-0.321	0.120	-2.666	0.010
D (Ex Rate)	-0.459	0.963	-0.476	0.636
D (Ex Rate (-1))	-0.341	0.982	-0.347	0.730
D (Ex Rate Volatility)	-24734770	61855780	-0.400	0.691
D (Ex Rate Volatility (-1))	24878248	60612906	0.410	0.683
D (Kenya GDP)	-0.120	0.322	-0.373	0.710
D (Kenya GDP (-1))	0.072	0.301	0.239	0.812

4.6.3 Effects of exchange rates on Kenya-China Trade Balance

4.6.3.1 F Bounds Test

As with the previous two objectives, the next step in the ARDL Cointegration approach, after confirming the order of integration and optimal lag selection, is to test for cointegration. From Table 4.15, the F statistic is 1.586, below the 5% critical bound of 3.23. Thus, there is no long-run relationship among variables. The researcher therefore proceeded to determine the short-run dynamics among the variables.

Table 4.15: Kenya China Trade Balance F Bounds Test

Test Statistic	Value	Significance level	Lower Bound	Upper Bound
F Statistic	1.586	10%	2.72	3.77
		5%	3.23	4.35
		2.50%	3.69	4.89
		1%	4.29	5.61

4.6.3.2 Short-Run Relationship

At a 5 % significance level, the lagged order 4 of Kenya's GDP and the GDP of China are significant in influencing the Kenya-China trade balance levels. Results also indicate that the trade balance's lagged value affects the current trade balance level, as indicated by the P value of 0.008, which is less than 0.05. All the other variables are insignificant as they have probability values above the 0.05 level. At lag 4, Kenya's GDP has a negative impact on the trade balance, China's GDP has a negative effect on the trade balance, and lag one value of trade balance has a negative effect on the current level of trade balance.

Table 4.16: Kenya-China Trade Balance Short-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.062	0.073	0.843	0.404
D (Trade balance (-1))	-0.422	0.152	-2.769	0.008
D (Trade balance (-2))	-0.213	0.152	-1.404	0.168
D (Trade balance (-3))	-0.137	0.153	-0.901	0.373
D (Trade balance (-4))	-0.184	0.142	-1.296	0.202
D (Trade balance (-5))	-0.112	0.148	-0.758	0.453
D (Exrate Volatility)	0.114	1.118	0.102	0.919
D (Exrate Volatility (-1))	-1.717	1.193	-1.438	0.158
D (Exrate Volatility (-2))	1.318	1.277	1.032	0.308
D (Exrate Volatility (-3))	0.622	1.334	0.466	0.644
D (Ex Rate Volatility (-4))	-1.228	1.449	-0.847	0.402
D (Ex Rate Volatility (-5))	2.180	1.398	1.559	0.126
D (Kenya GDP)	-0.162	0.509	-0.318	0.752
D (Kenya GDP (-1))	-0.957	0.498	-1.921	0.062
D (Kenya GDP (-2))	0.266	0.463	0.576	0.568
D (Kenya GDP (-3))	-0.505	0.462	-1.092	0.281
D (Kenya GDP (-4))	-0.955	0.411	-2.322	0.025
D (Kenya GDP (-5))	-0.227	0.384	-0.591	0.557
D (China GDP (-1))	-1.361	0.933	-1.458	0.152
D (China GDP)	-2.064	0.924	-2.233	0.031
D (China GDP (-2))	0.951	0.559	1.700	0.097
D (China GDP (-3))	0.274	0.562	0.488	0.628
D (China GDP (-4))	1.641	0.897	1.830	0.074
D (China GDP (-5))	0.600	1.004	0.597	0.554

4.6.4 Effects of exchange rates on the categorical commodities trade balance

To fulfill this objective, the trade balances of 6 economic categories, namely consumer goods, food and beverages, fuels and lubricants, industrial supplies, machinery, and transport equipment, were subjected to the ARDL model to examine whether short-run and long-run cointegration existed among the variables.

4.6.4.1 F Bounds Test

After determining that the variables were stationary and selecting the optimal lags, the data was subjected to the F Bounds test to determine the presence of cointegration among variables. The values for consumer goods, food and beverages, fuels and lubricants, and Industrial supplies

were above the upper bound of 4.35, thus concluding the presence of a long-run relationship among variables.

A long-run relationship exists among variables in the following categories: consumer goods, food and beverages, fuel, and lubricants, and industrial supplies economic categories as represented by their F statistic values of 15.99, 7.01, 6.31, and 16.82 respectively, which are above the upper bound value of 5.61 at 1 % level of significance. The F statistics for machinery and transport equipment at 3.63 and 3.85, respectively, are below the lower bound value of 4.29 at a 99% confidence level; thus, we accept the null hypothesis of no cointegration and conclude no long-run relationship exists among the variables of these models.

Table 4.17: Economic Categories F Bounds Test

Economic Category	F Statistic	Significance Level	Lower Bound	Upper Bound
Consumer Goods	15.998	10%	2.720	3.770
Food and Beverages	7.013	5%	3.230	4.450
Fuels and Lubricants	6.317	2.50%	3.690	4.890
Industrial Supplies	16.826	1%	4.290	5.610
Machinery	3.631			
Transport Equipment	3.851			

4.6.4.3 Long Run Relationship

Consumer goods, food and beverage, fuels, and lubricants, industrial supplies exhibited long run cointegration with the independent variables. Table 4.18 shows that exchange rates significantly influence the consumer goods trade balance, as indicated by the probability value of 0.001, which is less than 0.05 at a 95% confidence level. A 1-unit increase in the exchange rate results in a 1.06 decrease in the level of consumer goods trade balance, as indicated by its coefficient. The GDP of Kenya and that of the world are not significant in influencing the level of consumer goods trade balance in Kenya.

Table 4.18: Long Run Coefficients, Consumer Goods Trade Balance

Variable	Coefficient	Std Error	t-statistic	Probability
Constant	12.678	8.181	1.550	0.145
Kenya GDP	0.041	0.176	0.231	0.821
World GDP	-0.275	0.374	-0.734	0.476
Exchange Rate	-1.064	0.241	-4.409	0.001

Table 4.19 shows that none of the variables significantly influences the trade balance of food and beverages in Kenya, as indicated by the probability values above 0.05 at 95% confidence level.

Table 4.19 Long Run Coefficients, Food and Beverages Trade Balance

Variable	Coefficient	Std Error	t-statistic	Probability
Constant	20.945	21.879	0.957	0.356
Kenya GDP	-0.462	0.470	-0.983	0.344
World GDP	0.295	1.001	-0.295	0.773
Exchange Rate	0.113	0.645	0.175	0.864

Table 4.20 reveals that all three independent variables are important in influencing the industrial supplies trade balance as indicated by their probability values that are less than the 5 % significance level. A one-unit increase in the exchange rate results in an 83% decrease in the industrial supplies trade balance. Similarly, a 1 unit increase in Kenya's GDP results in a 67% decrease in the trade balance of industrial supplies in Kenya, while a 1 unit increase in the GDP of the World results in a 1.22 change in industrial supplies trade balance.

