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**The Effect of Exchange Rate Volatility on
Lending Rates for Commercial Banks in Kenya**

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ABSTRACT

This research examined how fluctuations in the exchange rate influenced interest rates charged by Kenyan commercial banks. Given the substantial influence of fluctuating exchange rates on economic activity and financial conditions, this study aimed to understand the relationship between currency changes and borrowing costs in Kenya. While earlier studies have investigated the wider impacts of exchange rate fluctuations on the profitability of banks, the specific impact on lending rates remains understudied. To accurately measure exchange rate volatility and comprehensively analyze its connection to lending rates, the study utilized the ARCH/GARCH models and subsequently a Stepwise Regression of the variables. The study found that while all three currencies showed volatility, only the Euro's exchange rate fluctuations had a positive and statistically significant effect on lending rates. Changes in the Euro influenced lending rate variations, whereas the USD and Ugandan Shilling's volatility did not.

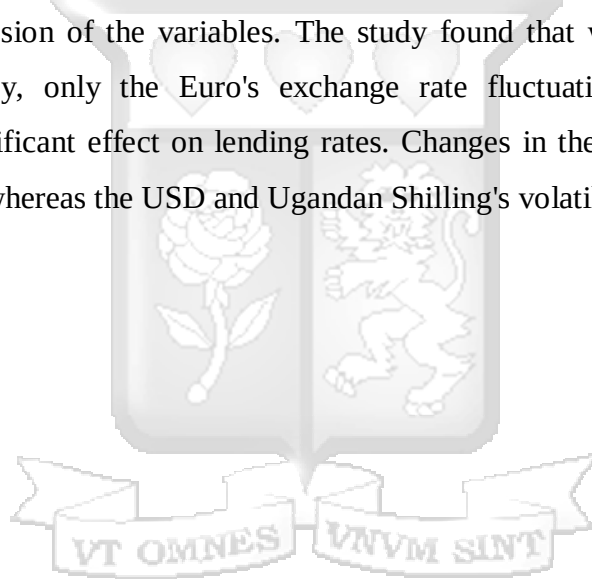


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CHAPTER 1

INTRODUCTION

1.1 Background

Before the mid-20th century, the global monetary system was based on the gold standard, where currencies were directly convertible into gold at fixed exchange rates. These fixed exchange rates were determined by the relative value of gold in different currencies. This system collapsed in 1944 with the establishment of the Bretton Woods system. Under this system, the US dollar was pegged to a specific gold value, and other countries fixed their exchange rates to the dollar. This fixed exchange rate regime persisted until the early 1970s when the United States adopted a floating exchange rate system. In this system, currency values are determined by market forces of supply and demand, rather than government intervention.

Before Kenya fully liberalized its currency exchange in 1993, it employed various exchange rate systems. Initially, upon independence in 1963, the Kenyan shilling was rigidly fixed to the US dollar. However, due to significant currency depreciation, a crawling peg system was introduced between from the end of 1982 to 1990, to gradually adjust the exchange rate based on a basket of major trading partners' currencies. Kenya then adopted a dual exchange rate, consisting of different rates, fixed and floating that are used for the same currency during the same period of time. This occurred up to 1993, where Kenya liberalized its currency as stated earlier. The shift to a floating exchange rate was motivated by several factors, including the need for greater flexibility in responding to market forces. As (Mwega, 2014) noted, a flexible exchange rate system allows for continuous adjustments to changes in foreign exchange supply and demand. While Kenya currently operates under a floating exchange rate, it is important to note that government intervention is used to stabilize the Kenyan shilling during periods of extreme overvaluation or undervaluation.

1.2 Factors Affecting Exchange Rate Volatility

Exchange rate volatility, defined as the unpredictable fluctuations in currency values (McKenzie, 1999), is a significant source of economic and financial instability. As (Vania Stavrakeva, 2023) highlights, this volatility can deter financial institutions from facilitating cross-border transactions due to increased perceived risks. While this study primarily focuses on the influence of exchange rate fluctuations on lending rates for commercial banks in Kenya, understanding the factors driving these fluctuations is essential for a comprehensive analysis.

(Fund, 2003) studied the causes of exchange rate volatility across 85 developing and transition economies in 2001 and concluded that inflation, GDP growth and fiscal deficits were among the macroeconomic factors having an effect on exchange volatility but noted that domestic developments caused disparities between volatilities across countries. This study by the IMF brings about a discussion of the factors affecting exchange rate volatility being specific to a certain country and the unique macroeconomic factors that come with it. (Zahra , Willy , & Tobias, 2020) specifically looked into the factors that affect exchange rate volatility relative to USD in Kenya using a descriptive study and regression analysis for the data and came to the conclusion that interest rates, inflation and remittances all have a significant impact on exchange rate volatility within the country. The author highlighted the key determinants of exchange rate fluctuations in Kenya which enables this study to gain additional perspective on macroeconomic factors to consider within the construction of the study as a whole.

