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Impact of exchange volatility on Agricultural Exports

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Abstract

This study investigates the impact of exchange rate volatility on agricultural exports in Kenya, a sector that contributes 33% to GDP and 60% to export earnings. The research employs a descriptive design and analyzes time series data from 2000 to 2020, using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to measure exchange rate volatility and a multiple linear regression framework to assess its effects alongside export prices, inflation, and GDP growth.

The results reveal a negative but statistically insignificant relationship between exchange rate volatility and agricultural exports, suggesting that currency fluctuations, while challenging, may not be the primary determinant of export performance. Export prices, however, exhibit a strong positive and significant effect on export volumes, emphasizing the importance of competitive pricing. Inflation is found to have a significant negative impact, indicating that rising production costs undermine export competitiveness, while GDP growth has a negative but statistically insignificant effect, likely reflecting increased domestic consumption.

The study concludes that while exchange rate volatility does not directly constrain agricultural exports, stabilizing exchange rates and controlling inflation are critical for creating a predictable trading environment. Policy recommendations include promoting currency stability, reducing production costs, and improving infrastructure to enhance the sector's resilience and competitiveness. These findings provide valuable insights for policymakers and stakeholders aiming to sustain economic growth through robust agricultural export performance.

CHAPTER ONE:INTRODUCTION

1.1Background

1.1.1 agricultural exports

Agricultural sector is the backbone of the Kenyan economy, it contributes to 33% of the GDP. The agricultural sector employs more than 40 percent of the total Kenyan population majorly employing people from the rural areas. It plays a crucial role in ensuring food self-sufficiency and addressing malnutrition.

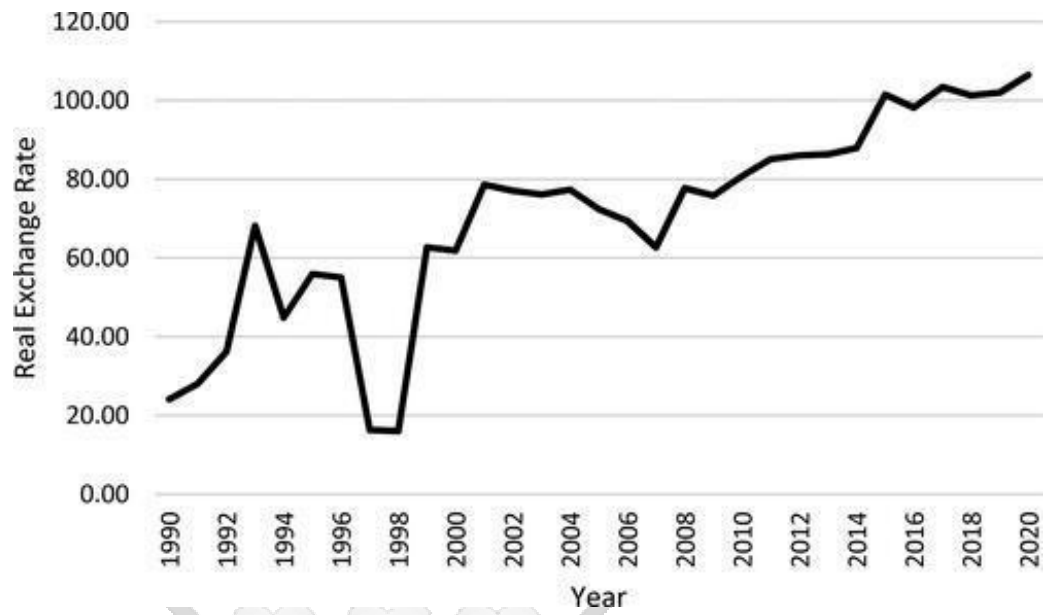
Agricultural exports accounts for 60% of the export earnings from trade in goods. In Q2 of 2022/2023 Out of the top 10 exports in Kenya, 6 of them are agricultural products which include nuts, palm oil, cut flowers, roses, tea and coffee. Tea was the leading export commodity with a value of 42.09 billion shillings ,Kentrade 2023).

Most of the agricultural products are exported to United Kingdom, the Netherlands, the United States and Germany. Most of these trade in done in terms of the us dollars and hence the farmers in Kenya are paid in US dollars for there produce by the international customers.

1.1.2 Exchange rate volatility

The rate at which one currency can be exchanged for another is known as the exchange rate. An appreciation of the currency makes exports more expensive for international customers and imports cheaper for locals while depreciation of the currency makes exports cheaper for international customers and imports more expensive for the locals. The exchange rates if affects by various factors such as inflation, interest rates and economic performance of the country.