Table 4.20: Long Run Coefficients, Industrial Supplies Trade Balance

Variable	Coefficient	Std Error	t-statistic	Probability
Constant	-19.945	11.185	-1.783	0.098
Ex Rate Volatility	-0.839	0.330	-2.544	0.025
Kenya GDP	-0.674	0.240	-2.808	0.015
World GDP	1.228	0.512	2.400	0.032

From Table 4.21, it is evident that only the World GDP significantly influences the level of the Fuel and lubricants trade balance. A 1 unit increase in World GDP results in a 7.084 unit decrease in trade balance. Other independent variables, i.e., Kenya's GDP and exchange rate,

positively impact the trade balance of fuels and lubricants; however, they are not crucial as represented by their probabilities greater than 0.05.

Table 4.21: Long Run Coefficients, Fuels and Lubricants Trade Balance

Variable	Coefficient	Std Error	t-statistic	Probability
C	176.116	54.716	3.219	0.007
Ex Rate Volatility	1.804	1.614	1.118	0.284
Kenya GDP	1.525	1.175	1.298	0.217
World GDP	-7.084	2.504	-2.829	0.014

4.6.4.4 Short-Run Estimation of Economic Categories

From the short-run estimation, all dependent variables, i.e., consumer goods, fuels and lubricants, food and beverages, machinery equipment, transport equipment, and industrial supplies, exhibited a short-run relationship with the independent variables- Kenya GDP, World GDP, and Ex Rate. However, none of the relationships was significant, as indicated by their probability values above 0.05 at the 95% confidence level.

CHAPTER 5

DISCUSSION CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter discusses the results from the study in alignment with empirical literature, conclusions and recommendations for future research are given by the researcher.

5.2 Summary of Findings

5.2.1 Effects of exchange rate volatility on imports

From the specified import model, all variables significantly influence the level of imports from China. Similarly, a long-run relationship exists between the independent variables, i.e., exchange rates, exchange rate volatility, Kenya's GDP and the level of imports. The volatility of exchange rates has a negative and significant relationship with imports from China in the long run. Similarly, depreciation of USDKES results in a decrease in volume of imports from China. This finding aligns with the study by Guan & Sheong (2020), who established that exchange rates negatively affected Africa's imports from China. Similarly, Gupta & Varshney (2021) arrived at a similar conclusion while examining the impact of the volatility of exchange rates on import volume in US-India Trade. The decline in imports could be as a result of depreciation causing foreign goods to be more expensive for Kenyan consumers, thus resulting in a decrease in consumption and import levels.

In the short term, the volatility of exchange rates negatively affects imports from China; however, the impact is insignificant. This contradicts the study by Oluyemi & Didi (2017), who concluded that exchange rates had a positive but insignificant impact on imports in Nigeria. Similarly, both the depreciation of the shilling and the increase in Kenya's GDP have a negative impact on imports in the short run. The error correction term shows more than half of the uncertainty in imports from China is offset by short-run correction for each quarterly import. Risk-averse traders avoiding taking up trades due to exchange rate uncertainty could explain the negative effect of volatility on imports.

5.2.2 Effects of exchange rate volatility on Exports

The study showed no long-term relationship between exports to China and exchange rate volatility. This is similar to the study by Oluyemi & Didi Isaac (2017), who found a negative

and insignificant effect of exchange rates on export volumes from Nigeria. In the same stride, Heriqbaldi et al.(2022) determined that real exchange rate volatility negatively affected exports to Singapore and the USA. Sharma (2020) concludes that uncertainties in exchange rates have a significant and negative effect on exports, while our study does not find the impact significant. The insignificant impact of shilling depreciation on exports to China could be explained by the low volume of goods Kenya exports to China, where Kenya accounts for a small percentage of import value at 0.006 per cent. Additionally, as a developing country, Kenya is less industrialized and relies on imports as opposed to the production of manufactured goods for export. The government doesn't have much influence in setting exported product prices since it is a price taker. The relationship between exports and the other independent variables, i.e., Kenya's GDP and exchange rates, is negative but insignificant.

5.3.3 Effects of exchange rate on Kenya-China Bilateral Trade Balance

In this paper, the Kenya-China bilateral trade balance was expressed as a unit-free function of exports/imports. The analysis showed no long-term relationship between exchange rate and the Kenya-China bilateral trade balance. The effect of exchange on the trade balance is insignificant since the exchange rate coefficients in the bilateral trade balance models are insignificant. This probably is because Kenya's imports from China are much more than Kenya's exports to China; hence, depreciation is insignificant However, a positive relationship between exchange rate and trade balance was established in the short term but was insignificant.

This stance is supported by the findings of Wang (2018), who, when exploring the impact of exchange rates on USA–China trade under the Chinese-managed floating exchange rate system, found no significant impact of USDCNY on the US bilateral trade deficit. Mwito et al.(2021) found contradictory results that established the presence of a significant negative impact in the short run and a positive effect on the trade balance in the long run, while Ogbonna & Ichoku(2022) found no meaningful relationship in their study examining Nigeria's bilateral trade balance with USA, China, and Belgium. From the model, an increase in the GDPs of China and Kenya results in a decline in the trade balance; however, the impact is insignificant.

5.3.4 Effects of Exchange Rate on Kenya's Trade Balance

To achieve this objective, the trade balances of major economic categories, i.e., industrial supplies, food and beverages, fuels and lubricants, consumer goods and services, machinery equipment, and transport equipment, were analyzed through the ARDL bounds cointegration approach. The model results pointed to a long-run relationship between exchange rates and four of the dependent variables: consumer goods, food and beverages, industrial supplies, and fuels and lubricants.

The impact of exchange rates on the trade balances of food and beverages and fuels and lubricants was found to be positive and insignificant in the long run. This stance is supported by Lotfalipour & Bazargan (2014), who investigated exchange rates and trade balance in Iran and concluded no significant relationship existed. This finding could be attributed to the fact that food and beverages as well as fuels and lubricants, are essential goods and they exhibit inelastic demand hence changes in prices have a relatively small effect on quantity demanded. Additionally, Kenya is heavily reliant on fuel imports whose market prices are influenced by global factors such as geopolitical tensions and oil supply dynamics. Therefore, the exchange rate may not have a direct impact on volumes as prices and determined by market forces.

A long-term negative and significant effect exists for consumer goods and industrial supplies. This contradicts the study by Lotfalipour & Bazargan (2014) but is supported by Kennedy (2013), who concludes that exchange rates positively and significantly affect Kenya's trade balance. The impact of exchange rates on consumer goods is attributable to consumer goods being price sensitive whereby changes in prices affect consumer demand and subsequently consumer volume.

The study showed no long-term or short-term relationship between exchange rates and two variables, i.e., Machinery Equipment and Transport Equipment. This propagates how different sectors and commodities are affected by exchange rates, as suggested by (Hunegnaw & Kim, 2017; Masih, 2018). Similarly, no short-run relationship existed with exchange rates for the other four variables, consumer goods, fuels and lubricants, food and beverages, and industrial supplies.

5.4 Conclusion

Since the flexible exchange rate regime was introduced, a principal concern has been whether the increase in volatility has impacted trade. The considerable array of theoretical and empirical literature on the effects of exchange rate volatility on trade remains somewhat ambiguous. This paper assessed the relationship between Kenya and its biggest trade partner, China. Quarterly trade and exchange rate data for the period ranging from 2005 to 2022 is used resulting in 72 observations. First, the researcher used the Garch model to estimate volatility and then employed the ARDL model to determine short-run and long-run effects on exports, imports, and trade balance from EViews software. Finally, CUSUM and CUSUM squares tests were employed to check for the stability of the model. The results from the unit root tests confirmed that the variables were integrated of order one and thus proceeded to employ the Error Correction Model.

