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Impact of Currency Exchange Rate on Agricultural Exports in Kenya

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Abstract: Agricultural exports play a pivotal role in Kenya's economic landscape. Kenya's Vision 2030 highlighted agriculture as one of the key economic pillars that will spur its achievement. However, there has been reduced profitability and an increased uncertainty of producing for export, leading to poor performance of Kenya's agricultural exports. It is against this background that this study examined the impact of currency exchange rate and agricultural exports in Kenya from 1982 to 2022. The study was anchored on the purchasing power parity theory, using the causal research design. OLS regression results indicated a significant positive effect of currency exchange rate on agricultural export performance at a 5% significance level. The study recommends that the government adopts policies that maintain a competitive exchange rates to boost the agricultural export performance in Kenya.

Keyword: Agricultural exports; currency exchange rate; purchasing power parity; Kenya.

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Introduction

Exports of agricultural products are important for economic expansion in developed and emerging nations by providing employment, foreign exchange, and reducing the balance of payment deficits (Siaw et al., 2018). Over the past few decades, a noteworthy transformation in agricultural exports occurred globally, with a shift from bulk crops to horticultural and processed food products (Martin, 2018). The percentage of bulk agricultural goods in total agricultural exports across the globe decreased from 25% to 17% for the period spanning 1988-2014. This shift in the global agricultural market structure unlocked numerous fresh prospects for exporters, generated employment opportunities and bolstered export revenues for trading nations (Miocevic & Karanovic, 2012).

According to data from FAO (2022), the value of global agricultural exports in 2021 was USD 1745 billion. Brazil, New Zealand and Spain were the top three net food exporters in 2021, accounting for 50% of exports, with a total value of USD 76.9 billion, with 50% of exports being soya beans, followed by New Zealand (USD 39.2 billion) and

Spain (USD 26.2 billion). Schweizer and Yildirim (2022) noted that Brazil has become an agricultural superpower and the largest competitor to the US, becoming the biggest exporter of soybeans and poultry products globally. Agri-food exports from the European Union reached €229.8 billion in 2022, which was a 31% increase as compared to the previous year (FAO, 2023).

In the African context, Agricultural exports totaled USD 185 billion in 2022, up 25% from the previous year. The proportion of bulk goods in agricultural exports in Sub-Saharan Africa has decreased from 60% to 42% while processed goods have increased to 35%, with the horticultural sector accounting for 22% of exports (Fukase & Martin, 2018). Kenya's Vision 2030 identified the agriculture sector as one of the key drivers of the economy to sustainably achieve an average economic growth rate of 10 percent, reduce poverty levels to 25 percent and boost food security to 30 percent by the year 2030. The key leading agricultural exports are tea, coffee, cut flowers and vegetables. Kenya is one of the world's leading exporters of black tea and cut flowers (Muthamia & Muthuri, 2015). Agricultural exports foster Kenya's economy in terms of foreign exchange earnings, employment opportunities and overall general economic growth (Irandu, 2019; Aragie et al., 2023). Nevertheless, because of volatility brought about by macroeconomic variables as exchange rate (Boansi et al., 2014; Samoei and Kipchoge, 2021), the performance of agricultural exports has been dismal over the years in Kenya (Kipkorir, 2020). For instance, agricultural exports in 2022 were valued at Kshs 353 billion, down from Kshs 511 billion in 2021 (WTO STATS, 2023).

The exchange rate refers to the expression of a country's currency value in another currency. It displays the amount of a certain currency that is sufficient to purchase one unit of another. Exchange rates impact the competitiveness and profitability of agricultural exports (Ogunjo et al, 2022). When a country's exchange rate is high, it means that its currency is more valuable and as a result, the agricultural produce becomes more expensive for foreign buyers (Ojede, 2015). This decrease in affordability reduces the demand for agricultural exports (Ogunjobi et al., 2022). Conversely, when the exchange rate is low, it means that the country's currency is less valuable, making agricultural products more affordable for foreign buyers. The increase in affordability leads to an increase in demand for agricultural exports (Akinniran, & Olatunji, 2018).

Even though there are a lot of studies on Kenya's agricultural industry, very few of these studies specifically addressed the country's agricultural exports as impacted by macroeconomic factors, such as currency exchange rate. For example, Kipkorir (2020) concentrated on trade liberalization (Kiprono 2019) concentrated on coffee exports while Irandu (2019) focused on horticultural exports. In light of this trend, the study was necessary to address the above gaps by examining how currency exchange rate impacts the Kenya's agricultural exports.