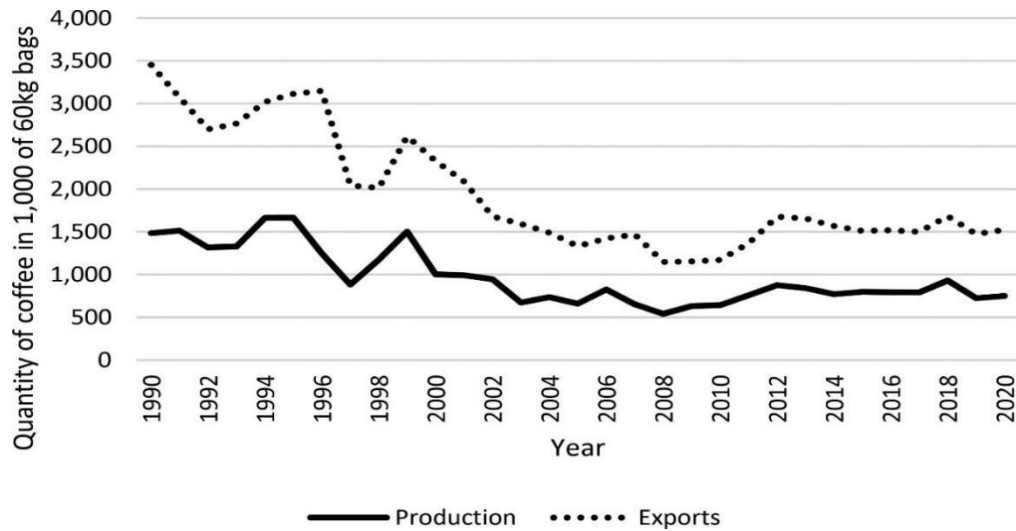
In kenya, the central bank plays a crucial role in managing the exchange rate. They use various methods inorder to maintain the stability of the local currency which is very important.



Kenya has seen volatility in exchange rates for several decades, which has alarmed stakeholders. The value of the Kenyan shilling (KShs) has fluctuated more recently as compared to other emerging nations. Above in the central bank of Kenya's figures for the real exchange rate for USD/KSHS between the years 1990-2020, we can notice that the Kenyan currency has lost significant value in long run.

1.1.3 relationship between agricultural exports and exchange rate volatility.

Elgali and Mustafa (2012), discovered that the agricultural commerce of developing nation exporters was negatively impacted by exchange rate volatility. But this impact was minimal and very similar to the impact on overall trade. Farmers that import agricultural inputs and raw materials, including fertilizer, would have to pay more for them as a result of the weakening of the Kenyan shilling. They will have to work without these supplies if they cannot afford them, which will lower output.



Trend analysis of Kenyan coffee production and exports from 1990 to 2020. *Source:* International Coffee Organization (ICO, 2021). Between 1990 to 2020 the Kenyan currency depreciated against the us dollar and coincidentally we can also see that between those years the quantity of coffee exports also reduced significantly. Although these reduction in coffee could have been caused by other factors such as more demand of coffee made in other countries. The aim of these research paper would be to study whether exchange rate is the significant factor causing the reduction in coffee exports.

1.2 Problem Statement

Agriculture remains a cornerstone of Kenya's economy, contributing significantly to employment, income generation, and export revenues (World Bank, 2021). As one of the leading sectors, the performance of agricultural exports is crucial for the country's economic stability and growth (FAO, 2020). However, the sector is highly susceptible to fluctuations in exchange rates, which can significantly influence the competitiveness of Kenyan agricultural products in the global market (Ngugi & Njeru, 2019).

Exchange rate volatility introduces uncertainty in trade transactions, affecting the pricing, profitability, and overall competitiveness of agricultural exports

(Chege & Kinyua, 2021). In recent years, the Kenyan shilling has experienced considerable fluctuations against major currencies, creating challenges for exporters in terms of cost predictability and revenue stability (Central Bank of Kenya, 2022). This volatility can lead to adverse outcomes, such as reduced export volumes, increased costs of production due to expensive imported inputs, and difficulties in long-term financial planning for stakeholders in the agricultural sector (Kamau, 2020).

Despite the recognized importance of exchange rate stability for economic performance, there is limited empirical research specifically addressing how exchange rate volatility impacts agricultural exports in Kenya. The lack of comprehensive analysis in this area hampers policymakers' ability to design effective strategies to mitigate these impacts and support the growth of agricultural exports.

This study aims to fill this gap by investigating the extent to which exchange rate volatility affects agricultural exports in Kenya. Understanding these dynamics is critical for developing policies that enhance the resilience of the agricultural sector, ensuring it remains a robust contributor to Kenya's economic development. Policymakers, exporters, and other stakeholders in the agricultural supply chain will find great guidance in the research's findings as they navigate the difficulties caused by swings in currency rates.

1.3 Research objectives

- a) To assess the effect of exchange rate volatility on agricultural production

1.4 Research questions

- a) How does volatility of the exchange rate affect the output and exports of agricultural products?

1.5 Significance

Research on the effect of the current exchange rate on the Kenyan agricultural economy is significant for several reasons.

Agricultural exports account for 60% of the export earnings from trade in goods. This would mean that Kenyan farmers are very vulnerable to exchange rate fluctuations. An appreciation of the Kenyan currency would lead to less competitive exports in the international markets in the short run.

The government can use the research paper to come up with strategies to reduce exchange rate volatility which will boost the agricultural leading to economic growth in the country.

The research paper can be used by potential investors to make a judgement of whether Kenya agricultural sector is a favorable place to invest their money with respect to there investment objectives .



CHAPTER TWO:LITERATURE REVIEW

2.0 Introduction

This section presents the theoretical and empirical literature review. Theoretical literature review delves into current theories and conceptual frameworks associated with the subject matter under research. It entails recognizing, contrasting, and assessing the different theoretical stances that have been applied to comprehend a phenomenon while A review of empirical literature concentrates on research that have gathered data and analysed it using empirical techniques. This entails analysing, contrasting, and assessing earlier research findings on subjects connected to the research topic.