The study's observation of a negative but insignificant short-term impact of exchange rate volatility on imports from China is consistent with the initial phase of the J curve effect. According to the J curve theory, in the short term following a currency depreciation, the trade balance may deteriorate or show only a small improvement as the volume of imports adjusts slowly to the change in relative prices due to existing contracts, price rigidities, or other factors In this case, the insignificant impact suggests that the adjustment process for imports may take time, which aligns with the J curve concept. Additionally, the negative impact of depreciation on imports suggests validation of the J-curve theory where in the long run, export volumes increase and import volumes decrease with the overall effect being improvement of the trade balance level.

However, a negative but insignificant relationship between Kenya's exports to China and exchange rate volatility is established contradicting the theoretical argument, as explained by the J-curve effect, that exchange rate volatility positively impacts exports in the long run .The study's identification of positive long-term effects of exchange rate on the trade balances of certain goods, such as food and beverages, fuels and lubricants suggests a manifestation of the J curve phenomenon where in the long term, the trade balance improves following a currency depreciation as the volume of exports increases and the volume of imports decreases in response to changes in relative prices. This adjustment may occur through changes in price competitiveness, productivity, and shifts in consumer preferences This is however not true for

the Kenya-China bilateral trade balance as well as for consumer goods and industrial supplies. The significant negative impact on the trade balances of certain goods observed in the study may indicate a gradual adjustment process consistent with the J curve dynamics.

The Balance of Payments (BOP) theory is validated by results from the import model whereby depreciation causes a decline in level of imports and an increase in export levels to China. It is however not true for the export model and the Kenya-China bilateral trade balance where there was no significant impact of exchange rates on these models. Similarly, the results of this study contradict this theory as expressed by the negative impact of depreciation on the trade balances for consumer goods and industrial supplies.

5.5 Recommendations

This study suggests using exchange rate policies to reduce imports from China in the long run. This could reduce the trade deficit and Kenya's reliability on Chinese imports. Reduction of import levels will promote local consumption in the long run.

Additionally, based on the findings, exchange rate policies can promote economic growth and Kenya's GDP level. This will defend the Country’s domestic competitiveness and improve the manufacture of substitute products to support a decline in imports from China.

From the findings, exchange rate policies are ineffective in managing Kenya -China export levels or influencing the bilateral trade balance level. More effort is required to reduce the bilateral trade deficit than the adjustment of interest rates. In this regard, to promote export levels, the government should review and reinforce the trade agreements with China to ensure that the export agreements have a real positive value on trade.

Strategies should be implemented for long-term change to promote export volumes, such as value addition and export of technology-based and diversified products. Also, as a developing country, Kenya can develop and specialize in the export of products with a comparative advantage.

Policymakers should consider volatility when applying economic policy to maintain a healthy overall trade balance. This is because the different economic categories are impacted differently by volatility; thus, exchange rate policies would have varying effects.

5.6 Limitations

The study was limited by the unavailability of observations beyond the chosen period and in a more disaggregated form, especially for the broad economic categories. This restricted the number of observations that were incorporated into the research data. The research was also limited to the Kenya-China bilateral relationship; hence, more research can be conducted reviewing other primary bilateral relationships.

5.7 Areas for further research

Future research should look at more industry-level and commodity-wise disaggregated data in this area. Additionally, more bilateral relationships can be included to determine the impact of exchange rate volatility on vital bilateral relationships and studies conducted for different time periods where there were changes in regimes/ policies or economic conditions. Finally, future studies can consider exploring the asymmetric effects of exchange rate volatility on trade using the Non-Linear Autoregressive Linear Model (NARDL).

REFERENCES

Achouak Barguellil, O. B.-S. &Mourad Z. (2018). Exchange Rate Volatility and Economic Growth. *Journal of Economic Intergration*, *33*(2), 1302–1336.

Adams, J., Khan, H. T. A., & Raeside, R. (2014). Research methods for business and social science students. *SAGE Publications India Pvt, Ltd.*.

Adams, J., & Metwally, A. (2021). Testing for the Marshall–Lerner condition in Egypt: an empirical analysis. *African Journal of Economic and Management Studies*, *12*(1), 151–170. https://doi.org/10.1108/AJEMS-01-2020-0001

Adewuyi, A. O., & Akpokodje, G. (2013). Exchange Rate Volatility and Economic Activities of Africa ' s Sub-Groups Exchange Rate Volatility and Economic Activities of Africa ' s Sub-Groups. *The International Trade Journal*, *August*, 37–41. https://doi.org/10.1080/08853908.2013.813352

Aftab, M. (2012). Impact of exchange rate volatility on sectoral exports of Pakistan : an ARDL investigation. *Journal of Chinese Economic and Foreign Trade Studies*, *5*(3), 215–231. https://doi.org/10.1108/17544401211263973

Aftab, M. (2017). *Exchange-rate volatility and Malaysian-Thai bilateral industry trade flows*. *44*(1), 99–114. https://doi.org/10.1108/JES-05-2015-0091

Aftab, M., Shah, K. B., & Akhter, S. N. (2017). Exchange rate volatility and Malysian -Thai bilateral industry trade flows. *Journal of Economic Studies*, *30*(3–4), 195.

Aftab, M., Syed, K. B., & Katper, N. (2017). Exchange-rate volatility and Malaysian-Thai bilateral industry trade flows Journal. *Journal of Economic Studies*, *January*. https://doi.org/10.1108/JES-05-2015-0091

Alsamara, M., Mimouni, K., Barkat, K., & Kayaly, D. (2022). *Can exchange rate policies and trade partners ' income enhance the trade balance in Algeria ? Evidence from the nonlinear ARDL model*. https://doi.org/10.1108/IJOEM-02-2022-0341

Bahmani-oskooee, M., & Fariditavana, H. (2015). Nonlinear ARDL approach , asymmetric effects and the J-curve. *Journal of Economic Studies*, *42*(3), 519–530. https://doi.org/10.1108/JES-03-2015-0042

Banik, B., & Roy, C. K. (2021). Effect of exchange rate uncertainty on bilateral trade performance in SAARC countries: a gravity model analysis. *International Trade, Politics and Development*, *5*(1), 32–50. https://doi.org/10.1108/itpd-08-2020-0076

Chang, B. H., Rajput, S. K. O., Bhutto, N. A., & Abro, Z. (2020). Asymmetric effect of extreme changes in the exchange rate volatility on the US imports: Evidence from multiple threshold nonlinear autoregressive distributed lag model. *Studies in Economics and Finance*, *37*(2), 293–309. https://doi.org/10.1108/SEF-03-2019-0122

Chiu, Y. (2009). Economic interdependence and bilateral trade imbalance across the Taiwan Strait. *Journal of Economic Studies*, *36*(4), 411–432. https://doi.org/10.1108/01443580910983816

Cooper, D., & Schindler, P. (n.d.). *Business Research Methods*. https://doi.org/10.1109/arms.1991.154456

Dada, J. T. (2021). Asymmetric effect of exchange rate volatility on trade in sub-Saharan African countries. *Journal of Economic and Administrative Sciences*, *37*(2), 149–162. https://doi.org/10.1108/jeas-09-2019-0101

Eduardo , Levi-YeyatiL: Sturzenegger, F. (2016). Classifying Exchange Rate Regimes, 15 years later. *Harvard Library*, *June*.