Literature Review

This section explores studies by other scholars, who looked at agricultural exports and how it is impacted by macroeconomic factors like currency exchange rates. Kiprono (2019) looked at Kenya's coffee export performance between 1980 and 2018. The author considered several factors while applying the Error Correction Model (ECM), including the global real GDP over time, trade openness, capital creation, Foreign Direct investment inflows, institutional quality in compliance with the law and exporting capacity. The results of his analysis demonstrated that coffee exports were considerably and favorably impacted by FDI inflows, institutional quality as well as the real effective exchange rate. Coffee exports benefited from the Kenyan currency's depreciation as well. It is crucial to remember that the study did not look at the agricultural exports as a whole; rather, it solely looked into the coffee export performance. Therefore, this study needed to concentrate on how Kenya's agricultural export performance is impacted by exchange rates.

Thuy and Thuy (2019) investigated how real exchange rate volatility affected Vietnam's exports using the bound testing method. The study examined quarterly data from 2000 to 2014. The findings demonstrated that devaluation and fluctuating exchange rates have a detrimental short-term impact on exports. However, a J-curve showed that in the long run, depreciation increased export volume. The goal was to ascertain how real exchange rate volatility affects Vietnam's export sector. This study looked at the effect of currency rates on Kenya's agricultural export performance.

Epaphra (2016) used Granger causality and Johansen's cointegration to examine the variables

influencing Tanzania's export performance between 1966 and 2015. The steady long-run connection between the export factors was also empirically estimated using error correction modeling. The results showed a favorable correlation between Tanzanian exports and exchange rates, real per capita GDP, and trade liberalization. Granger causality also showed a pattern of association between exports and economic development.

A study on the variables influencing exports in certain Asian economies, such as those in East, Southeast, and South Asia between 1980 and 2012 was carried out by Malhotra and Kumari (2016). The Ordinary Least Square (OLS) method was used to evaluate the impact of export performance while accounting for traditional supply and demand, the real effective exchange rate, global demand, capacity or production level, and relative prices. The study also considered how trade and foreign direct investment affected export performance. The researchers discovered that an increase in exports was caused by the currency rate's volatility. The study examined the level of association between exchange rate volatility and exports in general rather than the relationship between agricultural export performance and exchange rate volatility. However, this study looked at how Kenya's agricultural export performance was affected by exchange rates.

Theoretical Underpinnings

This study is anchored on the purchasing power parity (PPP) Theory proposed by Cassel (1918). The classic theory of purchasing power parity (PPP), a cornerstone of conventional open-economy macroeconomic models, is based on the notion that the currency exchange rate equalizes prices of comparable commodities in different nations (Vo & Vo, 2023). The theory stipulates that if a variation in currency exchange results in difference in pricing of a commodity across borders, then it will lead to arbitrage, which will lead to price adjustment or exchange rate variation or both. This theory is vital in understanding how the competitiveness and profitability of agricultural exports are impacted by exchange rates (Ogunjobi et al, 2022). When a country's exchange rate is high, it means that its currency is more valuable and as a result, the agricultural produce becomes more expensive for foreign buyers (Ojede, 2015). This decrease in affordability reduces the demand for agricultural exports (Ogunjobi et al., 2022). Conversely, when the exchange rate is low, it means that the country's currency is less valuable, making agricultural products more affordable for foreign buyers. This increase in affordability leads to an increase in demand for agricultural exports (Akinniran & Olatunji, 2018).

Methodology

This study used the causal research design. Kothari (2021) explains that the research design describes the aims and objectives of the study as well as the protocols and techniques that will be followed to gather and process data. The design was adopted in examining the effect of currency exchange rate on agricultural export performance in Kenya.

Description and Measurement of Variables

Table 1 provides information on the description of study variables, how they were measured, and the predicted signs.

Table 1: Description and Measurement of the Variables

Variable	Description	Measurement	Expected sign
Agricultural export Performance	Variation in the real output of the agricultural export	Percentage of total exports	Dependent variable
Currency exchange rate	Proportion of changing a country's Currency into another	Real effective exchange rate	+/-
Inflation	The overall rise in the prices of products which leads to a decline in the purchasing power of a currency within an economy	Consumer Price Index	+/-
Capital formation	The net capital buildup in a nation throughout an accounting period	Gross capital formation as a percentage of GDP	+/-

Population and Sampling

The source of data was the annual time series from 1982 to 2022 from the World Development Indicators in studying the impact of currency exchange rates on agricultural exports. The currency exchange rate was proxied by the real effective exchange rate while agricultural export performance was proxied as agricultural exports as a percentage of total exports. Other control variables were capital formation, which was proxied by gross capital formation as a percentage of GDP and inflation, which was measured by the consumer price index.