2.1 Theoretical literature review

2.1.1 Purchasing Power Parity theory

Gustav Cassel, a Swedish economist, created the Purchasing Power Parity (PPP) theory in the early 1900s. It is a fundamental idea in international economics. In his 1918 paper "Abnormal Deviations in International Exchanges," Cassel presented the theory. He argued that exchange rates between currencies should equalize the purchasing power of various currencies, i.e., when goods are expressed in a common currency, they should cost the same in various countries.

Purchasing power parity is an economic theory that states that in the long run, exchange rates between two currencies should adjust so that a basket of goods and services costs the same in both countries when priced in a common currency. The basic idea is that the purchasing power of different currencies should be equal when accounting for the cost of living and inflation differences between countries.

According to this notion, a certain amount of money should be able to buy the same amount of things wherever in the world. Several economists have proposed that the theory describes the forces influencing exchange rates over an extended period. (Mankiw 2008, p. 707). The purchasing power parity is founded on a principle known as the law of one price.

There are two types of PPP; that is absolute and relative PPP. Absolute PPP this strict version of PPP posits that exchange rates should directly reflect the price levels of identical baskets of goods in two countries. If the price level in country A is twice that of country B, the currency of country A should depreciate by 50% relative to country B's currency to maintain parity.

Relative PPP his strict version of PPP posits that exchange rates should directly reflect the price levels of identical baskets of goods in two countries. If the price level in country A is twice that of country B, the currency of country A should depreciate by 50% relative to country B's currency to maintain parity. If one country experiences higher inflation than another, its currency should depreciate in the foreign market according to PPP. PPP is often used by economists to predict long term changes in exchange rates.

2.2 Empirical Literature review

(Information Management and Business Review 2015) study, "The Effect of Exchange Rates on Agricultural Goods for Export: A Case of Thailand," investigated the impact of exchange rates on Thailand's agricultural exports, particularly focusing on rice and rubber. Utilizing both quantitative and qualitative methods, the authors analysed data from the Bank of Thailand from January 2002 to June 2014. The study's findings reveal a significant negative correlation between exchange rate fluctuations and the export volumes of these goods. Specifically, the authors found that when the Thai Baht appreciates, the country's agricultural exports tend to decline, making Thai goods less competitive on the global market. Furthermore, through in-depth interviews with 17 businessmen from rice and rubber export companies, the study uncovers the practical challenges exporters face due to exchange rate volatility. The respondents highlighted that rapid and unpredictable changes in exchange rates severely disrupt their operations,

making it difficult to price products effectively. To mitigate these risks, the study suggests that exporters adopt strategies such as forward contracts to hedge against exchange rate fluctuations. This approach would help stabilize their businesses and protect against the adverse effects of an appreciating Baht.

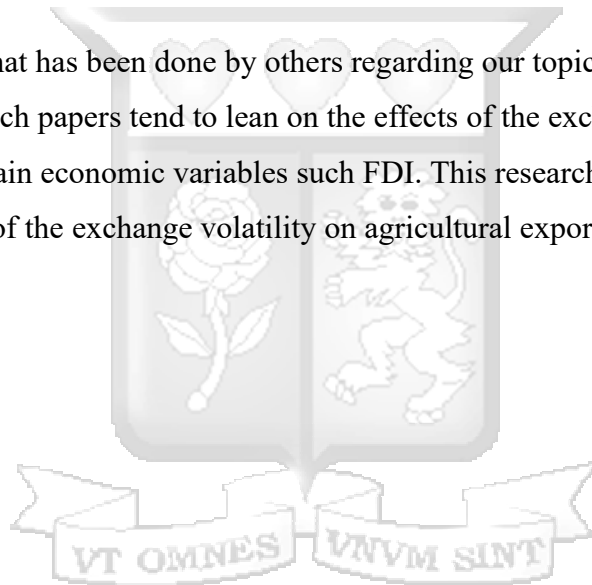
Alegwu, Aye, and Asogwa (2018) , study titled "Effect of Real Exchange Rate Volatility on Agricultural Products Export in Nigeria explored the impact of exchange rate fluctuations on the export performance of Nigeria's agricultural sector. Using annual time series data from 1970 to 2013, they employed a variety of econometric methods, including the Vector Error Correction Model (VECM), to assess both the short- and long-term effects of real exchange rate volatility on agricultural exports. Their analysis also included unit root tests and co-integration tests to establish the long-run relationship between the variables. The findings of the study reveal that real exchange rate volatility has a significant negative impact on the long-term export performance of agricultural products, particularly affecting crops like coffee and rubber. However, the short-run effects were found to be negative but statistically insignificant. The study also discovered bidirectional causality between real exchange rate volatility and cocoa exports, indicating a complex interplay between currency fluctuations and trade performance in this sector. These results underscore the challenges faced by Nigerian agricultural exporters in maintaining competitiveness in the face of currency instability.