Emenike, K. O. (2018). Exchange rate volatility in West African countries: is there a shred of Spillover? *International Journal of Emerging Markets*, *13*(6), 1457–1474. https://doi.org/10.1108/IJoEM-08-2017-0312

Giannellis, N., & Papadopoulos, A. P. (2011). What causes exchange rate volatility? Evidence from selected EMU members and candidates for EMU membership countries. *Journal of International Money and Finance*, *30*(1), 39–61. https://doi.org/10.1016/j.jimonfin.2010.07.002

Githaiga, N. M. (2021). Kenya-China Trade in Manufactured Goods : A Competitive or Complementary Relationship ? *Journal of Social Sciences*, 96–117. https://doi.org/10.4236/jss.2021.93007

Guan, Z., & Ip Ping Sheong, J. K. F. (2020). Determinants of bilateral trade between China

and Africa: a gravity model approach. *Journal of Economic Studies*, *47*(5), 1015–1038. https://doi.org/10.1108/JES-12-2018-0461

Gupta, M., & Varshney, S. (2021). Does exchange rate volatility influence import commodities of India-US? Evidence from ARDL approach. *South Asian Journal of Business Studies*. https://doi.org/10.1108/SAJBS-02-2021-0056

Heriqbaldi, U., Esquivias, M. A., Handoyo, R. D., Rifami, A. C., & Rohmawati, H. (2022). Exchange rate volatility and trade flows in Indonesia and ten main trade partners: asymmetric effects. *Studies in Economics and Finance*. https://doi.org/10.1108/SEF-10-2021-0451

Hunegnaw, F. B., & Kim, S. (2017). Foreign exchange rate and trade balance dynamics in East African countries. *The Journal of International Trade and Economic Development*, *8199*. https://doi.org/10.1080/09638199.2017.1327611

Iyoboyi, M., & Muftau, O. (2014). Impact of exchange rate depreciation on the balance of payments: Empirical evidence from Nigeria. Cogent Economics & Finance, 2(1), 923323. https://doi.org/10.1080/23322039.2014.923323

Kennedy, O. (2013). Kenya's Foreign Trade Balance: An Empirical Investigation. *European Scientific Journal*, *9*(19), 1857–7881.

Khan, M. Z. S., & Hossain, M. I. (2012). Determinants of trade balance of Bangladesh: A dynamic panel data analysis. *The Bangladesh Development Studies*, *35*(2), 45-65. https://www.jstor.org/stable/41968818

Kilicarslan, Z. (2018). Determinants of exchange rate volatility: empirical evidence for Turkey. *Pressacademia*, *5*(2), 204–213. https://doi.org/10.17261/pressacademia.2018.825

Kipkorir, K. M. (2020). Agricultural Trade Liberalization in Kenya and Implications for Kenya China Trade Relations. *Developing Country Studies*, *10*(1), 86–93. https://doi.org/10.7176/dcs/10-1-07

Kipruto, K. I. (2019). Economic Determinants of Exchange Rate Volatility in Kenya. *International Journal of Economics, Commerce and Management*, *VII*(4), 490–497.

Kiptui, M. C. (2018). The Dynamics of the Exchange Rate and Bilateral Trade Balances:

Evidence from Kenya using Nonlinear ARDL Approach. *International Journal of Contemporary Research and Review*, *9*(7), 20832–20849. https://doi.org/10.15520/ijcrr/2018/9/07/539

KNBS. (2006). ECONOMIC SURVEY 2006. *Kenya National Bureau of Statistics*.

KNBS. (2022). ECONOMIC SURVEY 2022. *Kenya National Bureau of Statistics*, *May*.

Latief, R., & Lefen, L. (2018). The effect of exchange rate volatility on international trade and foreign direct investment (Fdi) in developing countries along "one belt and one road." *International Journal of Financial Studies*, *6*(4). https://doi.org/10.3390/ijfs6040086

Lee-Lee, C., & Hui-Boon, T. (2007). Macroeconomic factors of exchange rate volatility: Evidence from four neighbouring ASEAN economies. *Studies in Economics and Finance*, *24*(4), 266–285. https://doi.org/10.1108/10867370710831828

Li, W., & Li, C. (2020). The Empirical Study on Potential of Bilateral Trade between China and Kenya in the Context "The Belt and Road." *Theoretical Economics Letters*, *10*(01), 119–130. https://doi.org/10.4236/tel.2020.101008

Lotfalipour, M. R., & Bazargan, B. (2014a). *The Impact of Exchange Rate Volatility on Trade Balance of Iran*. *2*(8), 293–302. https://doi.org/10.13189/aeb.2014.020801

Lotfalipour, M. R., & Bazargan, B. (2014b). The Impact of Exchange Rate Volatility on Trade Balance of Iran. *Advances in Economics and Business*, *2*(8), 293–302. https://doi.org/10.13189/aeb.2014.020801

M Masih, S. S. (2018). Exchange rate and trade balance based on nonlinear ARDL linkage : sectoral evidence from Thailand. *Munich Personal Repec Archive*, *87541*.

Magee, S. P. (1973). *Currency Con tracts , Pass-through , and*. *1973*(1), 303–325.

Mugambi, M. N. (2017). Impact of Exchange Rate Volatility on inflation Rates in Kenya ;Garch Model Approach. *Strathmore University*, *081928*.

Mulinge, E. (2012). An Analysis of China-Kenya Bilateral Relations on Infrastructure Development. *Trade and Foreign Policy Division: Kenya Institute for Public Policy Research and Analysis*.

Musila, J. (2018). The dynamics of in fl ation , exchange rates and the trade balance in a small economy. *International Journal of Development Issues*, *17*(2), 246–264. https://doi.org/10.1108/IJDI-12-2017-0209

Musyoki, D., Pokhariyal, G. P., & Pundo, M. (2012). *Real Exchange Rate Volatility in Kenya Corresponding Authors : Danson Musyoki*. *3*(2), 117–122.

Mwito, M. M., Mkenda, B. K., & Luvanda, E. (2021). The asymmetric J-curve phenomenon: Kenya versus her trading partners. *Central Bank Review*, *21*(1), 25–34. https://doi.org/10.1016/j.cbrev.2020.09.001

Nasir, M. A., & Jackson, K. (2019). An inquiry into exchange rate misalignments as a cause of major global trade imbalances. *Journal of Economic Studies*, *46*(4), 902–924. https://doi.org/10.1108/JES-03-2018-0102

Ogbonna, O. E., & Ichoku, H. E. (2022). Symmetric or asymmetric: how is Nigeria's bilateral trade balance responding to oil price and exchange rate changes? *Journal of Economic Studies*. https://doi.org/10.1108/JES-10-2021-0537

Ogutu, G. O. (2014). *Effects of the Real Exchange Rate on the Trade Balance in Kenya*. *46*(26), 3151–3162. http://www.tandfonline.com/doi/abs/10.1080/00036846.2014.922673

Okoth, M. N. (2013). The Effects of Interest Rate and Inflation Rate On Exchange Rates in Kenya. *University of Nairobi*, *53*(9), 1689–1699.