Diagnostic Tests

The following pre-estimation diagnostics were estimated before model estimation to ensure accurate and reliable results. They include the ADF test for stationarity and the ARDL Bounds for co-integration.

Ethical Considerations

The National Commission for Science, Technology and Innovation (NACOSTI) granted authorization for the study, demonstrating the researcher's scrupulous adherence to ethical norms and standards. Throughout data collection, analysis and result presentation, the researcher upheld strict criteria of impartiality, secrecy and academic honesty.

Econometric Model Specification

A Multivariate regression analysis was carried out to check the hypothesized relationship between currency exchange rate and agricultural export. The following model was used: $\mathbf{lnAGX_t = \beta_0+\beta_1 lnCER_t+\beta_2 lnINF_t+\beta_3 lnCPF_t+\mu}$

where lnAGX= natural logarithm of agricultural export performance, lnCER=natural logarithm of currency exchange rate, lnINF=natural logarithm of inflation and lnCPF= natural logarithm of capital formation, t=time index, and μ= error term.

Results and Discussion

This section contains results on descriptive statistics, diagnostic tests and regression analysis on the effect of currency exchange rate and agricultural export performance.

Descriptive Statistics

Table 2 indicates that agricultural exports performance had a mean of 10.64%, the maximum value of 17.74% and the minimum value 0f 5.51%. Currency exchange rate had a mean of Kshs 64.34 per US$, the maximum value of Kshs 117.87 per US$ and the minimum value of 10.92 Kshs per US$.

Table 2: Descriptive Statistics Results

	AGX	CER
Mean	10.6360	64.34
Median	10.6975	72.10084
Maximum	17.7381	117.866
Minimum	5.508344	10.92232
Std. Dev.	3.967303	31.83263
Skewness	0.366709	-0.34703
Kurtosis	2.027157	1.936618
Jarque-Bera	2.535721	2.754677
Probability	0.281433	0.252249
Observations	41	41

Augmented Dickey-Fuller Unit Root Test Results

Econometric models and approaches assume time series data to be stationarity, implying that data has constant mean and variable, hence it does not have a unit root (Gujarat, 2022). Therefore, it is imperative to test for the presence of a unit root before model estimation to ensure accurate results. The Augmented Dickey Fuller (ADF) test was used in checking the stationarity of the time series data. To handle possible serial correlation within the disturbance period, this test makes use of lag values. Aljandali and Tatahi (2018) state that the test's null hypothesis presupposes the presence of a unit root. The ADF test null hypothesis assumes the presence of stationarity. For the null hypothesis to be accepted, the ADF T-statistic must be greater than the 5% and 1% critical values regardless of the sign; otherwise, the null hypothesis is rejected. The ADF test results at various levels are displayed in Table 3.

Table 3 ADF Unit Root Results

Variable	ADF Test statistic @ level	Critical value @ 5%	ADF Test statistic @ 1st Difference	Critical value @ 5%	Level of Integration
LnAGX	-3.4850	-3.5266	-8.6042	-3.5298	I(1)
LnCER	-1.6522	-3.5266	-5.6147	-3.5298	I(1)
LnCPF	-2.6087	-3.5266	-5.9954	-3.5331	I(1)
LnINF	-5.0050	-3.5266	-	-	I(0)

From Table 3, agricultural export performance (lnAGX-8.6042), currency exchange rate (lnCER-5.6147), and capital formation (lnCPF-5.9954) were stationary at first difference or integrated of order one while inflation was stationary at level or integrated of order zero.

ARDL Bounds Cointegration Test

The study adopted the ARDL bounds cointegration test in checking for the presence of a long run relationship among the variables as the variables were integrated of order zero I(0) and one I(1). The decision criteria of the ARDL Bounds test is based on comparing the F-statistic value and the 5% Bounds critical values of the upper bound I(1) and lower bound I(0). Based on the decision criteria, cointegration is present when the ARDL Bounds F-statistic test value is greater than the 5% critical values of the upper and lower bounds. On the other hand, there is no cointegration when the ARDL Bounds F-statistic test value is lower than the upper and lower bound critical values at 5%. The results in table3 show the absence of cointegration among the variables as the F-statistic value of 3.333 was less than the upper bound critical values at 1%, 5% and 10% significance levels.