Narrowing down the scope to Kenya, it is obvious that this country has not been saved from the impacts of the instability of the exchange rates. This has been well brought up in the paper of (Rutto and Alala (2014)) that explored the impact of exchange rate volatility on Kenya's tea exports using time series data from 1970 to 2008. They applied Johansen and Julius' multivariate cointegration technique alongside error correction modelling (ECM) to analyse the short- and long-term effects. The study utilized Dickey-Fuller and Augmented Dickey-Fuller tests to ensure stationarity, and the results revealed that exchange rate volatility significantly and negatively impacted the

performance of Kenya's tea exports. The authors found that the fluctuations in exchange rates led to reduced foreign exchange earnings from tea exports, which is critical to Kenya's economy. Consequently, they recommended that Kenya's monetary authorities implement policies to stabilize the exchange rate to enhance tea export performance. The study underscores the importance of maintaining a stable exchange rate to protect the agricultural sector, which remains a vital source of income and employment in Kenya.

2.3 Gap in literature

By reviewing what has been done by others regarding our topic of interest, it is evident that. Most research papers tend to lean on the effects of the exchange rate on the general economy or certain economic variables such FDI. This research paper will specifically study the effect of the exchange volatility on agricultural exports.



CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter outlined the methodological assumptions and approaches employed in the study. It included the research design that was utilized, the population of the study, the various variables that were analyzed, and the sources of the data related to these variables. The chapter described the procedures through which the research questions were addressed and the analysis conducted to achieve the study objectives.

3.2 Research Design

The study employed a descriptive research design. This design was suitable for demonstrating the impact of the independent variable (exchange rate volatility) on the dependent variable (agricultural exports). The research aimed to determine the extent to which exchange rate volatility influenced agricultural export volumes in Kenya.

3.3 Population and sampling

The study focused on the impact of exchange rate volatility on agricultural exports in Kenya. As such, the research analyzed data related to Kenya-specific variables, ensuring relevance to the context of the study.

3.4 Data and Variables

Secondary data was utilized to conduct the study due to its reliability and availability. Time series data spanning 2000 to 2020 was used, covering a 20-year period to capture long-term trends and fluctuations. The data was sourced from institutions such as the Central Bank of Kenya and the International Monetary Fund.

Table 3.1 Variable description and measurement

Variable	Short representation	Measurement	Data source
Dependent variable			
Quantity of agriculture exported	Exports	Total quantity of coffee, tea and floriculture exported	Central Bank of Kenya
Independent variable			
Exchange rate volatility	Volatility	Exchange rate volatility using the garch model	Garch model in R using exchange rate data from Central bank of Kenya
Average price of exports	Priceexports	Average price of coffee, tea and floriculture exported	Central bank of Kenya
Gdp growth rate	Gdpgrowth	GDP growth rate in Kenya	International monetary fund
Inflation	Inflation	Inflation rate in kenya	International monetary fund and central bank of Kenya

3.5 Model specification for exchange rate volatility

To analyse exchange rate volatility, The study adopted the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, introduced by Bollerslev (1986). The

GARCH framework is widely used for modelling financial time series due to its ability to capture dynamic volatility patterns, including the volatility of exchange rates. The value of volatility from the garch model was then be fitted into a linear regression model for further analysis

$$\sigma_t^2 = \omega + \sum_{i=1}^q \alpha_i \epsilon_{t-i}^2 + \sum_{j=1}^p \beta_j \sigma_{t-j}^2$$

where:

- σ_t^2 : Conditional variance of the series at time t ,
- ω : Constant term,
- α_i : Coefficients for lagged squared residuals (ϵ_{t-i}^2),
- β_j : Coefficients for lagged variances (σ_{t-j}^2),
- p and q : The number of lagged variances and residuals, respectively.

ω : Constant Term

Represents the baseline or long-term average variance when there is no prior influence from past shocks.

α_i : ARCH Effects (Lagged Shock Coefficients)

Measure the impact of past squared residuals on current volatility.

High α_i values indicate that recent shocks or news have a strong influence on current volatility.

β_j : GARCH Effects (Lagged Variance Coefficients)

Reflect the persistence of past volatility in influencing current volatility.

3.6 Multiple linear regression model specification

The purpose of this section was to understand the impact of volatility of the exchange rate on agricultural exports, in order to analyse this relation we used a multiple linear regression model. A multiple linear regression model explains the relationship between a dependent variable (Y) and two or more independent variables ($X_1, X_2, \dots$). It generalizes simple linear regression by considering the combined effect of multiple predictors. In this case, the dependent variable is the quantity of agricultural items exported. The independent variables on the other hand included volatility of the exchange rate (volatility) calculated using the garch model, average price of the exports (price exports), GDP growth rate (gdpgrowth), inflation rate (inflation).

The regression was explicitly expressed as follows:

$$y_t = \beta_0 + \beta_1 \text{volatility} + \beta_2 \text{priceexports} + \beta_3 \text{inflation} + \beta_4 \text{gdpgrowth} + \epsilon_t$$

Where:

- Y_t = was the value of monthly agricultural exports at time t.
- Volatility was the monthly conditional volatility of the exchange rate at time t, estimated from the GARCH model.
- Priceexports was the monthly average price of tea, coffee and floriculture exports from Kenya at time t.
- Inflation was the monthly inflation rate in Kenya at time t.
- Gdpgrowth was the monthly gdp growth rate in kenya at time t.
- $\beta_1, \beta_2, \beta_3$ and β_4 are coefficients that measure the impact of volatility, price of exports, inflation and gdpgrowth on agricultural exports, respectively.
- ϵ_t = is the error term.

Interpretation:

- β : If positive, an increase in independent variable leads to an increase in the dependent variable value
- β : If negative, an increase in the independent variable leads to a decrease in the dependent variable value.
- This model allows you to quantify the impact volatility, price of exports, gdp growth and inflation on agricultural exports in Kenya.

3.7 Tests for significance

In this section, we conducted four main tests: Test for stationarity for exchange rate volatility, Testing the significance of the coefficients of the multiple linear regression model, testing for multicollinearity, and finally, testing for the reliability of the model results.

3.7.1 testing for stationarity of exchange rate volatility

To test the stationarity of the exchange rate volatility from the garch model we used the augmented dickey-fuller(ADF) test to check for stationarity of time series data. it is critical to ensure that the time series is significant as garch models assume stationarity

3.7.2 Testing the significance of coefficients.

To test the significance of the coefficient, we used the p value from the regression summary. Next, we determine the significance level. If the p value was less than the significance level, we reject the null hypothesis and come to the conclusion that the coefficient is statistically significant.

3.7.3 Testing for multicollinearity.

Variance Inflation Factor (VIF) values were calculated to assess the interdependence among independent variables. VIF values below 5 confirmed the absence of severe multicollinearity.

3.7.4 Testing the reliability of model results.

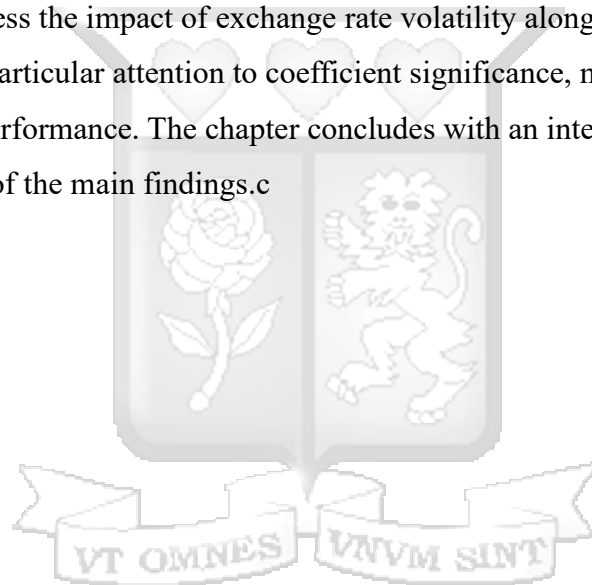
To test for the reliability of the model results, we calculated the goodness of fit statistics including R-squared. The higher the percentage of R-squared, the more reliable the model results.



Chapter 4: Data analysis and presentation

4.1 introduction

This chapter focuses on analyzing the data to explore the relationship between exchange rate volatility and agricultural exports. It begins with a detailed examination of the study variables to highlight their characteristics and trends. Exchange rate volatility is then modeled using the GARCH approach, with stationarity tested through the Augmented Dickey-Fuller (ADF) procedure. Subsequently, a multiple linear regression model is employed to assess the impact of exchange rate volatility alongside other explanatory variables, with particular attention to coefficient significance, multicollinearity, and overall model performance. The chapter concludes with an interpretation of the results and a summary of the main findings.



4.2 Descriptive analysis of the study variables.

The table below provides a brief descriptive statistics of the variables. `

Table 4.1 Descriptive Statistics

Variable	No. of observations	Mean	Standard deviation	Maximum Value	Minimum value
Exports	252	61092.22	17473.65	113670	30084.73
Kshusd	252	85.21671	12.25449	110.59	61.9
Priceexports	252	205877.4	58801.7	359712.8	88490.4
Gdpgrowth	252	0.04019	0.021912	0.081	-0.003
Inflation	252	0.08081	0.041314	0.171	0.016
Volatility	251	0.015087	0.01	0.077588	0.007437

Exports value is given in tonnes of agricultural produce exported.

Kshusd is the amount of ksh that can be obtained using 1 dollar.

priceexports is given as average price per tonne of agricultural produce.

Gdpgrowth is given as a decimal but it is to be interpreted as a percentage such that 0.081 is 8.1%. inflation is given as a decimal but it is to be interpreted as a percentage such that 0.015 is 1.5%.

4.3 Exchange rate volatility

Figure 4.1 Exchange rate volatility between 2000-2020 for kshusd pair.

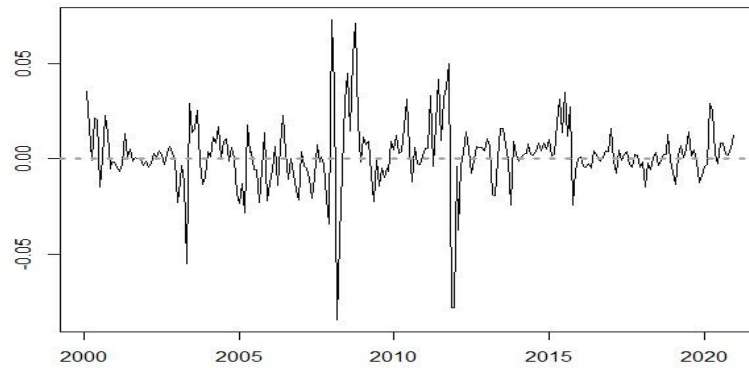


Figure 4.1 shows that there has been high volatility of exchange rates between 2000-2020 with particularly high volatility during 2008 and 2012.

4.4 Garch model analysis

Table 4.2 Garch exchange rate volatility

Garch Model Fit				
Conditional variance Dynamics				
GARCH MODEL : GARCH(1,1)				
Mean Model : ARFIMA(1,0,0)				
Distribution : std				
Optimal parameters				
	Estimate	Std. Error	t value	Pr(> t)
mu	0.001419	0.000768	1.8484	0.064549

ar1	0.326207	0.062810	5.1935	0.000000
omega	0.000029	0.000012	2.3583	0.018358
alpha1	0.541352	0.170983	3.1661	0.001545
beta1	0.457648	0.102478	4.4658	0.000008
shape	3.322449	0.629274	5.2798	0.000000

The above table provides an analysis of the exchange rate volatility of kshusd pair modelled using GARCH.

Mu represents the expected value of the average return of the series being modelled. Mu=0.001419 represents return of the exchange rate is 0.1419% per period. The GARCH(1,1) model fit indicates that exchange rate volatility is well captured, with a significant baseline volatility parameter ($\omega=0.000029$, $p=0.018$), suggesting a stable but low long-term variance. The ARCH ($\alpha_1=0.541352$, $p=0.0015$) and GARCH ($\beta_1=0.457640$, $p<0.00001$) coefficients are significant, confirming that both recent shocks and past volatility contribute meaningfully to current volatility. The stationarity condition ($\alpha_1+\beta_1=0.999$) is close to the threshold, indicating very persistent volatility dynamics. The mean model (ARFIMA(1,0,0)) has a significant AR1 coefficient (0.3266070, $p<0.00001$), suggesting a slight autocorrelation in the returns. Overall, the model is robust, with significant parameters capturing volatility dynamics effectively.

4.4.1 ADF-test for stationarity

Table 4.3 ADF test

Augmented Dickey-Fuller test
Data: volatilitygarch
Dickey-fuller = -4.0405, Lag order = 6, p-value= 0.01
Alternative hypothesis: stationary

At 5% significance level we can reject the null hypothesis hence the series is stationary

4.4 multiple linear regression analysis

To examine the relationship between exports and volatility of exchange the following multiple linear regression model was used:

$$y_t = \beta_0 + \beta_1 \text{volatility} + \beta_2 \text{priceexports} + \beta_3 \text{inflation} + \beta_4 \text{gdpgrowth} + \epsilon_t$$

4.4.1 significance of coefficients

Table 4.4 regression stats

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	3.359e+04	3.611e+03	9.302	< 2e-16 ***
volatility	-3.050e+04	7.868e+04	-0.388	0.699
priceexports	1.929e-01	1.361e-02	14.179	< 2e-16 ***
inflation	-1.173e+05	1.990e+04	-5.895	1.23e-08 ***
gdpgrowth	-5.541e+04	3.750e+04	-1.478	0.141

The multiple linear regression model is as follows:

$$\text{Exports} = 33590 - 30500 \text{volatility} + 0.1929 \text{priceexports} - 117300 \text{inflation} - 55410 \text{gdpgrowth}$$

From table 4.4, the study found that when volatility, price of exports, gdp growth and inflation are zero, the value of agricultural exports is 33590.

Further Volatility was found to have negative statistically insignificant effect on exports such that a unit increase in volatility leads to a 30,500 tonne decrease in exports, holding all other factors. These may be because Volatility can make it challenging for exporters to set stable prices, as they need to account for potential exchange rate fluctuations. This may make their goods less competitive in international markets. These results are similar to the results of Akinbode & Ojo,

2018 who found a statistically insignificant relationship between exchange rate volatility and agricultural exports

Price of exports was found to have a positive statistically significant effect on exports such that a increase in price by per tonne by 1 kshs leads to 0.1929 tonne increase in exports, holding all other factors constant. These may be because higher export prices can motivate producers to increase production and improve efficiency thereby increasing the supply of exportable goods which in turn, supports higher export volumes over time.

Inflation was found to have a negative statistically significant effect on exports such that a unit increase in inflations leads to a 117,300 tonne decrease in exports. Since the value of inflation is in decimals a one percent increase in inflation leads to a 1,173 tonne decrease in exports. This may be attributed to increase costs of inputs like seeds, fertilizers, fuel, labor, and machinery due to inflation. These higher production costs make agricultural goods more expensive, reducing competitiveness in international market. This results are similar to the results of J (1986), south Africa experienced double digit inflation which lead to declining profitability and purchasing power parity of agricultural products, increasing debts and risk, and the weakening of agriculture's competitive position on international markets.

Gdp was found to have a negative statistically insignificant effect on exports such that a unit increase in GDP leads to a 55410 tonne decrease in exports. Since the value of GDP is in decimals a one percent increase in GDP leads to a 554.1 tonne decrease in exports. These may arise because as GDP grows, incomes typically rise, leading to increased demand for domestically produced goods, including agricultural products. This could reduce the supply available for export as more of the agricultural output is consumed locally.

4.4.2 Multicollinearity test

Table 4.5 multicollinearity stats

Volatility	priceexports	Inflation	gdpgrowth
1.147101	1.039235	1.100344	1.089586

Table 4.5 shows that the VIF values are below 5 hence there is no multicollinearity in the model.

4.4.3 Goodness of fit statistics

Table 4.6 goodness of fit statistics

Residual standard error: 12400 on 246 degrees of freedom
Multiple R-Squared: 0.5017, Adjusted R-squared: 0.4936
F-statistic: 61.92 on 4 and 246 DF, p-value: < 2.2e-16

Table 4.6 shows that roughly 50% of the variation in the dependent variable is explained by the independent variables in the model reflecting a moderate level of explanatory power.

4.5 chapter summary

This chapter explored the relationship between exchange rate volatility and agricultural exports using GARCH model and multiple linear regression. The results of GARCH model confirm the persistence of volatility dynamics, with significant contributions from both recent and past fluctuations. Stationarity is tested and confirmed via the Augmented Dickey-Fuller test, ensuring the reliability of time-series data for further analysis.

Then multiple linear regression model is employed to assess the influence of exchange rate volatility, export prices, inflation, and GDP growth on agricultural exports. The findings indicate that exchange rate volatility negatively affects exports but lacks statistical significance. Export prices positively and significantly impact exports, while inflation has a significant negative effect. GDP growth shows a negative but statistically insignificant relationship with exports, suggesting that domestic demand could reduce export supply. The model explains approximately 50% of the variability in exports, with no multicollinearity issues detected, supporting the robustness of the analysis.

CHAPTER 5: SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a brief summary of the study findings, consolidates conclusions derived from the data analysis, and offers policy recommendations. Additionally, it identifies gaps and proposes areas for further research to enhance understanding of the relationship between exchange rate volatility and agricultural export performance in Kenya. Given the critical role agriculture plays in Kenya's economy, understanding these dynamics is vital for formulating robust economic policies that can support sustainable growth.

5.2 Summary of Findings

The primary objective of this study was to investigate the impact of exchange rate volatility on agricultural exports in Kenya. The research utilized a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to measure exchange rate volatility and applied a multiple linear regression analysis to evaluate its relationship with agricultural exports alongside other key economic indicators, including export prices, inflation, and GDP growth rates. The analysis was based on secondary data spanning two decades (2000–2020).

The key findings are summarized below:

Exchange Rate Volatility: Exchange rate volatility exhibited a negative but statistically insignificant relationship with agricultural exports. This indicates that while fluctuations in exchange rates create uncertainty for exporters, their direct impact on export volumes may be overshadowed by other factors, such as price of exports and inflation.

Export Prices: The study found a strong positive and statistically significant relationship between export prices and agricultural exports. Higher prices positively influenced

export volumes, emphasizing the need for strategies to enhance price competitiveness in international markets.

Inflation and GDP Growth: Inflation was found to have a significant negative effect on agricultural exports, suggesting that higher domestic costs reduce competitiveness. Conversely, GDP growth exhibited a negative but statistically insignificant relationship, implying that broader economic growth does not necessarily translate into higher agricultural export performance.

Model Reliability: The regression model accounted for approximately 50% of the variability in agricultural exports, reflecting a moderate level of explanatory power. This suggests that other unexamined variables, such as trade policies or global market conditions, may also play a significant role.

5.3 Conclusions

Various conclusions can be drawn from the finding of the study;

Firstly, the evidence suggests that while exchange rate volatility presents challenges for agricultural exporters, its impact is not statistically significant in the context of Kenya's agricultural exports. This suggests that other macroeconomic and sector-specific factors may have a more profound influence on export performance of the agricultural products.

Secondly, competitive pricing emerged as a more crucial determinant of export performance. Exporters who can maintain favorable prices are better positioned to navigate the uncertainties of international markets and currency fluctuations.

Thirdly, high inflation undermines export competitiveness by increasing costs of inputs like fertilizers, seeds and this leads to a reduced ability to invest in scaling production or

improving quality. These highlights importance of maintaining macroeconomic stability through monetary tightening and fiscal discipline.

Lastly, The negative but insignificant relationship between GDP growth and exports suggests that rising domestic demand might divert supply from export markets. This points to the importance of balancing domestic food security and export promotion policies, particularly in high-growth periods when local consumption could increase.

5.4 Policy Recommendations

Based on the findings, several policy recommendations are proposed to enhance the performance and resilience of Kenya's agricultural export sector:

Firstly, while the direct impact of exchange rate volatility was not significant, efforts to stabilize exchange rates are essential for reducing uncertainty and fostering a predictable trading environment. The Central Bank of Kenya can implement measures such as foreign exchange interventions, inflation targeting, and promoting foreign reserves to enhance currency stability.

Secondly, Policymakers should prioritize strategies that reduce production costs and improve efficiency in the agricultural sector. These could include subsidizing agricultural inputs, providing access to affordable financing, and investing in modern farming technologies to boost productivity and reduce reliance on costly imports.

Thirdly, The government should adopt macroeconomic policies to control inflation, focusing on both monetary and fiscal measures. Reducing inflation can help maintain the competitiveness of agricultural products in international markets.

Lastly, Investments in infrastructure, such as transportation networks, storage facilities, and digital platforms, can enhance the efficiency of agricultural supply chains and Improved infrastructure can reduce costs and minimize losses, making Kenyan exports more competitive.

5.5 Limitations of the Study

While the findings of this study provide valuable insights into the relationship between exchange rate volatility and agricultural exports in Kenya, certain limitations must be acknowledged to contextualize the results appropriately;

Firstly, The analysis relied on secondary data covering the period 2000–2020. While this timeframe provides a comprehensive view, the lack of more recent data may limit the applicability of findings to the current economic context.

Additionally, gaps or inconsistencies in historical data, particularly for agricultural exports, could introduce bias.

Secondly, The use of a multiple linear regression model, while appropriate for capturing relationships among variables, may not fully account for the dynamic and complex interactions in global trade. For instance, external shocks such as global price volatility, trade barriers, or climate-related disruptions were not included in the model (Chege & Kinyua, 2021).

Thirdly, the study treated agricultural exports as a single entity, which may obscure differences across various sub-sectors.

For example, the factors influencing coffee exports might differ significantly from those affecting tea or horticulture.

Lastly, Although the study included key economic indicators, additional variables such as labor productivity, access to financing, and infrastructure development could provide a more comprehensive understanding of the factors affecting agricultural exports.

5.6 Areas for Further Research

The findings of this study highlight several avenues for future research that can deepen the understanding of the interplay between exchange rate volatility and agricultural export performance;

Firstly, Future studies could focus on specific agricultural commodities, such as tea, coffee, or floriculture, to assess the differential impacts of exchange rate volatility on various sub-sectors. This granular approach could provide insights for tailored policy interventions.

Secondly, Future research could incorporate external variables, such as global commodity prices, trade policies, and geopolitical risks, to account for their influence on agricultural exports. This would provide a more holistic perspective.

Thirdly, A comparative analysis of Kenya's agricultural export performance relative to other countries in the region could help identify best practices and lessons that can be adapted to the Kenyan agricultural sector to enhance its efficiency.

Fourthly, Examining the impact of technology adoption and innovation in agriculture on export performance could offer valuable insights into how digital tools such as artificial intelligence and advanced farming practices can enhance productivity and market access.

Lastly, these research used the currency pair kshusd but a lot of the agricultural countries are also exported to Europe hence studying the volatility of the ksheuro would also provide some valuable insights on exchange rate volatility

References

Agricultural Products Export in Nigeria. *Agris On-line Papers in Economics and Informatics*, 10(3), 3–15.

Akinbode, S. O., & Ojo, O. T. (2018). The Effect of Exchange Rate Volatility on Agricultural Exports in Nigeria: An Autoregressive Distributed Lag (ARDL) Bounds Test Approach. *Nigerian Journal of Agricultural Economics*, 8(1), 11– 19. <https://doi.org/10.22004/ag.econ.280316>

Alegwu, F. O. & Aye, G. C. & Asogwa, B. C., 2018. "Effect of Real Exchange Rate Volatility on Agricultural Products Export in Nigeria," *AGRIS on-line Papers in Economics and Informatics*, Czech University of Life Sciences Prague, Faculty of Economics and Management, vol. 10(3), September.

Central Bank of Kenya. (2022). *Annual Report 2021-2022*. Central Bank of Kenya.

Chege, J., & Kinyua, D. (2021). *Exchange Rate Volatility and Its Impact on Export Performance: The Case of Kenya*.

Journal of International Trade and Economic Development, 30(4), 645-663.

Elgali, B.M.1 & Mustafa, R.H.1(2012), The impact of overvalued exchange rate policy on agricultural trade in Sudan.

FAO. (2020). *Kenya at a Glance: Agricultural Overview*. Food and Agriculture Organization of the United Nations.

ICO. (2019). Country coffee profile: Kenya, International Coffee Council [Paper presentation]. 124th Session, 25–29 March 2019, Nairobi, Kenya.

Information Management and Business Review Vol. 7, No. 1, pp. 1-11, February 2015 (ISSN 2220-3796)

J, V. Z. (1986). THE EFFECT OF INFLATION ON AGRICULTURAL PRODUCTION UNDER CONDITIONS OF

RISK. *AgEcon Search*. <https://doi.org/10.22004/ag.econ.267132>

Kamau, P. (2020). *The Effects of Exchange Rate Movements on Agricultural Export Performance in Kenya*. African Economic Research Consortium, Research Paper 362.

Kentrade(2023), Kenya's import and export data. https://www.kentrade.go.ke/wp-content/uploads/2023/04/TradeBulletin-The-Ultimate-Finale-7_compressed.pdf

Mankiw, N 2008, *Principles of Economics*, Mason, OH, South western Cengage Learning.

Ngugi, M. & Njeru, G. (2019). *Impact of Exchange Rate Fluctuations on Agricultural Exports in Kenya*.

International Journal of Economics and Finance, 11(7), 88-95.

Ruto, R. (December, 2014). Impact of exchange rate volatility on Kenya's tea exports,1-4.

World Bank. (2021). *Kenya Economic Update: Navigating the Pandemic*. World Bank Group