Oluyemi, O., & Didi Isaac, E. (2017). The Effect of Exchange Rate on Imports and Exports in Nigeria. *IIARD International Institute of Academic Research and Development*, *3*(2). www.iiardpub.org

Osoro, K. (2013). Kenya's Foreign Trade Balance: An Empirical Investigation. *European Scientific Journal*, *9*(19), 1857–7881.

Otieno, M. (2014). Real Exchange Rate Volatility and Exports in Kenya: 2005- 2012. *Kenya Institute for Public Policy Research and Analysis*, *4*(5), 115–131. http://www.sciencepublishinggroup.com/j/jwer

Ozturk, M. B. E., & Cavdar, S. C. (2021). *The Contagion of Covid-19 Pandemic on The Volatilities of International Crude Oil Prices , Gold , Exchange Rates and Bitcoin*. *8*(3),

171–179. https://doi.org/10.13106/jafeb.2021.vol8.no3.0171

Patroba, H. (2012). China in Kenya : Addressing Counterfeit Goods and Construction Sector Imbalances. *Saiia Occasional Paper*, *110*, 1–28.

Raga, S., Mendez-Parra, M., & Willem Te Velde, D. (2021). *Overview of Kenya-China bilateral trade ODI-FSD Kenya emerging analysis series Series Key messages*. *December*. www.odi.org/publications/overview-of-kenyachina-

Sanghi, A., & Johnson, D. (2016). Deal or No Deal: Strictly Business for China in Kenya? *Macroeconomic and Fiscal Management Global Practice Group*, *March*. https://doi.org/10.1596/1813-9450-7614

Saunders, M., Lewis, P., & Thornhill, A. (2007). Research Methods for Buniess Students. In *Pearson*. https://www.researchgate.net/publication/330760964_Research_Methods_for_Business_Students_Chapter_4_Understanding_research_philosophy_and_approaches_to_theory_development

Senadza, B., & Diaba, D. D. (2018). Effect of exchange rate volatility on trade in Sub-Saharan Africa☆. *Journal of African Trade*, *4*(1–2), 20. https://doi.org/10.1016/j.joat.2017.12.002

Sharma, C. (2020). Exchange rate volatility and exports from India : a commodity- level panel data analysis. *Journal of Financial Economic Policy*, *12*(1), 23–44. https://doi.org/10.1108/JFEP-11-2018-0157

Sokeng Dongfack, L. P., & Ouyang, H. (2019). The Impact of Real Exchange Rate Depreciation on Cameroon's Trade Balance: Is Devaluation a Remedy for Persistent Trade Deficits? *Journal of Economic Integration (JEI)*, *34*(1), 189–213. http://dx.doi.org/10.11130/jei.2019.34.1.189

Sugiharti, L., Esquivias, M. A., & Setyorani, B. (2020). The impact of exchange rate volatility on Indonesia's top exports to the five main export markets. *Heliyon*, *6*(1). https://doi.org/10.1016/j.heliyon.2019.e03141

Wang, Y. (2018). Effects of exchange rate and income on the US bilateral trade with China under Chinese managed floating exchange rate system. *Journal of Chinese Economic and*

Foreign Trade Studies, *11*(3), 236–246. https://doi.org/10.1108/JCEFTS-04-2018-0009

Warui, G. M. (2010). *THE EFFECT OF CHINA-KENYA ECONOMIC TIES ON SOCIAL AND ECONOMIC DEVELOPMENT IN KENYA*.

Wilfred, M., Bernard, O., & George, G. E. (2014). An analysis of concentric diversification strategy on Organization competitiveness : Case of sugar firms in Kenya. *European Journal of Business and Management*, *6*(19), 175–181. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.735.2640&rep=rep1&type=pdf

APPENDICES

ADDITIONAL RESULTS

Appendix 1: Lag Orders for different economic categories

1. **Consumer Goods**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	70.10379	NA	0.000	-8.813839	-8.625025	-8.815850
1	123.5979	71.32551	0.000	-13.81306	-12.86899	-13.82311
2	163.3168	31.77512*	0.000	-16.9755*	-15.2762*	-16.99368*

2. **Fuels and Lubricants**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	37.61067	NA	1.33e-07	-4.481422	-4.292609	-4.483434
1	84.34690	62.31498	2.45e-09	-8.579587	-7.635520	-8.589643
2	129.1290	35.82568*	1.00e-10*	-12.41720*	-10.71788*	-12.43530*

3. **Food and Beverages**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	51.14036	NA	2.19e-08	-6.285381	-6.096568	-6.287393
1	102.9560	69.08757*	2.05e-10*	-11.06080	-10.11674*	-11.07086
2	120.7694	14.25070	3.06e-10	-11.30259*	-9.603268	-11.32069*

4. Machinery Equipment

Lag	LogL	LR	FPE	AIC	SC	HQ
0	48.64144	NA	3.06e-08	-5.952191	-5.763378	-5.954203
1	93.44713	59.74093*	7.30e-10	-9.792951	-8.848884	-9.803007
2	123.8308	24.30694	2.03e-10*	-11.71077*	-10.01145*	-11.72887*

5. Transport Equipment

Lag	LogL	LR	FPE	AIC	SC	HQ
0	45.48853	NA	4.66e-08	-5.531804	-5.342990	-5.533815
1	91.28690	61.06449*	9.73e-10	-9.504920	-8.560853	-9.514976
2	120.7666	23.58380	3.06e-10*	-11.30222*	-9.602899*	-11.32032*

6. Industrial Supplies

Lag	LogL	LR	FPE	AIC	SC	HQ
0	64.85745	NA	3.52e-09	-8.114327	-7.925513	-8.116338
1	114.7896	66.57623	4.24e-11	-12.63862	-11.69455	-12.64867
2	153.8814	31.27342*	3.70e-12*	-15.71752*	-14.01820*	-15.73562*

Short run estimation

1. Consumer Goods

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.471884	0.817179	-0.577454	0.6666
D (LCONSUMERGOODSTB (-1))	-3.684659	5.596192	-0.658423	0.6293
D (LCONSUMERGOODSTB (-2))	1.790646	3.395438	0.527368	0.6910
D(LEXRATE)	0.825470	2.781885	0.296730	0.8164
D (LEXRATEVOL (-1))	-3.539181	3.043008	-1.163053	0.4521
D (LEXRATEVOL (-2))	1.217698	0.768657	1.584189	0.3585
D(LWORLDGDP)	-1.641365	1.558846	-1.052936	0.4836
D (LWORLDGDP (-1))	-2.629959	5.934784	-0.443143	0.7344
D (LWORLDGDP (-2))	0.080602	1.232717	0.065386	0.9584
D(LKEGDP)	3.160058	5.718173	0.552634	0.6786
D (LKEGDP (-1))	2.073064	6.091850	0.340301	0.7912
D (LKEGDP (-2))	0.370678	1.947428	0.190342	0.8803
RESID06(-2)	-8.268360	13.27714	-0.622752	0.6454

2. Food and Beverages

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.178174	0.163149	1.092089	0.3167
D (LFOODANDBEVTB (-1))	-0.086670	0.335857	-0.258057	0.8050

D(LEXRATEVOL)	-1.496324	1.343968	-1.113363	0.3082
D (LEXRATEVOL (-1))	0.467997	1.489310	0.314238	0.7640
D(LKEGDP)	-2.909090	1.685329	-1.726126	0.1351
D (LKEGDP (-1))	0.253308	0.985357	0.257072	0.8057
D(LWORLDGDP)	-0.535149	1.339281	-0.399579	0.7033
D (LWORLDGDP (-1))	1.394524	1.215011	1.147746	0.2948
RESID07(-1)	-0.922555	0.613670	-1.503341	0.1834