Table 4: ARDL Bounds Results

Test Statistic			**Value**			
F-statistic			**3.333820**			
Bounds Critical values						
	10%		**5%**		**1%**	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
35	3.8	4.888	4.568	5.795	6.38	7.73
40	3.76	4.795	4.51	5.643	6.238	7.74
Asymptotic	3.47	4.45	4.01	5.07	5.17	6.36

Regression Results

Table 5: Regression Results

Explained Variable:DLAGX
Method: Least Squares
Sample: 1982-2022
Included observations:41

Variable	**Coefficient**	**Std. Error**	**t-statistic**	**Prob**
DLCER	0.398346	0.050977	7.814212	0.0000
DLNCPF	0.487800	0.236795	2.060009	0.0465
LNINF	-0.281707	0.108733	-2.590808	0.0182
C	0.334201	0.085129	3.925797	0.0015
R-squared		0.661289	Mean dependent var	2.204397
Adjusted R-squared		0.633826	S.D. dependent var	0.328753
S.E. of regression		0.198936	Akaike info criterion	-0.299198
Sum squared resid		1.464297	Schwarz criterion	-0.132020
Log likelihood		10.13355	Hannan-Quinn criteria.	-0.238321
F-statistic		24.07920	Durbin- Watson stat	1.843424
Prob (F-statistic)		0.000000		

Results Interpretation

From Table 5, the Currency Exchange Rate (DLCER) has a significant effect on agricultural export performance with a p-value of 0.0000, which is less than 0.05. The positive sign of the coefficient signifies that the Currency exchange rate stimulates agricultural export performance. Furthermore, the Currency exchange rate had a coefficient (β_3) of 0.398346 showing that a percentage increase in capital expenditure leads to a 39.8346 percentage increase in the agricultural export performance, keeping all other variables constant.

These findings imply that favorable real currency exchange rates stimulate the performance of agricultural exports. The research outcome is in concurrence with the findings of other studies, such as that of Kiprono (2019), who found that the real effective exchange rate had a significant and positive impact on coffee exports in Kenya and Epaphra (2016), who found that the exchange rate

was positively related to Tanzanian exports. Additionally, the results align with the findings of Malhotra and Kumari (2016), who found that exchange rate volatility increased the export volume in Asian economies.