1.3 Main Traded Currencies in Kenya

According to the European Union, the EU is a prominent trading partner as it accounts for 13.6% of Kenya's exports in 2023. Uganda closely follows with 9.5% and the United States with 8.7% of Kenya's total exports. This data is further backed by the observatory of Economic Complexity (OEC) that noted Kenya exported mostly to the United States of America(\$722M) and to Uganda (\$677M) as of 2022. With the Dollar being a big and stable currency entrenched in the global economy, as stated by an article in Bloomberg, and the big trading relations Kenya has with Uganda and Europe, this in turn forms the

selection of the US Dollar, the Euro, and the Ugandan Shilling as the focal currencies in this study, driven by their significant economic influence within the Kenyan context

1.4 Problem Statement

(Erik & Igor, 2020) in a study analyzing the main trends and patterns of nominal lending rates in emerging markets and developing economies described the importance of bank interest rates. The authors highlight the importance by naming them as fundamental to macroeconomic and financial sector outcomes as they influence the availability of capital in the economy, the pool of viable investments as well as the health of public and private balance sheets. (Itimu & Abdul, 2018) noted the history of lending rates in Kenya by stating that the government intervened in the 1960s and the 1970s where interest rate policies were inactive by fixing minimum lending rates for commercial banks. However, the authors also note the significance of the liberalization on interest rates in the country since 1991 that has led to high interest rates thus reducing the spending capacity of households and businesses.

A research gap was identified during this study, as previous research has primarily focused on the impact of exchange rate volatility on commercial bank profitability in different countries such as Iran, Kenya and Sudan and no specific focus was found on lending rates. In addition, in regards to lending rates, studies found hinted at the correlation between exchange rate volatility and lending rates in Kenya while discussing their findings. (Kinyuru F. G., 2011), for example, stated that among the factors affecting lending rates in Kenya, foreign exchange risk influenced the determination of lending rates for commercial banks. Although the relationship was highlighted, past research did not signify the relationship as a main objective of the study. Moreover, studies have also delved into the factors that determine lending rates in Kenya by stating the significance of foreign exchange risk but not looking into that type of risk as a significant research objective.

With the continuous volatility of the exchange rate in Kenya since 1993, this study aims to quantify the effect of foreign exchange risk to lending rates of commercial banks in the

country by studying the volatility of the dollar, Euro and Ugandan shilling and the subsequent effects on credit determination.

1.5 Research Objective

As a whole, this study aimed:

1. To determine the magnitude and direction of the impact of exchange rate volatility of the USD, Euro, and Ugandan Shilling on lending rates for commercial banks in Kenya.
2. To investigate the statistical significance of the relationship between exchange rate volatility of the USD, Euro, and Ugandan Shilling and lending rates for commercial banks in Kenya.

1.6 Research Questions

The primary objective of this study was to examine the relationship between exchange rate volatility and lending rates within Kenya's commercial banking sector. Specifically, the research sought to answer the following questions:

- 1) What is the effect of exchange rate volatility of the USD, Euro, and Ugandan Shilling on lending rates for commercial banks in Kenya?
- 2) Which currency's volatility (USD, Euro, or UGX) has the most significant influence on lending rates?

1.7 Significance of the Study

The study is significant as it will firstly portray the significance of exchange rate volatility in the lending rate market in Kenya. Exchange rate volatility is a financial risk that is at most times calculated and factored in to the specification and risk appetite of an individual firm but not calculated across all listed commercial banks. This study could aid in the determination of monetary policies in regards to foreign exchange that could affected all listed commercial banks and curb against the negative effects of the volatility of the

Kenyan Shilling thus trickling down to the credit market and the determination of the borrowing ability of households and businesses in the country. This study will also be useful to firms in understanding how to improve current risk strategies and systems integrated within the firm in order to mitigate foreign exchange risk. All commercial banks in Kenya trade in foreign currency in different magnitudes and understanding the extent to which they are affected by volatility in exchange rates can improve future predictions and put in place pre-determined strategies that will significantly shield them from currency volatility.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The chapter gives insight into the literature review regarding foreign exchange, foreign exchange volatility as well as studies looking into the relationship between currency volatility and lending rates. Section 2.2 discusses theories related to the study, section 2.3 summarizes past studies conducted within the chosen study topic and section 2.4 summarizes the chapter with an overview of the literature and explains the relevance towards the study.

2.2 Theoretical Literature review

There are several theories related to foreign exchange volatility and credit risk. They include: Purchasing power parity, loanable funds theory and liquidity preference theory.

2.2.1 Purchasing Power Parity

Versions of purchasing power parity (PPP) theory can be traced back to the Salamanca school in 16th Century Spain but it was first put to practice by Swedish economist and professor Gustav Cassel in 1916, as a means of solving the crisis of maintaining the gold standard after world war I. (Taylor & Taylor, 2004) proposed that the exchange rate between two currencies should reflect the relative price levels of the two countries. In essence, this means that a unit of currency should have equivalent purchasing power in both countries. An example of the theory is, if the price of a book in Kenya is 100Ksh and that amount of money is converted to say the US dollar, it should cost the 100Ksh converted in that currency to buy the same book.

The simplest form of the PPP is the absolute PPP that states that the prices of product in two countries should be equal when measured by a common currency; the “law of one price”. The theory, however, does not hold for the following reasons. (Lafrance & Schembri, 2002) attests to the presence of transaction costs for traded goods, the fact that real exchange rate is not constant in the short run, the composition of basket of goods differs across countries and the existence of non-traded goods and services that preclude

arbitrage. To avoid these issues, a weaker form of the PPP known as relative PPP is used. It accounts for the effect of inflation on purchasing power.

The purchasing power parity theory has consistently been used to compare economic productivity and is stated to be a more accurate measure of wellbeing. The Eurostat-Organization for Economic Co-operation and Development (OECD) PPP Programme, for example, was established in the early 1980s to compare on a regular and timely basis the GDPs of member states. This comparative aspect of the theory in regards to comparison of a basket of goods will not be used within this study.

This theory is relevant, however, as it sets the tone to establish value of one currency to another. With those quantitative values and their changes established within the three main currencies stated in this study, they will aid in the modelling of the effect of those price changes to lending rates of commercial banks over the study period established.