3. Machinery Equipment

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
c	-0.015760	0.321623	-0.049002	0.9654
D (LMACHINERYTB (-1))	-0.187121	0.400569	-0.467139	0.6864
D (LMACHINERYTB (-2))	-0.272201	0.343066	-0.793436	0.5107
D(LEXRATE)	1.254497	2.389404	0.525025	0.6520
D (LEXRATEVOL (-1))	-0.03566	2.207753	-0.016155	0.9886
D (LEXRATEVOL (-2))	2.673388	3.195445	0.836625	0.4908
D (LWORLDGDP (-1))	4.756482	2.975433	1.598585	0.2510
D(LWORLDGDP)	-1.346252	2.870439	-0.469006	0.6852
D (LWORLDGDP (-2))	-3.417459	2.848795	-1.199616	0.3531
D(LKEGDP)	-2.731907	2.482109	-1.100640	0.3858
D (LKEGDP (-1))	-2.987240	2.941834	-1.015435	0.4168

D (LKEGDP (-2))	3.555940	2.679012	1.327332	0.3156

4. Transport Equipment

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.469610	0.414494	-1.132971	0.3748
D (LTRANSPORTEQPTB (-1))	0.060135	0.436914	0.137635	0.9031
D (LTRANSPORTEQPTB (-2))	0.286420	0.390017	0.734377	0.5391
D(LEXRATEVOL)	4.563134	3.140614	1.452944	0.2834
D (LEXRATEVOL (-1))	-3.833109	3.082420	-1.243539	0.3397
D (LEXRATEVOL (-2))	7.222148	3.736857	1.932680	0.1930
D (LWORLDGDP (-1))	7.084616	3.414133	2.075085	0.1737
D(LWORLDGDP)	-8.441788	4.296021	-1.965025	0.1883
D (LWORLDGDP (-2))	-8.985453	4.198045	-2.140390	0.1657
D(LKEGDP)	1.445642	3.025501	0.477819	0.6799
D (LKEGDP (-1))	-3.336377	3.311479	-1.007519	0.4198
D (LKEGDP (-2))	7.319492	3.432463	2.132432	0.1666

5. Industrial Supplies

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.070136	0.058506	-1.198795	0.4426
D (LINDUSTRIALSUPTB (-1))	-0.594560	0.413946	-1.436322	0.3872
D (LINDUSTRIALSUPTB (-2))	0.219691	0.261980	0.838577	0.5558
D(LEXRATEVOL)	-1.473262	0.360280	-4.089218	0.1527
D (LEXRATEVOL (-1))	0.641859	0.326890	1.963534	0.2999
D (LEXRATEVOL (-2))	0.650882	0.590029	1.103135	0.4688
D(LWORLDGDP)	2.077226	0.677159	3.067561	0.2006
D (LWORLDGDP (-1))	1.080446	0.691884	1.561600	0.3626
D (LWORLDGDP (-2))	0.819841	0.453117	1.809335	0.3214
D(LKEGDP)	-0.901094	0.334147	-2.696697	0.2261
D (LKEGDP (-1))	-0.780364	0.407906	-1.913096	0.3066
D (LKEGDP (-2))	0.346346	0.348208	0.994651	0.5017
RESID05(-2)	-1.269427	0.465193	-2.728819	0.2236

Appendix 2: Stability Tests

To determine stability of the model, the cumulative sum of recursive residuals (CUSUM) test, proposed by Brown, Durbin, and Evans (1975), is employed.

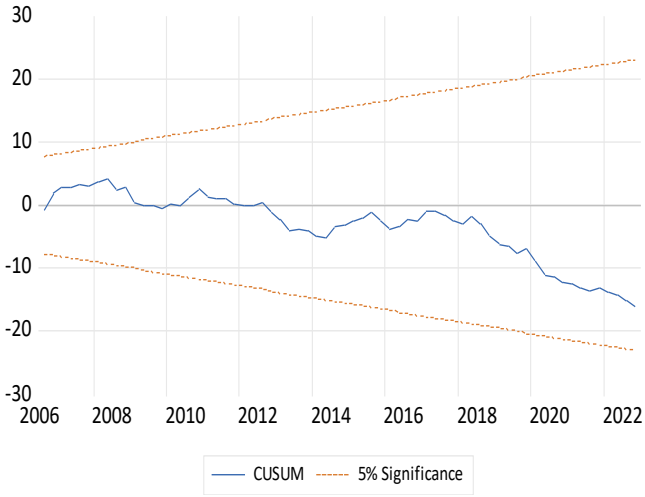


Figure 4.1: Import function graph.

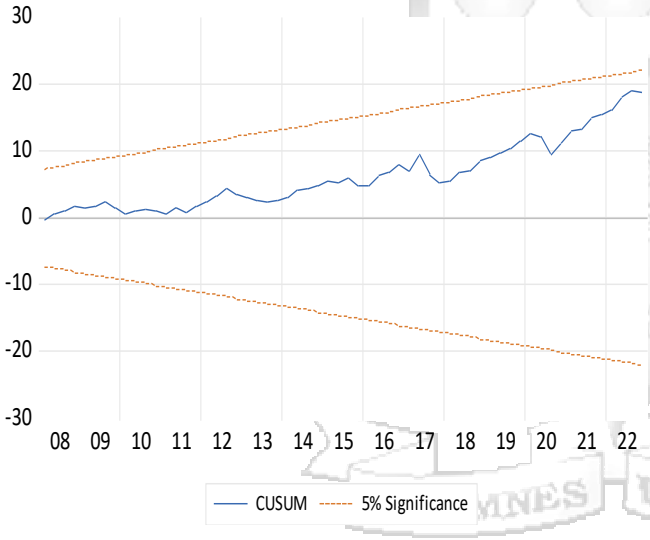


Figure 4.2: Export function graph

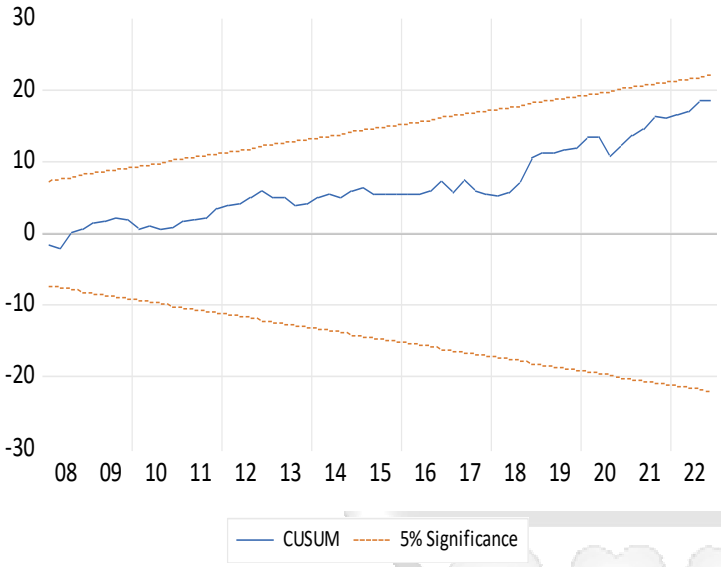
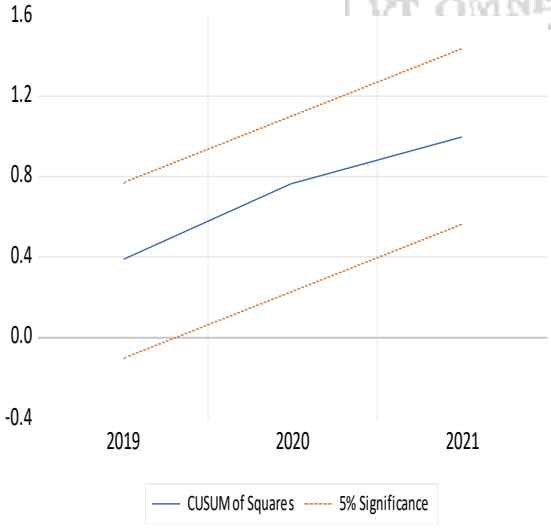