Post Estimation Diagnostic Tests

Jarque Berra Residual Normality Test

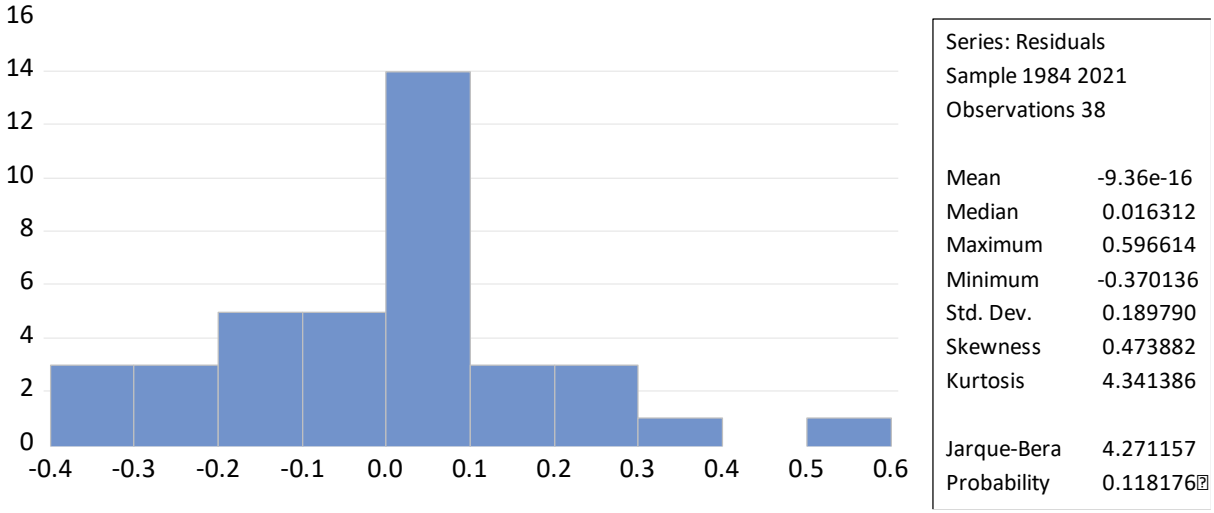

Figure1: Jarque-Berra Test for Normality

Table 6: Showing the Variance Inflation Factor Multicollinearity Test Results

	Coefficient	Uncentred	Centred
Variable	Variance	VIF	VIF
DLNCER	0.002599	43.84323	1.310105
DLNCPF	0.056072	519.0919	1.205332
LNINF	0.002274	12.53689	1.097964
CONSTANT	0.697769	722.8828	N/A

Normality of the residuals is a key assumption in linear regression. If the residuals are not normally distributed, it leads to inaccurate inferences. In testing for residual normality, the Jarque Berra test, which assumes normal distribution was used in this study. Figure 1's findings indicate a normal distribution of the regression residuals because of the Jarque-Berra p-value of 0.118176>0.05 (Aljandali and Tatahi, 2018).

Vif Multicollinearity Test

Variance Inflation Factor (VIF) test is a statistical concept that indicates the increase in the variance of the regression coefficient because of collinearity. For the VIF test, a criterion was set that VIF values should be below 10, displaying the absence of multicollinearity within the regression model (Gogtay & Thatlle, 2017). The outcomes of the VIF are presented in Table 6.

The centered VIF values were used in the interpretation of the results. Table 6 shows that the VIF values of DLNCER, DLNCPF and LNINF are 1.310105, 1.202713 and 1.097964 respectively. Given that the VIF values were less than 10, multicollinearity in model was presumed to be absent.

Autocorrelation

The regression model for auto correlation was examined in this work using the Breusch-Godfrey LM test. When the present values of the error term are influenced by the lag values of the error, auto correlation takes place. The null hypothesis of the Breusch-Godfrey LM test is that the regression model has no autocorrelation. The symbol for the null hypothesis is H0: p-value>0.05. The alternative hypothesis, denoted as H1: p-value<0.05, is the existence of auto correlation. Table 7 shows the

auto correlation result of the Breusch-Godfrey LM Test.

The results of the Breusch-Godfrey test in Table 7 reveal that the p-value for the Chi-square (2) test was 0.6063>0.05, suggesting that the null hypothesis—that the model had no auto correlation was accepted.

Table 7 Breusch- Godfrey Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 4 lags			
F-statistic	8.971941	Prob.F(2,35)	0.7151
Obs*R-squared	13.89583	Prob. Chi-Square(2)	0.6063

Table 8 Breusch-Pagan- Godfrey Heteroscedasticity Test

Heteroscedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	1.707010	Prob. F(3,37)	0.1824
Obs *R-squared	4.984738	Prob. Chi-Square(3)	0.1729
Scaled explained SS	3.204739	Prob. Chi-Square(3)	0.3611

Heteroscedasticity Test

Gujarat (2022) noted that heteroscedasticity is present in a regression model when the variance of errors in a regression model is not constant across the observations. This violates the ordinary least squares assumption on homoscedasticity, which dictates constant variance of the error term over time. The absence of homoscedasticity that is heteroscedasticity leads to biased estimates and standard errors. To check if the regression's residues showed heteroscedasticity, this study employed the Breusch-Pagan-Godfrey test. The absence of heteroscedasticity, or the null hypothesis, in this test, requires a p-value Chi-Square of the Observed R-squared to be more than 0.05. On the other hand, a p-value being less than 0.05 shows that the variance of the residuals is not equal over time in the regression model. The outcomes of the Breusch-Pagan-Godfrey Heteroscedasticity Test are shown in the Table 8.

Based on results in Table 8, the probability Chi-Square (4) of the Obs*R-squared value was 0.1729>0.05, implying the absence of heteroscedasticity, and at the 5% level of significance, the researcher did not reject the null hypothesis.

Conclusions and Recommendations

The aim of the study was to examine the impact of currency exchange on agricultural exports in Kenyan from 1982 to 2022. The study concludes that currency exchange rate is a significant determinant of agricultural export performance. Therefore, the study recommends that the government may consider implementing strategies to support exchange rate stability or actively manage the exchange rate through monetary policy to maintain competitive exchange rates to boost the agricultural export performance.

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