2.2.2 Loanable Funds Theory

The loanable funds theory was developed in the 1930s by economists Dennis Robertson and Bertil Ohlin, however its origins are linked to Swedish economist Knut Wicksell. (Alvin, 1951) describes the theory as the intersection of the demand-schedule for loanable funds with the supply-schedule. Essentially, when supply and demand differ, interest rates change and the loanable funds theory explains this through the interaction of lenders and borrowers within the market. Households, businesses, and government entities require borrowed funds to finance investments. The availability of loanable funds is determined by lenders' willingness and capacity to extend credit which are funds from savers or firms with excessive profits. The theory, however, does not take into account the role of international capital flows, the reality of information asymmetry in the market as well and the role the government plays within the determination of interest rates.

The theory is relevant to the study as it gives insight to the role of demand and supply of loanable funds to the determination of interest rates. This theory enables the study to link the effect of exchange rate volatility to the changes in demand and supply of loanable funds and gives rise to how that volatility ultimately affects the interest rates given by commercial banks for credit.

2.2.3 Liquidity Preference Theory

This theory was brought about by John Maynard Keynes in 1936 through his work “The general theory of employment, interest and money”. Millikan, M. (1938) states that interest rate in the liquidity preference theory is determined by liquidity preference and the quantity of money. The theory makes an assumption that people prefer to keep liquid assets such as cash than to illiquid assets such as bonds and therefore interest rates adjust to balance the unwillingness of those with liquidity to part with it. Essentially, a low interest rates means investors are willing to hold more bonds therefore increase money supply and high interest rates shows that investors are unwilling to be illiquid and in order to balance this state interest rates increase.

Many have criticized the theory for being too simplistic in assuming that interest rates are only determined by the demand and the supply of money and ignoring other factors such as savings that reduces market rates due to a decreased propensity to consume that affect interest rates.

Although this is the case, this study will borrow the aspect of money supply determining interest rates but add the thought process of exchange rate volatility to it. (Maria & Stilianos, 2009) state that the comparative statistics of their study are indicative of the positive relationship between exchange rate volatility and the volatility of money supply. By examining this connection, the study seeks to uncover the impact of exchange rate fluctuations on borrowing costs within the banking sector.

2.3 Empirical Literature Review

Numerous studies have conducted the effects of exchange rate volatility on bank performance or bank related aspects. (Mbutor, 2010) aimed to ascertain the impact of foreign exchange volatility on bank loans. The Vector Autoregressive model methodology was applied and the data series treated for temporal properties unit roots and co integration. The author within the measurement of exchange rate volatility stated an assumption that the banker factors in exchange rates in decision making with an

understanding of past trends but inability to predict the future. The study concluded through the impulse response analysis is that a standard deviation on exchange rates did not have an effect on lending behavior of banks in Nigeria. A strength of the study is the test for causality for exchange rates with multiple factors which this study aims to integrate. However, due to the study area being Nigeria, the macroeconomic factors affecting this study may be different therefore generating different results.

(Kinyuru F. G., 2011) analyzed the determinants of lending rates of commercial banks in Kenya from 2006 to 2010. The study used a descriptive survey with the population of the study being 44 commercial banks in Kenya. Primary and secondary data was used with questionnaires being the source of primary data and journals and reports from the commercial banks as well as the Central Bank of Kenya for the secondary data. A linear regression model of bank lending rates versus the factors influencing lending rates of commercial banks in which a positive relationship was established between market factors such as foreign exchange rates and lending rates. This study will borrow the quantitative establishment of the extent of foreign exchange effect on lending rates but will proceed to further analyze the volatility of those rates which this past study did not look into. A limitation of the study was that the correlation of the dependent variables in the regression were not accounted for. An inclusion of correlation tests would enable this study to have more distinctive results.

(Keshtgar, Pahlavani, & Mirjalili, 2020), studied the impact of exchange rate volatility on banking performance in Iran. The study included 14 banks and they were analyzed between the years of 2007 to 2017. The GARCH model was employed to derive exchange rate fluctuations and panel data was used to determine bank performance. In regards to bank performance, two criteria were used which included loans to deposit ratio (LTD) and the ratio of bank's capital return (ROI). A key area of the study was the inclusion of the efficiency variable that (Keshtgar, Pahlavani, & Mirjalili, 2020), states that the efficiency variable was the bank's ability to convert excess capital into lending and in turn have a positive impact on growth. The conclusion of the study was that exchange rate volatility has a positive effect on bank's lending behavior and with that conclusion, previous research has established a clear link between exchange rate volatility and bank lending

behavior, providing a foundation for this study. Although this is the case, the study fails to discuss the effect of exchange rate volatility on the lending rates as well as give a brief overview of the effect on the lending market in Iran as it focuses on other areas of bank performance. This study deviates by specifically looking into the effect of exchange rate fluctuations on lending rates rather than banking performance as a whole.

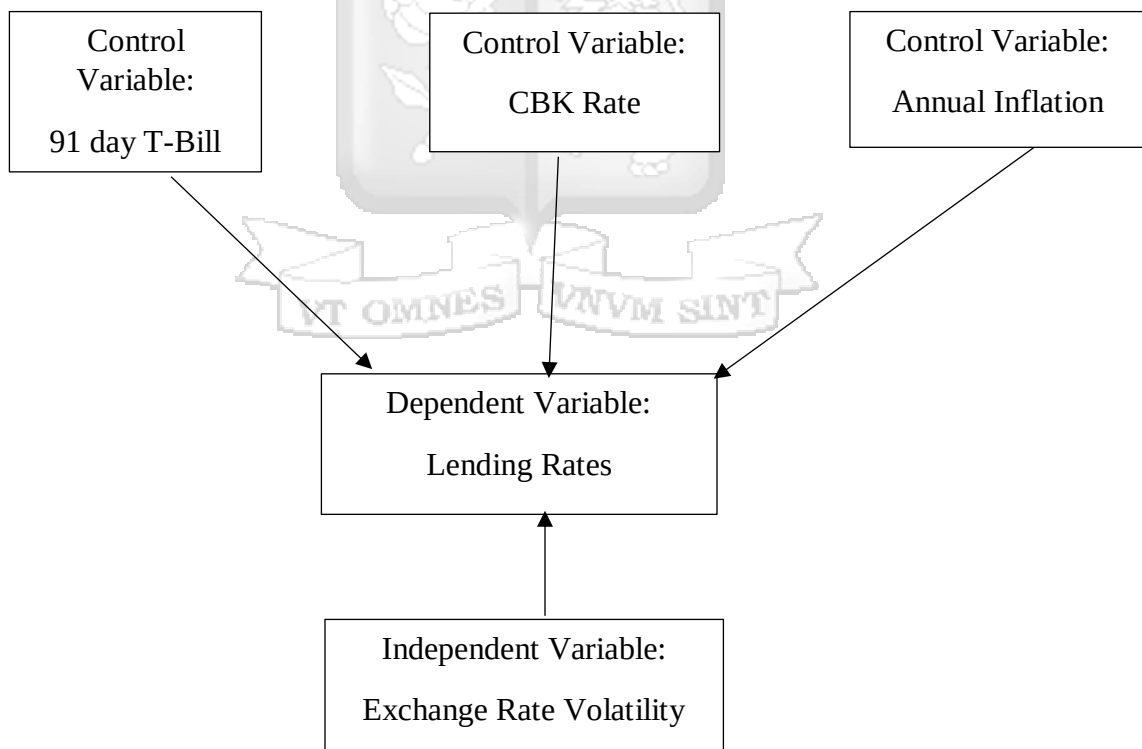
(Massomeh & Chen, 2019) used a log linear model within their study by including variables such as real effective exchange rate, exchange rate adjusted for inflation to determine in the short run as well as the long run to determine the ratio of liquid liabilities for 16 emerging countries between 1980 and 2011. The authors concluded that a strong negative link between exchange rate volatility and liquid liabilities was confirmed noting that unexpected exchange rate shocks causes households and firms to cut their banking activities as well as saving and investment. A majority of studies, however, note that study areas have a huge influence in determination of exchange rate volatility effects. (Elhussein & Osman, 2019) looked into the effect of exchange rate volatility on financial performance of banks in Sudan using data analysis such as OLS, GLS and ARDL and concluded that for the time period of the study, 2002-2017, noted that the severe economic sanctions imposed on the country significantly depreciated the national currency and created an uncompetitive investment environment. This resulted in a negligible relationship between exchange rate fluctuations and the financial performance of Sudanese banks.

Using the East African Community countries of Kenya, Uganda and Tanzania, (Njagi & Nzai, 2022) looked into the effect of exchange rate volatility on banking performance in these countries. The study employed an explanatory research design and inferential statistics such as a regression analysis was employed concluding that currency rate volatility and credit risk influence how successfully commercial banks operate and further stated that a decline in ROA may have been influenced by credit risk and currency rate volatility. This study further adds to the argument of the unique importance of study areas chosen in the conclusion of results as well as the importance of an active and competitive market in regards to investment.

2.4 Research Gap

Past Literature has mostly discussed the effect of exchange rate volatility on bank performance and profitability in different countries such as Iran, Sudan as well as those in the East African Community such as Uganda. This study seeks to address the gap in existing literature by specifically looking into the effect of exchange rate volatility on lending rates for commercial banks in Kenya and determine whether there is a significant relationship, an area which past literature has not significantly delved into. The theories stated set a sustainable foundation as purchasing power parity discusses the relationship between one currency and another while the loanable funds theory and liquidity preference theory improve this study by stating the role of demand and supply of loanable funds as well as liquidity in the determination of interest rates that commercial banks derive from.

2.5 Conceptual Framework



CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter looks into the methodology used to investigate the relationship between exchange rate volatility and lending rates for commercial banks in Kenya. Section 3.2 looks into understanding the research design while section 3.3 states the data source and population of the study. Section 3.4 highlights the data collection and sources while section 3.5 and 3.6 look into the diagnostic tests and model specification respectively.

3.2 Research design

This study employs a quantitative approach with a two-pronged analysis. First, it utilizes a multivariate time series model to examine the relationship between the exchange rates of the US Dollar, Euro, and Ugandan Shilling, and lending rates for commercial banks in Kenya. This approach differs from Epaphra M. (2017), who used a univariate time series to analyze the Tanzanian Shilling against the US Dollar. Our multivariate framework is necessary due to the inclusion of three exchange rates in the analysis. The study aims to determine the impact of exchange rate volatility on lending rates and investigate the presence of short-term and long-term effects. Independent variables include the exchange rates of the three currencies, while the dependent variable is the average lending rate of Kenyan commercial banks. Control variables encompass inflation, GDP growth rate, and the Central Bank Rate.

Secondly, the study conducts a stepwise regression analysis. This step aims to isolate the currency with the most significant impact on lending rates by regressing the modeled volatility of each exchange rate against the average lending rate.

3.3 Population and Sampling

The analysis for the three objectives stated in the study utilizes the total population of commercial banks in Kenya as the basis for analysis. Due to the dependent variable, the average lending rates, reflecting the aggregated outcome for all commercial banks in Kenya, the use of the entire population ensures an extensive examination of the effects of exchange rate volatility. In addition, the use of this approach reduces the potential biases caused as a result of sampling, therefore offering a more accurate depiction of the study's hypothesis in regards to exchange rate volatility and average lending rates for commercial banks in Kenya.

3.4 Data Collection and Sources

This study utilized monthly secondary data sourced from the Central Bank of Kenya. This data encompassed exchange rates for the US Dollar, Euro, and Ugandan Shilling, as well as average lending rates for commercial banks within Kenya. The quantitative data will be gathered for the period FY 2014 to the period FY 2023, a duration of ten years.

3.5 Diagnostic Tests

Testing for stationarity within this study is important as it shows that the statistical properties of the data such as mean, variance and auto correlation remain constant over time. This enables the study to obtain an accurate analysis of the relationship between the dependent and independent variables as the time series model applied within this study assumes stationarity. Should the time series data exhibit non-stationarity in the initial tests, differencing procedures will be applied to achieve stationarity. Subsequent stationarity tests will then be conducted to confirm the effectiveness of the differencing process and subsequent effectiveness of the model applied.

3.5.1 Unit Root Tests

The study therefore employs the Augmented Dicky Fuller Test to test for unit roots within the data. If the calculated p-value is below the 0.05 significance threshold, the null hypothesis of a unit root is rejected, indicating that the data series is stationary. Differencing of the data does not have to be conducted for further analysis.

p-value > 0.05: Fail to reject the null hypothesis: data has a unit root and is non-stationary

p-value < 0.05: Reject the null hypothesis: data has no unit root and is stationary

Rejecting the null hypothesis H0 shows that the time series does not have a time dependent structure

3.5.2 Breusch-Godfrey Test

This is a test that is used to detect autocorrelation in the residuals of a linear regression model. The test can also detect autocorrelation up to any predesignated order p

Hypothesis:

H₀: There is no autocorrelation up to the p-th lag in the residuals

$$H_0 = p_1 = p_2 \dots = p_p = 0$$

H_a: There is autocorrelation up to the p-th lag in the residuals

$$H_a : \text{At least one } p_i \neq 0 \text{ for } i = 1, 2, \dots, p$$

The value of the test statistic is computed as:

$$LM = n \cdot R^2$$

Where:

n = the number of observations

R² = co-efficient of determination from the auxiliary regression.

We reject the null hypothesis and state that the residuals of the model are not independently distributed if:

$$P \text{ value} \leq 0.05$$

Where: The LM statistic follows a χ^2 distribution p degrees of freedom.

3.6 Model Specification

This study employs ARCH/GARCH models to capture exchange rate volatility, given their suitability for modeling time-varying volatility. Epaphra M. (2017) emphasizes the significance of exchange rate volatility analysis for policymakers, as it provides insights into market expectations and policy uncertainty. Additionally, a stepwise regression analysis is conducted

3.6.1 ARCH MODEL

The ARCH (autoregressive conditionally heteroscedastic) model was introduced by Robert Engle in 1982 and it models the current error term as a function of the squared past error terms. In simple terms it is a statistical model that states that the variance of error in one period is conditional on the variance of the error in other periods. It is used to analyse volatility in time series in order to forecast future volatility. (Bera & Higgins, 1993) notes that the variance of the current error, conditional on the realized values of the lagged errors is an increasing function of the magnitude of the lagged errors **irrespective of their signs**. The model is stated down below:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \alpha_2 \epsilon_{t-2}^2 + \cdots + \alpha_q \epsilon_{t-q}^2$$

σ_t^2 is the conditional variance

ϵ_t is the error term

where $\alpha_i \geq 0$ and $\alpha_0 \geq 0$

3.6.2 GARCH MODEL

The GARCH model, developed by Tim Bollerslev in 1986, is an advanced version of the ARCH model. By incorporating past conditional variances, GARCH provides a more comprehensive approach to capturing the changing volatility patterns observed in time series data. It is suitable for data that has prolonged periods of volatility as the number of parameters is reduced. The model is stated down below

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \dots + \alpha_q \epsilon_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \dots + \beta_j \sigma_{t-j}^2$$

σ_t^2 is the conditional variance

ϵ_t is the error term

where $\alpha_i \geq 0$, $\alpha_0 \geq 0$ and $\beta_j \geq 0$

ARCH/GARCH models are employed due to their inherent ability to accommodate time-varying volatility, making them suitable for analyzing the dynamic nature of exchange rate fluctuations.

3.6.3 Step Wise Regression

In 1960, Efroymson proposed an algorithm known as the step wise regression. It is a type of regression that introduces or removes independent variables into a model in a predefined order, allowing researchers to assess how each set of variables contributes to predicting the outcome. Unlike standard multiple regression, which enters all predictors simultaneously, this approach provides insights into the incremental predictive power of each variable. This study, however, employs the backward elimination method, starting with a model including all variables. The analysis then systematically removes insignificant variables, ultimately identifying the most significant variable that best explains variations in lending rates and answers the second objective in the study.

3.6.4 Hypothesis

(Yabu & Kimolo, 2020) investigated the relationship between exchange rate volatility and macroeconomic variables in East African countries, including Kenya, Uganda, and Tanzania. Their findings established a positive relationship in the long run between exchange rate volatility and lending rates. Based on their research as well as Kenya's external borrowing trends and mainly traded currencies over the last ten years, this study hypothesizes that exchange rate volatility positively impacts lending rates for commercial banks in Kenya.



CHAPTER 4

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the research findings concerning the impact of exchange rate volatility on lending rates within Kenya's commercial banking sector. The analysis utilized a range of statistical techniques, including stationarity tests, volatility modeling, and regression analysis, to examine the data and derive meaningful insights. The chapter is organized as follows: it begins with a presentation of descriptive statistics, followed by in-depth discussions of stationarity testing, volatility estimation, regression analysis, diagnostic tests, and an interpretation of the results.

4.2 Summary Statistics

Figure 3 provides a summary of the descriptive statistics for all variables included in the dataset, encompassing measures of central tendency and dispersion.

<i>Variable</i>	<i>Observations</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Min</i>	<i>Max</i>
<i>Lending Rate</i>	129	14.06916	2.004095	11.75	18.3
<i>USD</i>	131	109.205	15.67907	86.21	159.69
<i>Euro</i>	131	123.6727	14.32259	99.41	174.31
<i>UGX</i>	131	32.5655	3.314949	23.84	38.05
<i>Annual~Inf</i>	129	6.414504	1.104357	4.53	8.78
<i>91 day T Bill</i>	130	9.133777	2.944401	6.16	21.65
<i>CBK Rate</i>	129	9.272901	1.71404	7	13

The descriptive statistics offer a preliminary overview of the dataset. Notably, the high standard deviation observed for the USD and Euro exchange rates suggests substantial volatility within the study period. This volatility is likely attributable to several factors, including the US Federal Reserve's interest rate adjustments and concerns surrounding Kenya's Eurobond payments, which contributed to the USD reaching a record high of 159.69 within the period of the study.

4.3 Diagnostic Checks

4.3.1 Stationarity

To ensure the data was suitable for time series analysis as stated in the earlier section, stationary tests using the Augmented Dickey Fuller Test (ADF) were conducted to confirm stationarity of the variables.

<i>Variable</i>	<i>Dickey-Fuller Statistic</i>	<i>p-value</i>	<i>Conclusion</i>
<i>Lending rate</i>	<i>-1.075</i>	<i>0.7248</i>	<i>Non-Stationary</i>
<i>USD</i>	<i>0.581</i>	<i>0.9871</i>	<i>Non-Stationary</i>
<i>Euro</i>	<i>-0.799</i>	<i>0.8194</i>	<i>Non-Stationary</i>
<i>UGX</i>	<i>-0.51</i>	<i>0.89</i>	<i>Non-Stationary</i>
<i>Annual inflation</i>	<i>-2.071</i>	<i>0.2564</i>	<i>Non-Stationary</i>
<i>91 day T bill</i>	<i>-1.775</i>	<i>0.9015</i>	<i>Non-Stationary</i>
<i>CBK Rate</i>	<i>-1.566</i>	<i>0.5008</i>	<i>Non-Stationary</i>

Pre differencing: Given the presence of unit roots in the initial data series, as evidenced by the results of the unit root tests, differencing was applied to transform the data into a stationary form. Post differencing, all the variables did not show any presence of a unit root and was therefore stationary. This is show in the results below:

<i>Variable</i>	<i>Dickey-Fuller Statistic</i>	<i>p-value</i>	<i>Conclusion</i>
<i>d_lendingrate</i>	<i>-3.168</i>	<i>0.0219</i>	<i>Stationary</i>
<i>d_usd_rate</i>	<i>-3.545</i>	<i>0.0069</i>	<i>Stationary</i>
<i>d_euro_rate</i>	<i>-3.868</i>	<i>0.0023</i>	<i>Stationary</i>
<i>d_ugx_rate</i>	<i>-3.121</i>	<i>0.025</i>	<i>Stationary</i>
<i>d_annual_inflation</i>	<i>-3.694</i>	<i>0.0042</i>	<i>Stationary</i>
<i>d_t_bill_91</i>	<i>-4.261</i>	<i>0.0070</i>	<i>Stationary</i>
<i>d_cbk_rate</i>	<i>-2.564</i>	<i>0.1007</i>	<i>Stationary</i>

After differencing, the Beta captures the relationship between the changes in the variables not the relationship between the absolute levels of the variables, that is the differenced data will focus on how shocks to exchange rates will influence lending rates in the same period. The differenced data is what will be used for the remainder of the chapter.

4.3.2 Serial Correlation

Testing for serial correlation is used to determine whether the residuals within a regression model are correlated with one another. As this study conducts a backward elimination stepwise regression that looks to highlight the most significant variable by systematically removing insignificant variables, the model assumes uncorrelated errors due to the assumptions of Ordinary Least Squares (OLS) regression. Therefore, understanding if there is correlation within the data is very important. The Breusch-Godfrey Test was used to test for correlation in this study.

<i>Lag(s)</i>	<i>chi2</i>	<i>df</i>	<i>Prob > chi2</i>
1	0.280	1	0.5970

Since the p-value (0.5970) is greater than the significance level (0.05), we fail to reject the null hypothesis. This suggests that there is no significant evidence of autocorrelation in the model residuals at a lag of 1.

4.3.3 Multi collinearity

To assess the potential influence of multicollinearity among the independent variables, Variance Inflation Factors (VIFs) were calculated. The results indicate a low degree of multicollinearity, with a mean VIF of 1.83. Individual VIFs for each predictor were also generally low, all of which had a value less than 5, suggesting that the independent variables in the model exhibit minimal correlation with one another. This finding supports the robustness of the regression model estimates.

<i>Variable</i>	<i>VIF</i>	<i>1/VIF</i>
<i>USD Volatility</i>	3.14	0.318364
<i>Euro Volatility</i>	2.80	0.357002
<i>UGX Volatility</i>	1.93	0.518662
<i>CBK Rate</i>	1.07	0.938487
<i>91 Day T Bill</i>	1.03	0.975323
<i>Annual Inflation</i>	1.02	0.979371
<i>Mean VIF</i>	1.83	

4.4 ARCH/GARCH Model Results

A GARCH (1,1) model was employed to analyze volatility dynamics for the USD, Euro, and Ugandan Shilling. This model was selected because it effectively captures the influence of previous shocks (ARCH component) and the continuity of past volatility (GARCH component). Its simplicity and efficiency make it well-suited for this analysis, particularly since financial volatility is typically more affected by recent shocks and historical volatility rather than older data points. Prior to applying the model, it was essential to verify that the data met key assumptions, including stationarity, absence of serial correlation, and no multicollinearity among variables. To confirm these conditions, the Augmented Dickey-Fuller Test was employed to assess stationarity, the Breusch-Godfrey Test was used to detect serial correlation, and Variance Inflation Factors (VIFs) were calculated to evaluate multicollinearity. The results of these tests are presented in the chapter, in which they highlight that the assumptions were upheld before application of the model.

The results consistently demonstrated significant ARCH effects across all currencies, signifying a substantial influence of recent price shocks on current volatility. The USD exhibited a pronounced ARCH effect (coefficient = 1.0905, $p < 0.001$), highlighting the strong impact of past shocks. The Euro displayed significant ARCH (coefficient = 0.3025, $p = 0.001$) and GARCH (coefficient = 0.6175, $p < 0.001$) effects, indicating that both recent shocks and past volatility levels significantly contribute to current volatility. In contrast, for the Ugandan Shilling, only the ARCH effect was significant (coefficient = 0.6110, $p = 0.001$), suggesting that recent shocks primarily drive volatility, while the GARCH effect (coefficient = 0.1396, $p = 0.400$) was insignificant, indicating limited persistence in volatility.

Descriptive statistics for the estimated volatility series were calculated. The USD exhibited the highest volatility, followed by the Euro and the Ugandan Shilling. These volatility measures, as shown below, will be utilized as key explanatory variables in subsequent regression analyses to investigate their potential influence on lending rates within the Kenyan context.

<i>Variable</i>	<i>Observations</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>USD Volatility</i>	131	1.419251	1.771852
<i>Euro Volatility</i>	131	2.794549	1.309337
<i>UGX Volatility</i>	131	0.5632052	0.2548577

4.5 Regression Results and Analysis

4.5.1 Stepwise Regression

To investigate the influence of exchange rate volatility on commercial bank lending rates in Kenya, a stepwise regression analysis was conducted using monthly data from 2014 to 2024. A stepwise regression approach was employed in this study because the research is exploratory in nature, aiming to investigate whether any significant relationships exist between the independent and dependent variables. Additionally, this method helps identify which independent variables have the most substantial impact on the dependent variable, allowing for a more focused analysis of key drivers.

The dependent variable was the change in lending rates ($d_lendingrate$), and the independent variables included the volatilities of the USD, Euro, and Ugandan Shilling exchange rates (usd_vol , $euro_vol$, ugx_vol), along with control variables such as annual inflation ($d_annual_inflation$), the 91-day Treasury bill rate ($d_t_bill_91$), and the Central Bank of Kenya (CBK) rate (d_cbk_rate). A significance threshold of $p = 0.05$ was employed for variable selection in the stepwise regression.

4.5.2 Final Model

The final model, determined through the stepwise process, retained only Euro exchange rate volatility ($euro_vol$) as a statistically significant predictor. The regression results are summarized below.

Stepwise Regression Results	
(1)	
d_lendingr~e	

euro_vol	0.0735**
(2.69)	
Constant	-0.204*
(-2.43)	

Observations	129

<i>t statistics in parentheses</i>	
<i>* p<0.05, ** p<0.01, *** p<0.001</i>	

4.5.3 Interpretation of Results

Upon conducting the stepwise regression using the backward elimination method, only one variable was found to be statistically significant. The coefficient for the Euro volatility (euro_vol) that is 0.0735 was statistically significant at the 5% level ($p = 0.008$). This suggests a positive relationship between Euro exchange rate volatility and changes in lending rates, implying that increased Euro volatility tends to be associated with higher lending rates. To be specific, a 1unit increase in the volatility of the Euro exchange rate is associated with a 0.0735-unit increase in lending rates, holding other factors constant. However, the model's R-squared of 5.41% suggests that only a small portion of the variation in lending rate changes is explained by Euro exchange rate volatility.

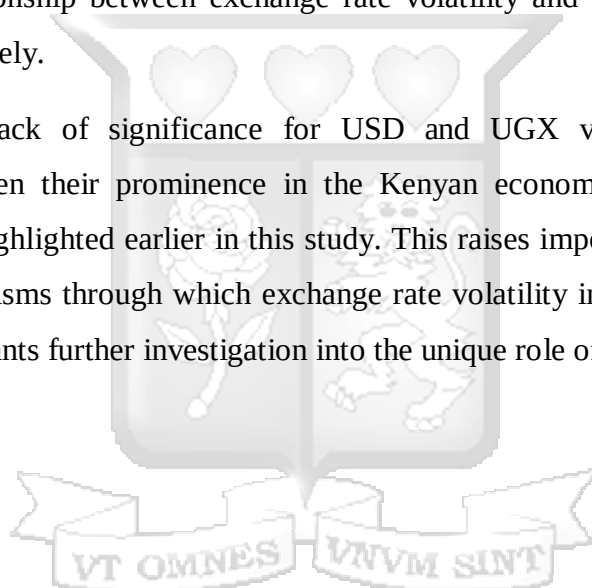
4.5.4 Discussion of Results

The findings from the ARCH/GARCH model applied to the data reveal several key insights. All three currencies—USD, Euro, and Ugandan Shilling—displayed significant ARCH effects, with the USD exchange rate showing the highest sensitivity to recent shocks, such as short-term market events. While the Euro and Ugandan Shilling also demonstrated significant ARCH effects, these were less pronounced compared to the US Dollar. These outcomes suggest that recent market shocks, including economic news or policy changes, play a critical role in driving exchange rate volatility. A notable example of this dynamic in the 2024 financial year was the heightened volatility of the US dollar against the Kenyan Shilling, driven by concerns over Kenya's impending deadline for euro bond payments. The study's findings are consistent with these recent market

developments. Furthermore, the Euro exchange rate exhibited both significant ARCH and GARCH effects, indicating that its volatility is influenced not only by recent shocks but also by past volatility levels, suggesting a tendency for volatility to cluster over time.

The study's results also reveal that, among the exchange rate volatilities examined, only the Euro volatility has a statistically significant impact on lending rates for Kenyan commercial banks. This finding supports the study's hypothesis of a positive relationship between lending rates and exchange rate volatility, though in the Kenyan context, this relationship is specifically tied to the Euro. These results are consistent with prior research by (Keshtgar, Pahlavani, & Mirjalili, 2020) and (Kinyuru F. G., 2011) who similarly found a positive relationship between exchange rate volatility and lending rates in Iran and Kenya, respectively.

However, the lack of significance for USD and UGX volatilities is particularly noteworthy, given their prominence in the Kenyan economy as the primary traded currencies, as highlighted earlier in this study. This raises important questions about the specific mechanisms through which exchange rate volatility influences lending rates in Kenya and warrants further investigation into the unique role of the Euro in this context.



CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study aimed to examine the effect of exchange rate volatility on lending rates for commercial banks in Kenya. Specifically, the study looked to investigate the following objectives; Determine the magnitude and direction of the impact of exchange rate volatility of the USD, Euro, and Ugandan Shilling on lending rates and to investigate the statistical significance of the relationship between exchange rate volatility of these currencies and lending rates.

To achieve these objectives, the study employed a quantitative research design, utilizing ARCH/GARCH models to capture exchange rate volatility and stepwise regression analysis to determine its influence on lending rates. Monthly data from 2014 to 2024 was analyzed, incorporating key macroeconomic control variables such as inflation, the Central Bank of Kenya (CBK) rate, and the 91-day Treasury bill rate, all factors understood to affect lending rates for commercial banks in Kenya.

The findings indicated that while all three currencies exhibited volatility, only the Euro's exchange rate volatility had a positive and statistically significant impact on lending rates. The results suggest that fluctuations in the Euro contribute to variations in lending rates, while volatility in the USD and Ugandan Shilling does not significantly affect lending rates. Although the results of the model were statistically significant, the study also confirmed that lending rate variations were only partially explained by exchange rate volatility, indicating the presence of other influencing factors but significance of exchange rate volatility impact.

5.2 Conclusion

Based on the study's findings, the study established a statistically significant relationship between the Euro exchange rate volatility obtained through the ARCH/GARCH model and lending rates for commercial banks in Kenya. This implies that increased fluctuations in the Euro's exchange rate lead to changes in borrowing costs. Contrary to expectations,

the US Dollar and Ugandan Shilling exchange rate volatilities did not have a statistically significant effect on lending rates although these currencies are crucial for Kenya's trade and financial markets as stated within chapter 1 of this study. In addition, The R-squared value in the regression analysis suggests that exchange rate volatility alone does not fully explain lending rate variations. Other macroeconomic and financial variables not included in the model are likely to play a role in determining lending rates. The findings highlight the complexity of interest rate determination in Kenya's financial sector but emphasize the role of foreign exchange fluctuations in influencing borrowing costs.

5.3 Recommendations

5.3.1 Policy Recommendations

Given the study's results, the Central Bank of Kenya (CBK) should closely monitor exchange rate movements, particularly the Euro, and use this information when setting interest rate related policies. Moreover, the CBK should consider diversifying its foreign exchange reserves beyond the USD and incorporating more Euro reserves, given the currency's impact on lending rates.

Given the significant impact of Euro volatility on lending rates, commercial banks could look into strengthening their foreign exchange risk management strategies. This could involve greater use of more complex instruments such as currency hedging instruments to mitigate against effects of exchange rate fluctuations. Moreover, commercial banks should develop more flexible loan pricing mechanisms that account for exchange rate fluctuations, particularly in Euro-denominated transactions and enhance their use of predictive analytics to anticipate exchange rate trends and adjust their lending strategies accordingly.

5.3.2 Recommendations for Further Research

Future studies could explore the inclusion of additional factors like economic growth, external debt, and remittance inflows/outflows to gain deeper insights into their collective influence on lending rates, as these elements inherently involve exchange rate dynamics. Further research could also use different models to investigate the effect of exchange rate

volatility on lending rates in both the short run and long run as different currencies may have different lasting impacts on lending rates for commercial banks in Kenya. In addition, a comparative study examining the relationship between exchange rate volatility and lending rates in other East African economies would provide valuable insights into regional trends that may influence regional policy implementations by East African governing bodies and provide an opportunity to learn and incorporate lending strategies from different countries that yield positive results.

To conclude, this study contributes to existing literature by emphasizing the selective influence of exchange rate volatility and further highlight the importance of exchange rate volatility within the credit sector.



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