Figure 4.3: Kenya-China trade balance graph

From the three graphs, it is evident that the long run and short run coefficients are stable as they do not break the 5 % significance limits and thus, we can confirm the model coefficients are stable at 5 % level of significance.

Similarly, to confirm stability of the models, the data series was subjected to cumulative sum and cumulative sum of squares test. For all the dependent variables the CUSUM and CUSUM of squares graphs fall within the 5 % limit thus confirming stability of the models. From the graphs below all models are stable as indicated by the graphs fitting the 5 % limit



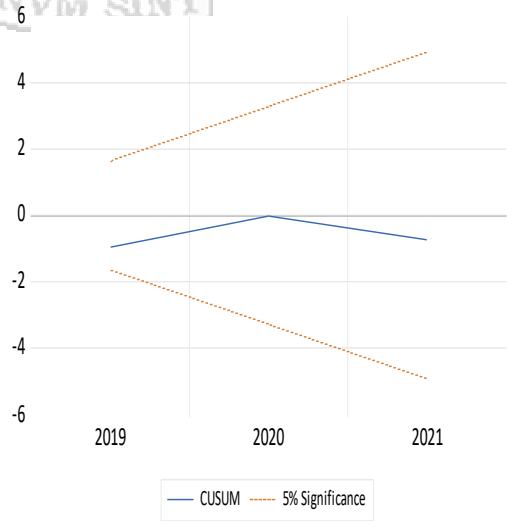


Figure 4.4: Consumer goods and services stability test

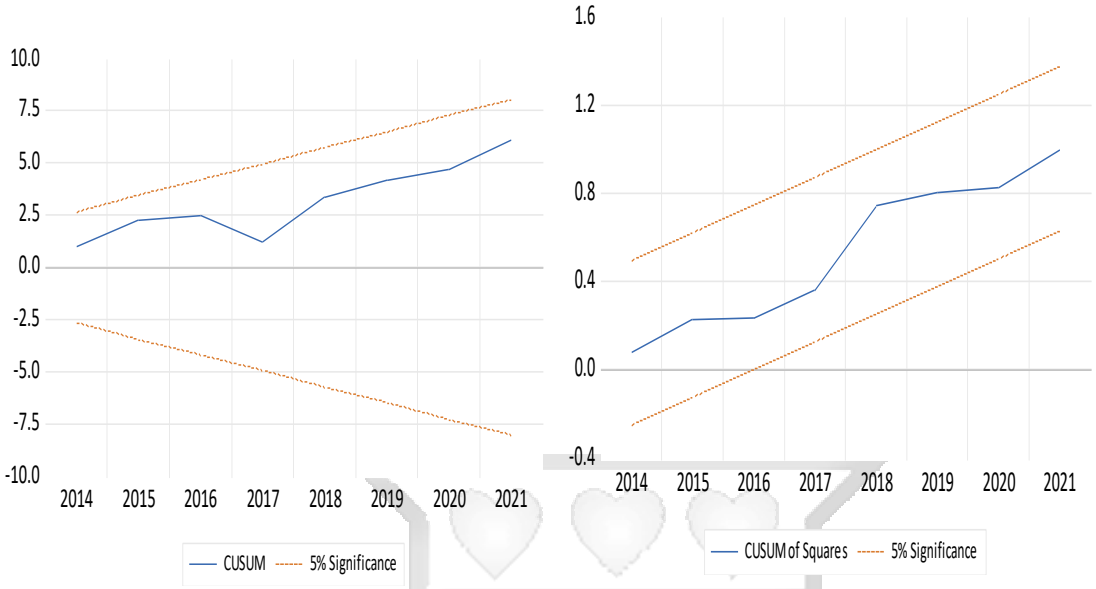


Figure 4.5: Food and Beverages stability test

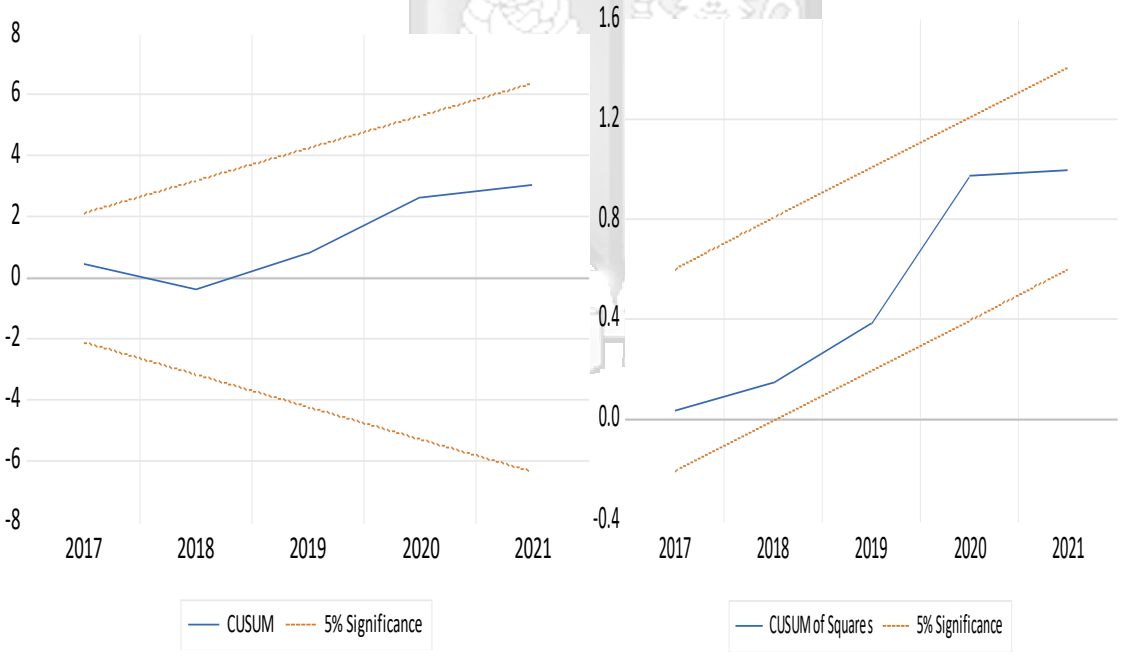


Figure 4.6: Fuels and Lubricants stability test

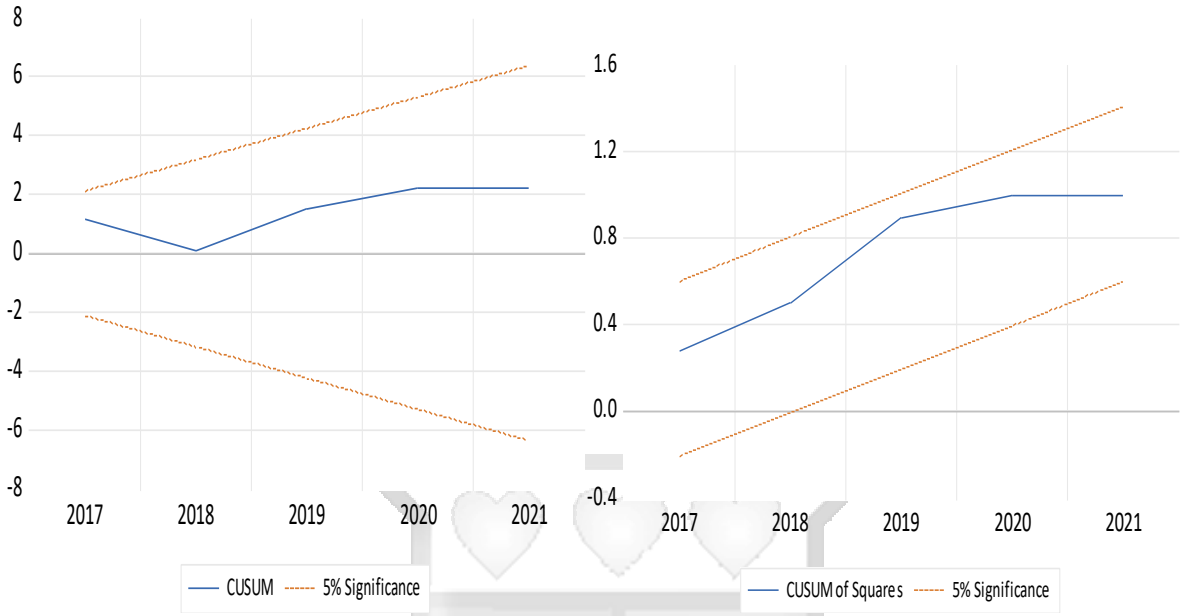


Figure 4.7: Industrial Supplies Stability Test

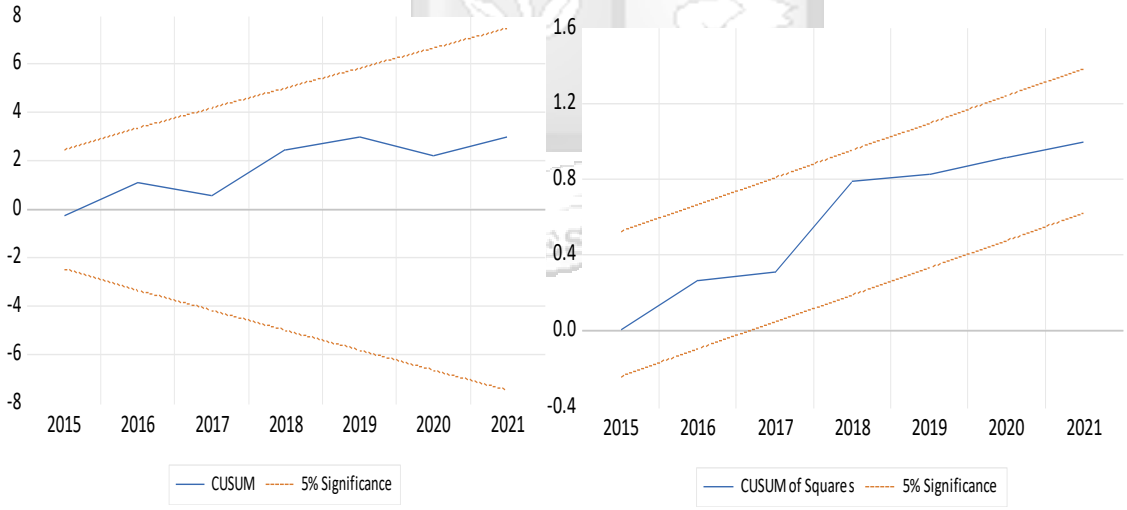


Figure 4.8: Transport Equipment Stability Test

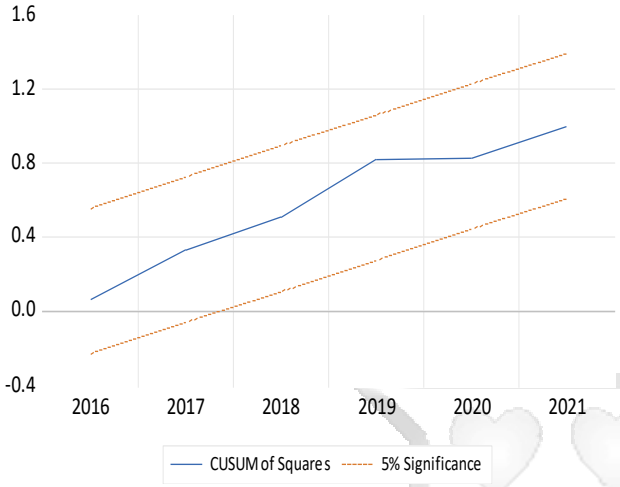


Figure 4.9: Machinery Equipment Stability Test

ETHICAL REVIEW LETTER

Strathmore UNIVERSITY

22nd March 2023

Ms Miriti Grace Kinya,
grace.miriti@strathmore.edu

Dear Ms Miriti,

RE: Effects of Exchange Rates on Kenya-China bilateral trade

This is to inform you that SU-ISERC has reviewed and **approved** your above SU-masters research proposal. Your application reference number is **SU-ISERC1649/23.** The approval period is from **22nd March 2023 to 21st March 2024.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 48 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 48 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to SU-ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) https://research-portal.nacosti.go.ke/ and obtain other clearances needed.

Yours sincerely,

for: **Dr Ben Ngoye,**
Secretary; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
22-Mar-2023
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

Cc: Mr Ambrose Rachier,
Chairperson; SU-ISERC

Ole Sangale Rd, Madaraka Estate. PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)703 034000
Email admissions@strathmore.edu www.strathmore.edu

SBS INTRODUCTION LETTER

Cle Sangale Rd, Madaraka Estate,
P.O Box 59857 00200, Nairobi, Kenya,
Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu

Strathmore UNIVERSITY
BUSINESS SCHOOL

30th March 2023

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – GRACE MIRITI

This is to introduce Grace Miriti who is a Master of Commerce (MCOM) Student at Strathmore University Business School, admission number MCOM/86378. As part of our MCOM Programme, Grace is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MCOM course. To this effect, Grace would like to request appropriate data from your organization.

Grace is undertaking a research paper on "**The Effects of Exchange Rate Volatility of Kenya-China Bilateral Trade.**" The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MCOM Programme seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

Njoki Kiagiri
Manager – Graduate Programmes
Strathmore University Business School.

NACOSTI PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **830271**

Date of Issue: **13/April/2023**

RESEARCH LICENSE

This is to Certify that Ms.. Grace Kinya Miriti of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: The Effects of Exchange Rate on Kenya-China Bilateral Trade for the period ending : 13/April/2024.

License No: **NACOSTI/P/23/25001**

830271

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions