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**MODERATING EFFECT OF BALANCE OF PAYMENT POSITION ON THE
DRIVERS OF EXCHANGE RATE VOLATILITY IN KENYA**

LEONARD KIRIANKI

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF
COMMERCE (MCOM) AT STRATHMORE UNIVERSITY**



MAY 2024

DECLARATION

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

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31/05/2024

ABSTRACT

The volatility of exchange rates is the source of exchange rate risk and has certain implications on the volume of international trade. Exchange rates influence decisions made by individuals, governments, and businesses. Collectively, this affects economic activity, inflation, and the balance of payments. The study sought to establish the effects of market sentiment, information asymmetry, and economic cycles on exchange rate volatility in Kenya, moderated by the balance payment position. The study was supported by the Purchasing Power Parity Theory. It applied a positivist research philosophy while its research design was correlational. Secondary data on the research variables was collected from the Central Bank of Kenya and Bloomberg for ten years between 2014 and 2023 using monthly data a total of 120 observations. This study used EViews12 to conduct descriptive and inferential statistical analysis. According to the findings of the study, Balance of payment was significant as a moderating variable for all the equations and reduced the effect of the independent variable on the dependent variable thus strengthening the Kenya shilling. All regression models indicate that the dependent variable of exchange rates was significantly affected by information asymmetry, economic cycles, and balance of payment. Inflation was introduced as a control variable and was found to be significant in all models. The study adds to the existing body of knowledge on drivers of exchange rate volatility by providing fresh insights through the focus on the moderating effect of balance of payments. Additionally, the interactions amongst market sentiment, information asymmetry, and economic cycles in one single study are unique in terms of their influence on exchange rate volatility, thereby offering useful references to scholars, professionals, and researchers. The study recommended that the Government needs to come up measures to reduced information asymmetry in the economy and find solution to high net imports by encouraging import substitution. These policies should be cognisant of underlying factors such as information asymmetry, economic cycles, and even balance of payments.

Key Terms: Balance of Trade Position, Economic Cycles, Information Asymmetry,



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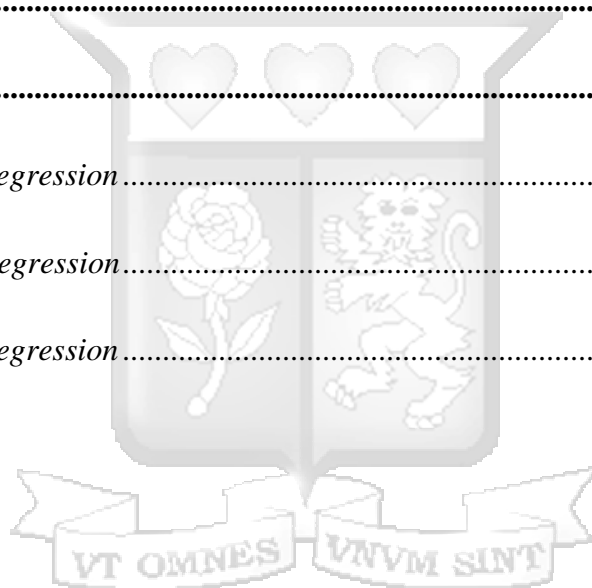
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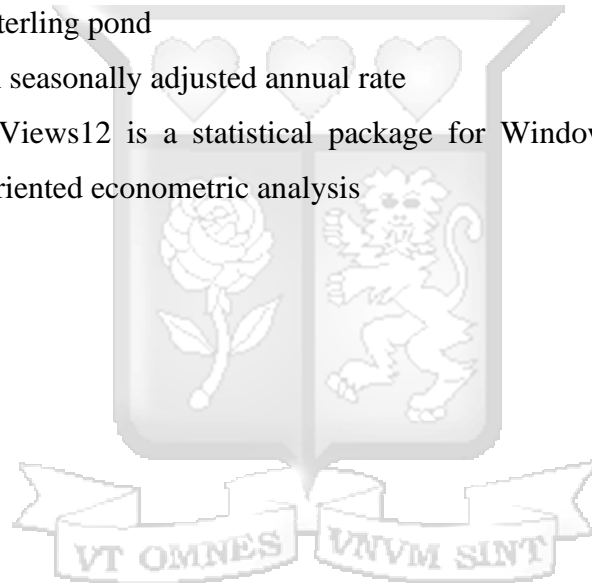
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LIST OF ABBREVIATIONS

ADRs	Advance Declining Ratios
ARDL	Autoregressive Distributed Lag
ASPI	All Share Price Index
CAPM	Capital Asset Pricing Model
CBK	Central Bank of Kenya
CBOE	Chicago Board of Options Exchange
CDS	Central Depositing System
CMA	Capital Market Authority
COVID-19	Corona Virus Disease 2019
CPI	Consumer Price index
CSE	Colombo Stock Exchange
ECM	Error Correction Model
EMH	Efficient Market Hypothesis
EPC	Export Promotion Council
EU	European Union
FDI	Foreign Direct Investment
FOREX	Foreign Exchange
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GCC	Gulf Corporation Council
GDP	Gross Domestic Product
GJR-GARCH	Glosten, Jagannathan, and Runkle-Generalized Autoregressive Conditional Heteroscedasticity
IFS	International Financial Statistics
IRD	Interest Rate Differentials
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KSE	Karachi Stock Exchange
MFNF	Mutual Funds Net Flow
MPT	Modern Portfolio Theory
NIPO	Number of Initial Public Offerings
NSE	Nairobi Securities Exchange

OTC	Over the counter
PCR	Put-Call Ratios
PER	PE ratios
PMG	Pooled Mean Group
TURN	Turnover ratios
TV	Trading Volumes
UK	United Kingdom
VAR	Vector Autoregressive Models
VECM	Vector error correction model
STP	Sterling pound (as used in the analysis)
GBP	Sterling pond
SAAR	A seasonally adjusted annual rate
EViews12	EViews12 is a statistical package for Windows, used for time-series-oriented econometric analysis



DEFINITION OF TERMS

Balance of Payment Position	the difference between the amount of money a country receives from exports, foreign trade, etc. and the amount it spends on imports, etc. from other countries (Cambridge University Press).
Economic Cycles	refer to phenomena that are characterized by economy-wide variations in the level of production or economic activity over an extended period, say several months or years (Murray <i>et al</i> , 2017).
Exchange Rate Volatility	refers to the sharp rise and fall of the exchange rate of local currencies to foreign currencies (Miyajima, 2019).
Information Asymmetry	a situation whereby one party in a relationship has superior information, either in terms of quality or quantity, to the other (Bergh <i>et al</i> , 2019).
Market Sentiment	relates to the general attitude of investors towards financial markets or the established belief patterns pertaining to stock returns that result in over or under-reaction (Aggarwal, 2022).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The world has been experiencing a lot of upheavals in recent times including the recent global pandemic and the ongoing Russia-Ukraine war which have affected many economies. One impact of such upheavals is the exchange rate volatility. A report by the IMF (2003) on the factors affecting exchange rate volatility found that there was no consensus in the economic literature on the factors affecting exchange rates and their Volatility. The report suggests the absence of agreement reflected basic difficulties in modelling and predicting exchange rates. González-Páramo (2008) asserted that Modern times continue to be very uncertain in terms of the economic conditions. This uncertainty has led to increased volatility in financial markets. Ilhan (2006) postulates that the volatility of exchange rates is the source of exchange rates risk and has certain implications on the volume of international trade, consequently on the balance of payments. In a study on exchange rate volatility and pass-through to inflation in South Africa, Miyajima (2019) affirmed that exchange rate volatility refers to the sharp rise and fall of the exchange rate of local currencies to foreign currencies. Exchange rate volatility may also be referred to as the risk linked with unanticipated movements in the exchange rate (Calderón & Kubota, 2018).

The occurrence of global economic crises such as the outbreak of the coronavirus disease 2019 (COVID-19) can adversely affect the global economic and trade environment through the adopted control measures such as trade, population movement, and transportation restrictions thereby leading to increased exchange rate volatility. Kemo *et al.* (2023) posited that given the dependence of Sub-Saharan countries on international trade, the stability or instability of exchange rates can be highly impactful on their economic growth rates. Indeed, whenever, such countries' local currency is characterised by unpredictable fluctuations, this will invariably lead to exchange rate volatility and indirectly influence economic activity such as trade flows, employment, and investment. Wadada (2022) found that exchange volatility has a considerable impact on international trade and foreign direct investment (FDI) in Uganda and during a period of twenty years between 2000 and 2020 witnessed wide swings in the exchange rate volatility.

Trends in Kenya's shilling against the US Dollar, Euro, and Sterling Pound between 2017 and 2021 indicated that the shilling was able to maintain an average annual exchange rate of Ksh. 102.22 against the US Dollar, however, it hit its lowest exchange rate during the worst of the COVID-19 pandemic at Ksh. 111 in the fourth quarter of 2020 as illustrated in Figure 1.1 (Kingi & Chore, 2021). The study found that the Kenya shilling lost 7.72 per cent of its value against the US Dollar between the beginning of 2020 and 30th December 2020 due to the adverse effects of the COVID-19 pandemic when there were unprecedented economic disruptions. The impact of this depreciation according to the CDH Incorporated (2024) report was investor uncertainty since the value of investments is destabilised. investors in capital markets losing confidence in listed companies' abilities to repatriate dividends in hard currency and this has led to reduced investment.

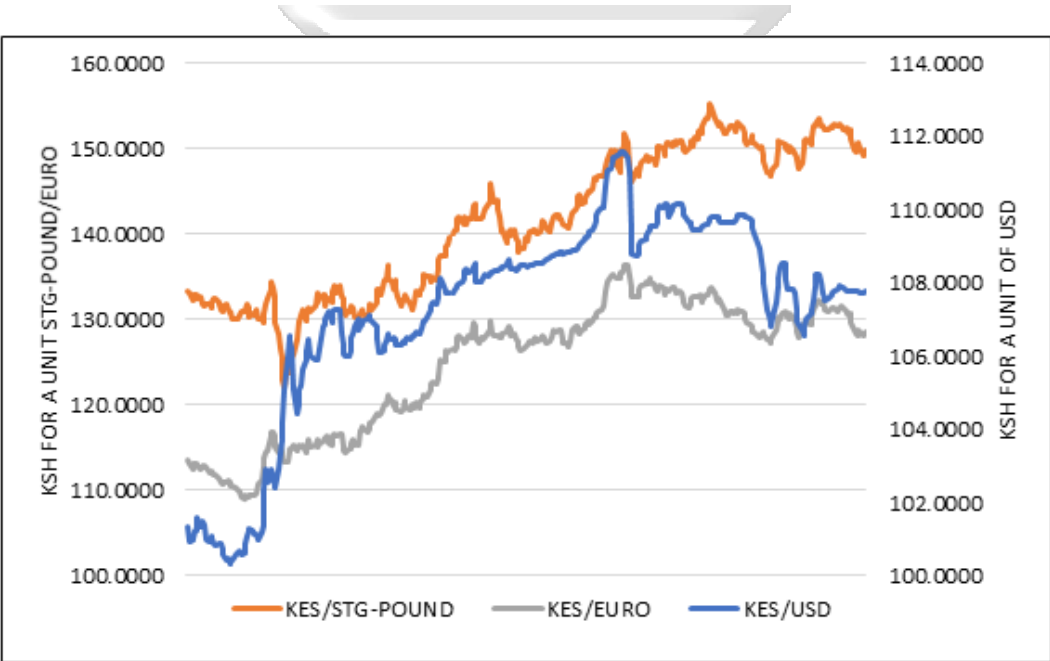


Figure 1. 1: Trends in Kenya shilling against the US Dollar, Euro, and Sterling Pound

(Source: Central Bank of Kenya, 2020, 2021).

Wanjagi (2023) posted that 10 years back, the average exchange rate of Ksh to the dollar was 85 Ksh. In April 2023, the average was 134.40 (USD/Ksh), compared with 129.74 USD/Ksh in the previous month this represented a 3.59% depreciation in one month. In April 2022, the average was 115 USD/Ksh representing a 16.86% depreciation in one year. Consequently, Kenyans were having to spend about 37% more shillings than they would have had to spend 10 years ago to buy

the same amount of dollars. Additionally, Kenyans had to spend 17% more shillings than they had to spend around the same time the previous year. The implication of this was that the weakening shilling made it more expensive for Kenyans to import goods and services, the weaker shilling also reduced the purchasing power of Kenyans' pay checks. Further, the government's debt is denominated in US dollars, so a weaker shilling made it more expensive for the government to repay its debt. This led to higher taxes and cuts in government spending, the indirect effects to the Kenyan economy included loss of jobs in industries that depends on exports, and in the public sector.

Obillo *et al.* (2022) conducted a study on modelling volatility in the currency exchange rates of the Kenya Shilling against the US Dollar and posited that the lack of adequate information by some parties, also known as information asymmetry, makes foreign exchange rates susceptible to a wide variety of internal and external events, particularly in developing countries where there are well established informal sectors. Indeed, the parties most affected by the information asymmetry are government officials who need to make financial policy decisions, as well as individuals and market participants who require adequate information to enable them to make informed investment decisions. Mburu (2015) affirmed that economic cycles tend to have a durable effect on exchange rate volatility owing to the sluggishness of self-correcting mechanisms, particularly in developing countries such as Kenya; and most economic shocks to real exchange rates are self-driven.

1.1.1 Exchange Rate Volatility in Kenya

According to Leigh *et al* (2015) recent exchange rate movements have been unusually large, triggering a debate regarding their likely effects on trade. Historical experience in advanced and emerging market and developing economies suggests that exchange rate movements typically have sizable effects on export and import volumes. In this regard, Mwega and Ndung'u (2001) affirmed that Kenya's Government sought to formulate compatible fiscal and monetary policies that were aimed at reinforcing the foreign exchange rate policies and prioritizing the diversification of the country's export basket to offer more protection to the Kenya Shilling against changes in the external economy. However, whilst this has resulted in increased exports, Maurer *et al.* (2023) established that the country has remained a net importer of products and had a negative balance of

trade of USD 1.9 Billion worth of imports against USD 916 million worth of exports from the European Union region in 2019 thereby making it vulnerable to exchange rate volatility.

A study by Irungu (2017) found that the most critical determinants of foreign exchange volatility in Kenya are interest rates especially high lending interest rates which enhance exchange rates; the rate of inflation which is negatively correlated with the exchange rate; trade flows which influence exchange rates positively particularly when combined with other factors; and external debt which negatively affects exchange rates. This study had conceptual knowledge gaps such that the variable determinant varied from the ones in this study. Abdi *et al.* (2020) established that remittances and inflation rates in Kenya have a positive effect on exchange rate volatility while interest rates are negatively correlated with foreign exchange volatility. This study had conceptual knowledge gaps on variable determinants that were different from this study.

Karuoro (2018) maintained that there is a negative but insignificant relationship between interbank trading volume and exchange rate volatility while the relationship between interest rates and exchange rate volatility is a negative and significant one. This study had conceptual knowledge gaps which this study sought to fill by introducing new determinant variables. Maana *et al.* (2015) affirmed that whenever the exchange rate volatility goes beyond acceptable limits, the Central Bank of Kenya (CBK) normally intervenes to stabilize it by using its foreign exchange reserves; and that the estimated return period for specific extreme exchange rate volatility is typically approximately 3 years or 1,000 days. This study differed from this one on variable selection.

Musyoki *et al.* (2012) found that Kenya's real exchange rate volatility was dependent upon both external and domestic economic shocks to real exchange rate fundamentals and changes to macroeconomic indicators. The study differs from this one in the use of non-fundamental variables. Muigai and Cherono (2019) ascertained that Kenya's stock prices were negatively correlated with exchange volatility and, as such, whenever there is exchange rate volatility, investors are compelled to divert their funds to economies with more stable exchange rates and lowered perceived market risks. They differed from this study on inverse variable positioning and the use of stock price in the study.

Research on exchange rate volatility has had several controversies. There have been studies conducted on fixed or pegged exchange rate regimes, particularly in emerging or developing

economies (Ilizetzi *et al.*, 2019; Edwards, 2019; and Itshoki & Mukhin, 2021) whose market characteristics are very different from the floating or flexible exchange rate regimes and, as such, their findings are incomparable in terms of building the case for measures against exchange rate volatility as suggested by Fraj *et al.* (2018). Additionally, there have been controversies regarding the appropriate measures of exchange rate volatility since some of the methods such as GARCH yielding statistically significant relationships between exchange rate volatility and various macroeconomic variables including volume of trade, inflation, and interest rates depending on the control variables (Barguelli, *et al.*, 2018; Bollerslev, 1986), while others such as VAR and ECM (Arize, 1995) models tend yielding statistically insignificant results, while others still found no relationship at all (Arize, 1999).

1.1.2 Drivers of Exchange Rate Volatility

Market sentiment is a behavioural finance concept that is concerned with individual investors' opinions or perceptions regarding the level of risk associated with the acquisition of a given asset (Karim *et al.*, 2022). Accordingly, bullish investor sentiments in the stock market reflect a positive influence of future economic growth as well as asset allocation which will invariably lead to positive reactions by the investors that manifest in increased purchasing of shares resulting in increased share prices and stock returns (Karim *et al.*, 2022). Hyo *et al.* (2022) investigated exchange rate predictability based on market sentiment using both economic fundamentals and market sentiment and established in the short run, the market sentiment effectively predicted the euro exchange rate. They used the daily sentiment index in the study. This study varies with this study in the principal determinant and the moderation effect of the balance of payment.

A study was conducted by John *et al.* (2022) on investors' sentiment and stock return in the Nigerian Stock Market and determined that there is a positive correlation between investor sentiment and the performance of the stock market owing to the low market integrity of the Nigerian stock market along with institutional involvement. This study had conceptual knowledge gaps in that the study focused on stock return. Musembi *et al.* (2020) studied the symmetric and asymmetric effect of investor sentiment on the performance of the equity market in the Nairobi Securities Exchange (NSE), Kenya and affirmed that there was evidence of a significant and

positive correlation between investor sentiment and the performance of the equity market. This study had conceptual knowledge gaps with the repose variable not being exchange rate volatility.

In addition to the identified research gaps, research on investor sentiment was found to have several controversies. Muguto *et al.* (2022) and Huang *et al.* (2014) established that owing to the lack of general, clear and standard understanding of investor sentiment, there have been numerous proxies that have been adapted as representations of investor sentiment that are founded on controversial theoretical explanations. Additionally, Bai *et al.* (2023) affirmed that many studies on market sentiment are limited by their concentration on a single geographical context rather than comparative cross-country assessments leading to the lack of backing of the findings from a global perspective. Further, the findings of other studies still such as Chen and Haga (2021) are based on subjective measures of market sentiment such as emotional sentiment which are difficult to quantify rendering the findings inappropriate.

There have been several studies that focused on the relevance of rationality of investor sentiment such as Rehman and Apergis (2019), Haritha and Rishad (2020), and Shahzad *et al.* (2021); conversely, there are other studies that were focused on correlation between investor sentiment irrationality and exchange rate volatility such as Baariu and Jagongo (2022); Ghumro *et al.* (2022); Rupande *et al.* (2019); and Pillada and Rangasamy (2023).

Bhatia and Kaur (2023) determined that Indian companies can directly reduce the cost of equity through voluntary disclosures and indirectly through the mediation effects of information asymmetry. The key knowledge gaps of this study were conceptual and contextual with the key focus being on the cost of equity and information asymmetry used as a mediating variable as opposed to this study as an independent variable. Spina (2019) found that bank regulators ignored information asymmetry as a concern which reflected their negligence to reduce the level of risk exposure that contributed to the collapse of various banking institutions since the borrowers defaulted on their loans and were left with collateral (mortgage-backed securities) that had lost value. This study had conceptual gaps from this study is on the variable selection and the outcome and effect of information asymmetry.

Sarno *et al* (2021) did an investigation on learning from volume asymmetric information in the foreign exchange market. Using foreign exchange volume of 31 currency pairs. Their result

showed that the interaction coefficient is positive and highly statistically significant, indicating that an elevated level of information asymmetry exists across foreign exchange market participants. They also postulate that asymmetry is independent of currencies' average level of liquidity, volatility, or volume. The study differed from this study in that it used the volume of traded shares as a proxy for information asymmetry. This study further augments the independent variable with market sentiment and economic cycles as drivers of exchange rate volatility

Research on information asymmetry has also been riddled with controversies. For instance, Berg *et al.* (2017) established that as much as 40% of findings across more than 300 articles were affected by biases through the underrepresentation of insignificant statistical levels and an overemphasis of significant statistical levels, while some of the authors were found to be privy to confidential information thereby creating moral hazards for readers. Additionally, Farhani *et al.* (2023) found that the wide variety of research methodologies adopted particularly the correlational models that were used in measuring the impact of information asymmetry on exchange volatility yield conflicting results which make them unreliable from a comparative research perspective. Katusiime (2018) inferred that some of the research that adopted Autoregressive and GARCH techniques for measuring informational asymmetry and exchange rate volatility in developing countries such as Uganda found inconsistencies when gauged against similar research in developed countries owing to the lack of reliable data on information asymmetry in the former.

Economic cycles are fluctuations in each economy that are an indication of the dynamic nature of the operational environment that informs the policy decisions that are taken by companies such that during periods of expansion, there is a generally positive outlook on the economy which makes firms take more risks in their financial decision making while the reverse is true for periods of contraction (Duong *et al.*, 2023). Indeed, during positive economic cycles (expansion), firms can operate profitably owing to reduced costs of borrowing (lower interest rates), and higher consumer purchasing power owing to the multiplier effects of higher employment, amongst other factors (Dao *et al.*, 2020).

Kamalyan & Davtyan (2022) studied the effect of exchange rate on business cycle. The study used data from emerging countries applying impulse responses and found that heightened exchange rate uncertainty yields a drop-in economic activity, an increase in prices, and an exchange rate

depreciation. This study varied from the current study in that there is an inverted variable position, and the study further added additional independent variables to estimate the impact on exchange rate volatility. Bushe (2019) established that small to micro and small enterprises in South Africa have failed due to three key factors, namely, entrepreneur capacity, environmental inauspiciousness, and enterprise incompetence which stem from economic downturns that have been increasingly prevalent in recent times. This study had conceptual knowledge gaps.

Sang (2021) established that during the first quarter of 2017, Kenya experienced an economic downturn because of the election cycle where uncertainty regarding the political climate led to depressed economic growth characterized by lower access to credit, declining stock market activity, high unemployment, and increased interest rates. This study had conceptual knowledge gaps. The Kenya Institute for Public Policy Research and Analysis (KIPPR) (2020) ascertained that the country’s close linkages with global economies such as the UK and the USA have led to cyclical fluctuations in tandem with business cycles in those countries such as Brexit in the UK that manifest in sharp changes in international trade and local economic growth. This study had conceptual knowledge gaps. A report by the World Bank (2022) indicated that upheavals in its economic growth indicators owing to a combination of the post-election dynamics and the effects of COVID-19 which manifested in high cost of living owing to inflationary pressures as well as the depreciation of Kenya shilling, increasing debt levels and worsening business environment as is shown in Figure 1.1. However, as shown in the figure, there was an expansion of 7.5% in 2021 in the immediate aftermath of a contraction of 0.3% in 2020 due to COVID-19 on account of the resumption of economic activities.

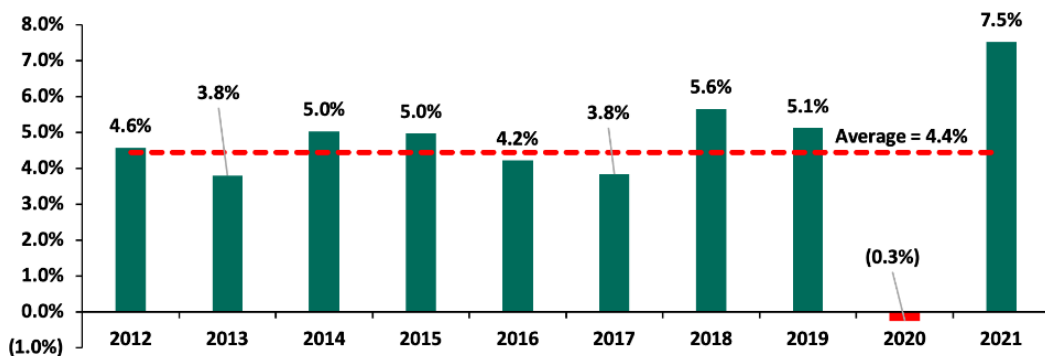


Figure 1. 2: GDP Growth Rates in Kenya between 2012 and 2021

(Source: World Bank, 2022)

An assessment of the research on the influence of economic cycles and exchange volatility indicates that some controversies and contradictions can be accredited to dissimilarities in groups and countries and periods of study which have rendered the findings incomparable (Krznar and Matheson, 2017); and differences in methodological approaches along with lack of clarity regarding the right factors that need to be considered that vary from one country to another (Asogwa *et al.* 2014). Different approaches and measurements as in Baxter and Stockman (1989) Further, differences in research methods adopted in the estimation of exchange rate volatility as well as the arguments regarding whether to use real or nominal exchange rates (Ramoni-Perazzi and Romero, 2022).

1.1.3 Balance of Payment Position

According to Blavasciunaite *et al.* (2020), one of the key components of the integration of countries into the world economy is international trade, while the balance of trade position reflects the difference between imports and exports pertaining to a given country. The study also found that the right balance of trade position is critical for the efficient allocation of resources, the promotion of technical progression, new product development, and the diffusion of knowledge. Arize *et al.* (2017) posited that one of the most important determinants of the balance of payment position is the depreciation or appreciation of the domestic currency relative to international currencies since this prevailing exchange rate will determine the value of the imports and exports; indeed, a depreciation in the currency has an adverse effect on the value of the exports given that imported raw materials are needed for their production.

A study by Clark *et al* (2004) on how exchange rate volatility affects trade flows found that overall, there is no robust evidence of a large negative effect of exchange rate volatility on trade. According to the paper, while exchange rate fluctuations had increased in times of currency and balance of payments crises during the 1980s and 1990s, there was no increase, on average, in such volatility between the 1970s and the 1990s. This study has contrasted the aforementioned study by using the balance of payment as a moderator variable. Nguyen and Dang (2022) studied the impact of exchange rate on the balance of payment with a focus on Vietnam and found that Vietnam's foreign exchange rate had a significant positive impact on the balance of payment. This differed with the present study because the balance of payment is not a dependent variable and is used as a

moderator variable and other predictor variables are used. Secondly, there is an inverse relationship in which in this study exchange rate is the dependent variable.

A study on the effect of exchange on the trade balance in Tanzania between 1970 and 2014 by Mganza (2015) established that terms of trade played a significant and positive role on the country's balance of trade implying that favourable terms of trade enhanced the balance of trade position. Vallance and Fabrice (2016) examined the influence of exchange rate volatility on Rwanda's balance of trade and determined that there was a positive quadratic correlation between the exchange rate and the country's balance of trade position suggesting a direct relationship between increased imports and exports and increments in the exchange rate. Kamugisha and Assoua (2020) carried out a study on the effects of devaluation on trade balance in Uganda and found that there was only a short-run effect of changes in real exchange rates on trade balances while incomes had a more long-term effect on trade balances.

Mwai (2015) studied the effect of selected macroeconomic variables on the balance of payment in Kenya and found that as envisioned by the Bretton Woods institutions, a free-floating exchange rate acted as a catalyst for improved balance of payment, however, both the balance of trade position and the current account continued to worsen. According to a study by the Global Economy (2024), Kenya's trade balance as a percentage of GDP between 2015 and 2022 indicates that there was a fluctuating trend that ranged between a low of -10.52% in 2017 to a high of -7.96% in 2020 which is illustrated in Figure 1.2. Indeed, the 2022 figure of -9.3% compares with the global average of -4.42% based on 148 countries.

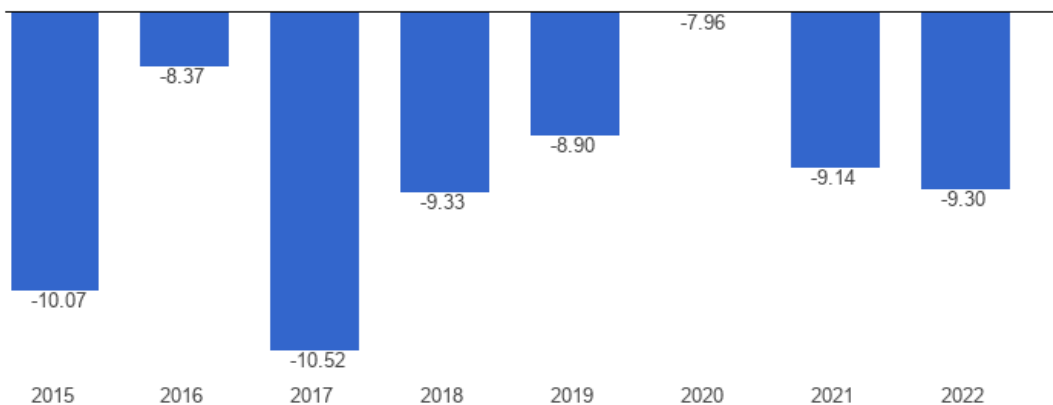


Figure 1. 3: Trade Balance as a Percentage of GDP in Kenya between 2015 and 2022

(Source: Global Economy, 2024)

There have been several controversies related to research on balance of trade. Firstly, in estimating the effects of exchange rate volatility on export volumes a few studies (Osokooee & Aftab, 2018; Senadza & Diaba 2017; and Thuy *et al.*, 2019) have used restrictive modelling assumptions which have hampered the accuracy of their findings and made it difficult for proper comparative assessments. Secondly, all these studies have examined the effect of exchange volatility as an independent variable on trade as the dependent variable, therefore, this inverted correlation yields completely different results from those studying the influence of the balance of trade on exchange rate volatility.

1.2 Problem Statement

A study by Zoric (2020) established that exchange rate stability is critical towards the growth of exports for a given economy through the stabilisation of the domestic currency and lowering of foreign exchange risk, particularly for developed countries which rely more on their exports for economic growth. Additionally, Guzman *et al.* (2016) posited that stable exchange rates are a source of confidence regarding the production of exports and import-competing goods and services, thereby encouraging investments in these sectors. According to Ozili (2024), Nigeria recently introduced the unification of the country's exchange rate so as to embrace the floating exchange rate principle of willing buyer and willing seller which resulted in reduced Government intervention, reduced speculation, improved stability and restored trust by market players in the foreign exchange market. Mbaya (2013) affirmed that international investors prefer to acquire stocks and trade in currencies that are both stable and have an appreciating exchange rate so as to ensure the maximisation of their returns. Hussein and Ouma (2020) added that economies seek to ensure exchange rate stability by maintaining healthy holdings of foreign reserves which serve as cushions against the adverse effects of market volatility by preventing sharp depreciation or devaluation of the local currency through the acquisition or selling of the country's own currency.

According to a report by the CBK (2024), there were major concerns regarding the continued depreciation of the Kenya shilling, owing to the increased cost of living, which was likely to reduce the capacity for local investments as well as constrain disposable income and consumer demand. Weaker shilling effects were being passed by importers to consumers resulting in reduced supply of key commodities, hence dampening economic activity. Additionally, banks and Kenyan CEOs

felt that pressure on the shilling on account of demand for dollars to support debt service, higher for longer global interest rates, low foreign direct inflows, high import bills, deferred investment decisions, weakened sentiments towards the Shilling and sovereign credit rating. This explains the main problem associated with exchange rate volatility, who is affected, and why it needs to be controlled.

A report by the CBK (2024) indicated that owing to recent periods of drought in Kenya, increased oil prices and prices of electricity, there was an increase in the inflation rate of food prices, while poor performance of domestic products during 2021/22 financial year led to depreciation of the exchange rate of the shilling against major international currencies, which in turn led to negative market sentiment regarding the country's investment outlook and ultimately depressed economic growth. In echoing these sentiments, the KBA (2021) affirmed that following the COVID-19 pandemic, the local Kenyan currency depreciated against the dollar in 2020, however, sustained by adequate foreign exchange reserves, there was some buffer against high volatility in the short term. This notwithstanding, the long-term effects were manifested in the general weakening of the balance of trade position on the back of a deterioration in net inflows by a staggering 84.8%.

Additionally, the enumeration of the impact of depreciating Kenya shilling by Wanjagi (2023) on how it will make it more expensive for Kenyans to import goods and services, and reduce the purchasing power of Kenyans' pay checks signal a need to understand the drivers of exchange rate volatility as this as a direct effect on the quality and standards of living for Kenya and generally speaking on decent living, finally the weakening of the Ksh. means expensive imports yet Kenya is a net importer which then makes the cost of living to be very high and unbearable to many.

The study seeks to address a number of gaps in the existing body of knowledge. Firstly, there have been a number of studies on exchange rate volatility that failed to incorporate information asymmetry (Irungu, 2017), market sentiment and economic cycles (Irungu, 2017) thus meaning that the findings are not aligned with the present study. Research on exchange rate volatility has had several controversies. There have been studies conducted on fixed or pegged exchange rate regimes, particularly in emerging or developing economies (Iizetzki *et al.*, 2019; Edwards, 2019; and Itshoki & Mukhin, 2021) whose market characteristics are very different from the floating or flexible exchange rate regimes and, as such, their findings are incomparable in terms of building

the case for measures against exchange rate volatility as suggested by Fraj *et al.* (2018). Additionally, there have been controversies regarding the appropriate measures of exchange rate volatility since some of the methods such as GARCH yielding statistically significant relationships between exchange rate volatility and various macroeconomic variables including volume of trade, inflation, and interest rates depending on the control variables (Barguelli, *et al.*, 2018; Bollerslev, 1986), while others such as VAR and ECM (Arize, 1995) models tend yielding statistically insignificant results, while others still found no relationship at all (Arize, 1999).

1.3 Research Objectives

1.3.1 Main Objective

To establish the moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.

1.3.2 Specific Objectives

- i. To determine the influence of market sentiment on exchange rate volatility in Kenya.
- ii. To examine the influence of information asymmetry on exchange rate volatility in Kenya.
- iii. To establish the significance of economic cycles on exchange rate volatility in Kenya.
- iv. To assess the moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.

1.4 Research Questions

- i. How significant is market sentiment as a driver of exchange rate volatility in Kenya?
- ii. How significant is information asymmetry as a driver of exchange rate volatility in Kenya?
- iii. How significant are economic cycles as drivers of exchange rate volatility in Kenya?
- iv. What is the moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya?

1.5 Scope of the Study

The study investigated the determinants of exchange rate volatility in Kenya and the moderating effect of the balance of payment position. Secondary data was collected on market sentiment,

information asymmetry, economic cycles, exchange rate volatility and balance of payment position for the period between 2014 and 2023 being monthly data a total of 120 observations. The study focused on the relationship between the three independent variables (market sentiment; information asymmetry; and economic cycles) on the dependent variable (exchange rate volatility). It also assessed the moderating effect of balance of payment position on the relationship between independent variables of market sentiment, information asymmetry, economic cycles and the dependent variable exchange rate volatility in Kenya. The theoretical review focused on the Purchasing Power Parity Theory.

1.6 Significance of the Study

This study will be significant to various parties as explained below.

1.6.1 The Government of Kenya

The findings of the study are important to policymakers in the Ministry of Finance and the Central Bank of Kenya regarding the interplay amongst market sentiment, information asymmetry, economic cycles and foreign exchange volatility and how to formulate and implement policies that will ensure reduction in the effects of foreign exchange volatility.

1.6.2 Practitioners

The study is also significant to professionals working in the foreign exchange market including traders in foreign exchange bureaus, FOREX employees in commercial banks, institutional investors and individual investors regarding how to optimize the relationships amongst market sentiment, information asymmetry, economic cycles and foreign exchange volatility.

1.6.3 Economists

It was envisioned that the findings of this study would provide useful reference material for economists on the effects of market sentiment, information asymmetry, and economic cycles on exchange rate volatility.

1.6.4 Researchers and Scholars

Given the gaps that have been identified in the body of knowledge, the study was significant to researchers and scholars who are interested in the determinants of exchange rate volatility in Kenya.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter will cover the various aspects of the literature review which will encompass the theoretical review, the empirical review, research gaps, and the conceptual framework. The theoretical review will include the Purchasing Power Parity Theory. The empirical review will feature past studies in the study variables including the independent variables (market sentiment, information asymmetry, and economic cycles), the moderating variable (balance of payment position), and the dependent variable (exchange rate volatility). The research gaps will focus on points of divergence between the studies covered in the literature and this study. Finally, the conceptual framework will illustrate all the variables and their respective indicators as well as the direction of their relationship, and the operationalization of the variables.

2.2 Theoretical Review

A theoretical review is a structure that offers a path for the development and application of a formal theory to enable a better understanding of phenomena (Grant & Osanloo, 2016). The following sections will cover the theories that seek to explain the main purpose of the research using the Purchasing Power Parity (PPP) Theory.

2.2.1 Purchasing Power Parity Theory

The Purchasing Power Parity (PPP) Theory was originally proposed by Terborgh (1926) who held that given a scenario where two currencies have the same domestic purchasing power, they should have equal values in the foreign exchange market, otherwise, it would be profitable for a country whose currency is over-valued to buy goods in the country with the undervalued currency until the demand for the latter currency pushes its exchange value to equality. Thus, the ratio between the internal purchasing powers of the two currencies is their purchasing power parity and essentially determines their exchange rate. According to Makin (2002), over longer periods, the most fundamental theory of exchange rate determination is purchasing power parity (PPP), which links relative price levels and inflation rates to movements in the nominal exchange rate

Taylor and Taylor (2004) acknowledged that the PPP theory is founded on the principle that a unit of currency should be able to enable the acquisition of the same basket of goods in one country as the comparable amount of foreign currency, at the prevailing exchange rate, can purchase in a foreign country, in order for parity in the purchasing power to be established in the unit of currency across the two countries.

Alsmadi, Al-Gasaymeh and Alrawashdeh (2022) established that the PPP theory applies the law of one price (LOP) which stipulates that holding transportation and other transaction costs constant, competitive markets will be inclined toward the equalisation of the prices of an identical good in two countries in a common currency. However, for the PPP theory to hold, arbitrage occurring in a collection of goods and services in each market basket will influence the exchange rate instead of the markets prices of the goods and services. Madeira and Masih (2017) explained that, in general, the PPP theory holds because there is a co-integrating correlation among exchange rates, local price levels, and foreign price levels which tend to adjust to equilibrium in the long run. Thus, the real exchange rate rather than the movement is the most critical factor for policymakers to consider when gauging the competitiveness of local or foreign firms.

The theory explains or explicate exchange rate volatility in that currencies will converge to a point of equilibrium. So, if there is disparity between the exchange rate and PPP rates, then an individual can aim to trade the move toward this central point. The PPP theory assumes that a decline in the purchasing power of a currency, caused by factors such as inflation, should equate to an equal fall in the exchange rate. Finally, since trade is a component of goods and services movement, PPP will affect balance of payment in that goods imports can be made cheaper or expensive depending on the relative inflation and currency power pair of the respective trading countries.

2.2.2 Theory of Asymmetric Information

The theory of asymmetric information was advanced independently by Akerlof (1970), Spence (1973) and Stiglitz (1977). It posits that unequal information between buyers and sellers, could lead to inefficient and undesirable outcomes for the individual who has less information. Such unequal information-bargaining position could result in the deviation of asset prices from their long-run equilibrium value ((Hoguet, 2005; Li, 2008). In accordance with the theory, economic agents who possess some privileged information will be able to earn abnormal returns on stocks,

as they exploit such information to the detriment of the other party to the transaction. There are two fundamental concerns associated with asymmetric information; moral hazard and adverse selection. Moral hazard refers to the risk or likelihood that one individual has become party a contract in the absence of good faith or through the provision of misleading information (Hébert, 2018; Cvitanic *et al.*, 2017). Adverse selection refers to the possibility of high risk individuals been advantaged at the expense of more deserving ones (Shepard, 2022).

Othman *et al.* (2022) posited that the efficiency of prices in forex markets is dependent upon the spread of information across a market in a manner in which all market participants can obtain and access it. Unfortunately, many countries are hampered by inefficiencies which lead to asymmetric information where some market participants have superior information to others and are able to exploit this (such as through speculation) to make abnormal returns. Dada (2021) added that given that the effective functioning of the forex markets is based on the availability of adequate information for market participants, it follows that the interaction amongst exchange rates, exchange rate volatility and international trade are affected positively or negatively on the basis of this adequacy of information. Therefore, asymmetric information becomes a serious concern during periods of exchange volatility since there is increased uncertainty and reduced confidence by market participants.

The theory is aligned with the study variables in a number of ways. Given that its central argument is based on the impact of asymmetric information on transactions, it is definitely associated with independent variable two, information asymmetry. Secondly, since market sentiment is based on the availability of information on various macroeconomic indicators by investors, it follows that the theory is also associated with independent variable one, market sentiment. Thirdly, it can also be argued that economic cycles are responsible for exchange rate volatility, which, in turn, is dependent upon the nature of information available, meaning that there is a definite correlation of the theory with economic cycles. Additionally, information asymmetry influences international financing such that the borrowing country may enter into a transaction to borrow a loan without full information regarding the risks involved, thereby affecting the BOP. Finally, as demonstrated by Dada (2021), asymmetric information becomes a serious concern during periods of exchange volatility since there is increased uncertainty and reduced confidence by market participants.

2.3 Empirical Review

An empirical review seeks to examine past studies that provide answers to specific research questions systematically through experience by applying rational thinking (Cooper & Schindler, 2014). Alternatively, it may be viewed as the means through which conclusions can be arrived at regarding a given inquiry by systematic observation and data analysis (Beins, 2013). Following are the relevant past studies pertaining to the study variables. The selection of the independent variables is based on the fact that economic cycles are responsible for exchange rate volatility, which, in turn, is dependent upon the nature of information available. Additionally, information asymmetry influences international financing such that the borrowing country may enter into a transaction to borrow a loan without full information regarding the risks involved, thereby affecting the BOP.

2.3.1 Exchange Rate Volatility

The exchange rate is defined as the price of one currency in terms of another currency. In a floating exchange rate regime, the transaction costs are higher than with a pegged or fixed exchange rate (Jones and Kenen, 1990). Volatility is defined as an unobservable or latent variable, deterministic or stochastic. There have however been studies that try to make the exchange rate volatility an observable variable, with varied results (Bauwens and Sucarrat, 2005). The first indicator of exchange rate volatility is the Consumer Price Index (CPI). The CPI is an indicator that measures average price changes in the prices of a fixed basket of goods and services over a given period in a country (Singla *et al.*, 2019). A study was conducted by Sheikh *et al.* (2020) on the symmetrical co-integrating relationship between money supply, interest rates, consumer price index, terroristic disruptions, and the Karachi Stock Exchange (KSE). The study employed the ARDL model alongside the bound testing procedure as well as the error correlation model to examine the correlation between macroeconomic variability and changes in the KSE-100 indexes following the Global Financial Crisis of 2008. The proxies of macroeconomic variability were CSI, interest rates, and money supply. The study employed several root tests to identify seasonality effects in the data including KPSS, augmented fuller, and Philips Peron unit. The study established that before the crisis there was an inverse correlation in the long run between both money supply and interest rates, and changes in the exchange rate; however, CSI was found to have a positive and significant

correlation with exchange rate volatility which was similar to the findings of Mbaya (2013). Conversely, after the crisis, there was a positive correlation between exchange volatility and money supply in the long run, while interest rates varied inversely with changes in the KSE indexes. The study finding and methodology were similar to that of Mpofu (2015), while contradicted the findings of Nguse *et al.* (2021). This study was limited by its different geographical context which represented a contextual gap; its lack of focus on market sentiment, information asymmetry and balance of payment position were also conceptual gaps; while the different research design was a methodological gap. This study contrasted with the findings of Islam *et al.* (2022).

Islam *et al.* (2022) conducted a study on whether exchange rate volatility increases the CPI in Bangladesh by focusing on exports and imports. The study collected monthly basis data from the international financial statistics and world development indicators for the period between January 2013 and June 2019. It was established that there is a significant positive correlation between the CPI and exchange rate volatility. Additionally, owing to the lack of local production capability, increments in import volumes and import taxes lead to increases in the CPI which was similar to the findings of Aisen *et al.* (2021). This study had several knowledge gaps including the different geographical contexts which was a contextual gap: and the lack of focus on market sentiment, information asymmetry and economic cycles which were conceptual gaps. This study supported the finding of Sheikh *et al.* (2020).

The second indicator of exchange rate volatility is employment data. Employment data refers to information about all the individuals who provide their services in public, private and informal sectors of an economy for wages or payment in each period (Bakhshi *et al.*, 2017). Mpofu (2015) examined the influence of real exchange rate volatility on both employment growth and macroeconomic dynamics in South Africa. The study adopted an ARDL co-integration approach to facilitate the analysis of the correlation between exchange rate volatility and employment growth. It collected quarterly time series data for the period between 1995 and 2010. The results indicated that there was a significant but contradictory correlation between exchange rate volatility and employment growth. Additionally, employment growth was also found to be significantly correlated with exchange rate level, wages, output and interest rates which contrasted with the findings of Goldberg and Tracy (2000). Further, the most feasible means through which the

negative effects of exchange rate volatility could be reduced was through the adoption of macroeconomic policies that simultaneously foster employment growth while stabilising exchange rates. The study was similar in methodology and findings with Sheikh et al. (2020), while the methodology was similar to that of Nguse *et al.* (2021) although the findings were in contradiction. This study was limited by its different geographical context which was a contextual gap, while its lack of focus on market sentiment, information asymmetry, economic cycles and balance of trade position were conceptual gaps.

Nguse *et al.* (2021) investigated the influence of exchange rate levels and volatility on international trade in Ethiopia. The study used trade openness as a proxy for international trade. It collected secondary time-series data for the period between 1992 and 2019 and used the ARDL model to analyse the long-term relationship between exchange rate level and volatility and international trade performance. Additionally, the short-term relationships between the variables were analysed using an error correction model. The study's control variables were FDI, GDP and inflation. According to the results, there was a negative and significant correlation between exchange rate level and international trade. However, exchange rate volatility was found to relate significantly and positively to international trade which is contrasted with the findings of Lai *et al.* (2023). Further, all the control variables correlated positively with international trade in the short term. By extension, the study established that the enhancement of GDP and FDI led to multiplier effects such as employment growth. This study was limited by its different geographical context which was a contextual gap; while its lack of focus on market sentiment, information asymmetry and economic cycles were conceptual gaps.

Irungu (2017) studied the factors that influence volatility in the foreign exchange rate in Kenya. The study collected secondary data from the CBK, World Bank, Kenya National Bureau of Statistics and International Monetary Fund (IMF) for the period between 1980 and 2016. The study found that there was a positive and significant correlation between lending interest rates and the official exchange rate. Additionally, the study established that there was a negative and insignificant relationship between the inflation rate and the official foreign exchange rate. Further, there was a negative and insignificant correlation between trade flows and the official foreign exchange rate; while the relationship between external debt and the official exchange rate was positive but insignificant which was similar to the findings of Odera (2015). The study has several

knowledge gaps including the lack of focus on market sentiment, information asymmetry and economic cycles which were conceptual gaps.

2.3.2 Market Sentiment on Exchange Rate Volatility

According to Blasco *et al.* (2012), market sentiment refers to market participants' expectations regarding the direction and magnitude of anticipated price changes. Aggarwal (2022) posited that market sentiment relates to the general attitude of investors towards financial markets; or the established belief patterns pertaining to stock returns that result in over or under-reaction. Hu *et al.* (2022) argued that, as a component of behavioural finance, market sentiment is a difficult quantity to measure given the subjective nature of individual investor's sentiments since each one has unique preferences.

The first indicator of market sentiment is the high-low index. The high-low index is the method of measuring market sentiment regarding the performance of a given market that makes comparisons of stocks that are nearing their 52-week highs with stocks that are nearing their 52-week lows to enable investors to confirm the prevailing market trend (Li *et al.*, 2021). According to Rehman (2013), in the past, many studies tried to capture the impact of investor sentiments on the stock market returns, while few have applied this to exchange rate volatility. The study was conducted in Pakistan using secondary data from the IMF website and Karachi Stock Exchange for stock returns. The study used a number of currencies comprising mainly of currencies like US dollar, Japanese Yen, Swiss Franc, Pound and Mexican Lira. This study found that investor sentiment explained exchange rate volatility though the impact was low. This finding was aligned with Hyo *et al.* (2022). This study's weakness was that it used only one independent variable thus having limited scope which was a conceptual gap, while the use of ADF to measure stationarity was a methodological gap.

Sang *et al.* (2022) investigated exchange rate predictability based on market sentiment using both economic fundamentals and market sentiment. The study was conducted in the Korean institute of economic policy, study used machine learning to predict exchange rates. They used several, different models to examine the explanatory power of the machine learning model (e.g. a baseline model, a linear model, a dense artificial neural network model, a multi-step fully connected artificial neural network model, a convolutional neural network model, and an LSTM model).

According to their study, learning models showed higher explanatory power than the linear models. The linear model had a tendency to poorly fit the data, and the market sentiment variable is not significant in the model. The strength of this study was the use of machine learning to predict exchange rate. The study's use of machine learning models was a methodological gap while its lack of focus on information asymmetry, economic cycles and exchange rate volatility were conceptual gaps.

The second indicator of market sentiment is the bullish per cent index. The bullish per cent index is a breadth indicator that was developed by Abe Cohen in 1955 that measures the level of risk exposure by determining the percentage of securities in a stock exchange that is on a point and figure buy signal and are usually depicted with a range of 0% to 100% (Gurrib, 2018). Plakandaras et al (2015) rejected the efficient market hypothesis when investor sentiment was used as a predictor of exchange rate, he postulated that it can be used as an addition to information regarding the future directional movement of the exchange rates. This study used stock twist as a proxy for market sentiment and employed econometric and machine learning methodologies to model output for future exchange rates. This study's lack of focus on information asymmetry, economic cycles and exchange rate volatility were conceptual gaps.

Hopper (1997) conducted a study in Philadelphia and postulated that What is not so well known outside academia is that exchange rates don't seem to be affected by economic fundamentals in the short run and that economists have found instead that the best forecast of the exchange rate, at least in the short run, is whatever it happens to be today. Hopper advanced that exchange rates were influenced by market sentiment rather than by economic fundamentals. The study utilized GARCH model using data on the yen and the deutsche mark from January 2, 1981, to June 30, 1996. This study agreed with Rehman (2013) and contradicted the finding of Sang *et al* (2022). The study had different research design which was a methodological gap and it lacked focus on information asymmetry, economic cycles and exchange rate volatility were conceptual gaps. The weakness of this study was the use of one a single predictor variable.

The third indicator of market sentiment is moving averages. According to Bhootra (2023), the use of 50-day moving averages over the 200-day moving average is a common indicator of market sentiment. This indicator shows how many stocks are trading above their long-term moving

average and is expressed as a percentage. Accordingly, if the indicator is rising and shows that over 60% of stocks are trading above their 200-day moving averages, it indicates a broad bullish sentiment. In contrast, Agénor (2005) studied the effect of market sentiment on macroeconomics under pegged exchange rates and found that in the short run sentiment affected exchange rate fluctuations. This study used an intertemporal optimizing framework to examine the macroeconomic effects of changes in market sentiment which represented a methodological gap. This study concurred with Rehman (2013), and Hopper (1997) but contradicted Sang *et al* (2022).

Rao and Ramachandran (2014) performed a study on the effect of market sentiments on exchange rates in Botswana. A multinomial probability model was used to capture the uncertainties in the movement of market sentiments. Weekly exchange rates of Botswana Pula were used against six currencies. The finding was that all the currencies had clusters of sentiment states which were strongly persistent. The study differed from Rehman (2013), and Hopper (1997) and Sang *et al* (2022) on the measurement of sentiment where it used exchange rate volatility as a proxy for investor sentiment which represented methodology gaps.

Mwangi (2017) studied the effects of exchange rate changes on the stock market performance in the NSE. This study adopted a descriptive research design and collected secondary data from the NSE between January 2012 and December 2016 covering both index movement and exchange rate volatility. According to the results, there was an unstable foreign exchange rate movement on average during the period under review. Additionally, a declining trend was observed for the NSE performance both for the All-Share Index and the NSE 20 Share Index which agreed with Waithaka (2014). This study was limited by its lack of concentrated focus on economic cycles as an independent variable and the lack of a theoretical foundation. The relatively short period of study was a weakness of the study while the focus on both the All-Share Index and the NSE 20 was a strength.

2.3.3 Information Asymmetry on Exchange Rate Volatility

Bergh *et al.* (2019) defined information asymmetry as a situation whereby one party in a relationship has superior information, either in terms of quality or quantity, to the other. Glücksman (2020) opined that information asymmetry typically occurs due to agency problems where the agent (manager) has more information about the business than the principal

(shareholder/ owner) and abuses this position by pursuing his selfish gain at the expense of the owner's welfare. Johnson and So (2017) maintained that interactions between economic agents are predicated on the severity and content of asymmetric information, particularly where adverse selection (a phenomenon whereby more risky individuals are chosen due to the lack of good quality information) and moral hazard (the risk that one party knowing entered into a contract in bad faith or has misrepresented critical information regarding their financial position) are concerned.

Othman *et al* (2022) conducted a study on the influence of symmetric and asymmetric information on exchange rate volatility in selected Arab countries using various Middle Eastern currencies. The study applied the EGARCH model for analysing the volatility structure of selected currencies using the daily data of rate of return of real exchange rates over the period from January 3, 2017, to June 2, 2022. The currencies used in this study were Saudi Riyal, Kuwait Dinar, Bahrain Dinar, Egyptian Pound, Algerian Dinar, Tunisian Dinar, and Moroccan Dirham. The study findings were that volatility structures of all the real exchange rate markets' return under study were symmetrically informative, and the memory of volatility structures was influenced more by past information. This study's weakness was the sole focus on the effect of information asymmetry alone as a driver of exchange rate volatility the period selected was rather short as well. The study was limited by its lack of focus on market sentiment, economic cycles and exchange rate volatility which were conceptual gaps.

Chen *et al* (2020) studied the impact of economic policy uncertainty on China's exchange rate volatility from December 2001 to November 2018. The study contrasted economic policy uncertainty with information asymmetry. Using quantile regression, they found that economic policy uncertainty has an impact on China's exchange rate volatility. The study's weakness was limited scope due to the use of one independent variable which represented a conceptual gap, while the choice of different research design was a methodological gap.

Ranaldo and Somogyi (2021) studied asymmetric risk in the forex market using OLS method and found that agents had superior information that was heterogeneous and consistent with asymmetric information, which, in turn, generated high returns even after accounting for risk, transaction cost, and other common risk factors shown in the FX. The employed a difference research design which

was a methodological gap while its lack of focus on market sentiment, and economic cycles represented conceptual gaps.

Onur (2008) posited that asymmetric information were the missing link between the currency demands of investors and changes in the exchange rate. The study utilised data from the Foreign Currency Department of the Bank of Israel (BOI) that covered all daily spot and swap transactions in the New Israeli Sheqel (NIS)/Dollar market between June 2000 and June 2006. The study employed simple regression model to examine the empirical relationship between order flows and changes in exchange rate. The study found that exchange rate and currency demand were positively correlated for well-informed investors and negatively correlated for less well-informed investors. Additionally, the amount of asymmetric information in the market played an important role in determining the equilibrium exchange rate. This contrasted with the findings of Othman *et al* (2022), Chen *et al* (2020) and Ranaldo and Somogyi (2021). The study had a different research design which was a methodological gap and it did not focus on market sentiment and economic cycles which were conceptual gaps.

The second indicator of information asymmetry is share-return volatility. Ombaba and Aduda (2016) defined share-return volatility as dispersions in the returns in a given share or stock in a market portfolio. Omokehinde *et al.* (2017) explained that share-return volatility determines the extent of symmetry or asymmetry of a given stock market in terms of how responsive it is to information whether negative or positive. Thus, if information is absorbed into the market non-linearly, it is said to be asymmetric while information that is integrated linearly is symmetric, and depending on the level of market sentiment it can have huge implications for the stock-return volatility. This study failed to focus on economic cycles and balance of trade positions; it had a different geographical context; and it had a different research methodology.

Sreenu (2023) studied the effect of exchange rate volatility and inflation on stock market return dynamics in India. Secondary data was collected on annual inflation and exchange rates from the RBI and the stock market for the period between January 2000 and June 2020. An autoregressive distributed lag (ARDL), GARCH, and the corresponding Error Correction Model (ECM) were adopted to investigate the impact of stock market returns volatility. The study found that there was a significant correlation in the long term between the market returns and the rate of exchange;

however, in the short term, there was a negative and insignificant correlation which was similar to the findings of Babu (2017) and Kori (2018). The study's key knowledge gaps are the different geographical contexts; the inverted relationship between the variables where the exchange rate volatility was the independent variable while the stock return volatility was the dependent variable; and the lack of focus on economic cycles and balance of trade position.

The third indicator of information asymmetry is share trading volume. Share or stock trading volume refers to the number of shares or stocks that a company sells in a financial market in a given period and is measured in terms of the aggregate market dollar volume (Arthur *et al.*, 2018). Batta (2014) investigated the relationship between trading volume and stock return volatility by focusing on the Nairobi Securities Exchange. The study opted for a correlational research design and the target population was all the 20 companies from the NSE 20-share index. Secondary data was collected on daily closing stock prices of all these companies, as well as daily trade volume which was taken as a proxy for information arrival for the period between January 2008 and December 2013. The study calculated daily realized volatility using standard deviations while simple averages were used to determine realized volatility at separate time zones. The study established that there was evidence of persistence of volatility of stock returns in the NSE which tended to reduce when higher volumes of stock were traded which was similar to the findings of Kamuti (2013). However, the study did not find a statistically significant correlation between trading volume and the persistence of stock volatility implying that their other extraneous determinants of stock volatility besides trading volume which contrasted with Ali *et al.* (2005). This study was limited by its different theoretical framework which featured the mixture of the distributions model, sequential information arrival model, asymmetric information model, and difference in opinion model; the focus on trading volume as a variable rather than on information asymmetry; and the lack of focus on market sentiment, economic cycles and balance of trade position.

Kayani *et al.* (2023) examined the asymmetric impact of exchange rate volatility on trade flows by focusing on developed and developing Asian economies. The study collected quarterly secondary data from the International Monetary Fund's International Financial Statistics (IFS) database for the period between 1980 and 2018 for Pakistan, Malaysia, Korea, and Japan. Linear and non-linear ARDL estimation models were adopted. The latter was found to be more effective

at producing significant results regarding the correlation between exchange rate volatility and trade flows. Additionally, both models indicated a negative correlation between increased exchange rate volatility and exports and imports for Pakistan. However, Malaysia's exports benefitted from decreased volatility since there were no long-run effects of exchange rate volatility. Additionally, there was a positive correlation between increased exchange volatility and exports for Japan which was similar to the findings of Thorbecke and Kato (2012); while increased volatility rates were found to enhance Korea's imports. This study's key knowledge gaps include the different geographical contexts; the lack of focus on market sentiment and economic cycles; and the lack of a theoretical framework.

2.3.4 Economic Cycles on Exchange Rate Volatility

Economic cycles refer to phenomena that are characterized by economy-wide variations in the level of production or economic activity over an extended period, say several months or years (Murray *et al.*, 2017). Economic cycles are typically most apparent during economic recessions and crises since these tend to increase the volatility of economic activity, food shortages due to poor productivity, increased unemployment, depletion of production inputs, increased prices of essential commodities, just to name a few (Kufenko & Geiger, 2016). Economic cycles usually go through four stages, namely: expansion – characterized by rapid growth, low-interest rates, and increased production levels; peak – characterized by short-term stability of economic indicators; contraction – characterized by slowing growth, increased unemployment, the stagnation of price levels and decreased demand; and trough – characterized by the lowest levels of productivity, recession due to lack of spending power, low-income levels, and lowest levels of supply and demand (Korhonen *et al.*, 2018). The most recent global economic cycle resulted from the COVID-19 pandemic where there was a reduction in global economic growth in 2020 by an annualized rate of -3.2% (Jackson *et al.*, 2020).

The first indicator of economic cycles is Gross Domestic Product (GDP). The GDP refers to the aggregate market valuation of goods and services that are produced within a given country's borders in a particular period, usually a year (Coscieme *et al.*, 2020). MacDonald and Swagel (2000) found out that there was little research done on the exchange rate-business cycle relationship. Secondary data was collected for the period from January 1975 to October 1997. Real

bilateral exchange rates were constructed for the deutsche mark, yen, and pound vis-a-vis the U.S. dollar. The results showed that business cycle factors were the dominant factor in accounting for recent exchange rate movements in the United States, Germany, Japan, and United Kingdom, though these were not the only or the most important influencers on the currencies. The study was unique as it considered the effect of the business cycle on the exchange rate, it contradicted the view of Baxter and Stockmanz (1989) and Idris *et al.* (2019) who postulated business cycles did not affect the exchange rate or trade flows. The choice of different research design represented a methodological gap while the lack of focus on market sentiment and information asymmetry were conceptual gaps.

Kamalyan and Davtyan (2022) studied the effect of exchange rate on business cycle. The study used data from emerging countries applying impulse responses. The finding of this study was that heightened exchange rate uncertainty yielded a drop-in economic activity, an increase in prices, and an exchange rate depreciation. The study contrasted with MacDonald and Swagel (2000) on variable positioning and methodology but had similar findings, additionally this study contradicted Baxter and Stockmanz (1989), and Idris *et al.* (2019). The key study gap was that they only used exchange rates in reverse order from the earlier studies and only one predictor variable was used to see the effect on business cycles which represented conceptual gaps.

A study was conducted by Idris *et al.* (2019) on the relationship between exchange rate and gross domestic product in Nigeria. The study adopted the Exchange Rate Ageing Theory. The study collected annual secondary data from the CBN statistical bulletin for the period between 1981 and 2017 and applied the ARDL co-integration procedure. According to the results, there was no correlation between the country's GDP and its official exchange rate movement, which contrasted with Barguelli *et al.* (2018). The main points of divergence for this study were the different theoretical frameworks; the lack of focus on market sentiment, information asymmetry, and balance of trade; and the different geographical contexts.

Lubis *et al.* (2017) investigated the effects of exchange rate on GDP in the five founding members of the ASEAN namely, Indonesia, Malaysia, Thailand, Singapore, and Philippines. Panel data was collected on the exchange rates and GDPs of each of the countries for the period between 1980 and 2014. Through the application of the ordinary least squares estimation approach, it was found

that there was a statistically significant correlation between exchange rate and GDP in the five countries. The results further indicated that the depreciation of exchange rates would raise the countries' GDP levels which was similar to the findings of Habib et al. (2017). This study contradicted Idris *et al.* (2019). The study was limited by its different geographical context; the inverted correlation between exchange rate (as the independent variable) and GDP (as the dependent variable); the lack of focus on market sentiment, information asymmetry, and balance of trade position; and the lack of a theoretical framework.

The second indicator of economic cycles is interest rates. Interest rates are defined as the cost incurred by a borrower for the use of money provided by a lender (Fisher & Weil, 2017). MacDonald and Swagel (2000) postulated in their study that movements in real long-term interest rates in Germany coincided with the appreciation of the deutsche mark in the late 1970s and the subsequent depreciation through 1982, as well as the appreciation from 1985-91. This positive real exchange rate-real interest rate relationship was synonymous with the business cycle. Secondly, in general terms, short and long interest rates have different effects over the business cycle, so that econometric work that excluded one or the other in trying to tie down the real exchange rate-real interest rate link was likely to produce an unspecified relationship. Further the study showed that using bandpass filters there is a clear business cycle component to the real exchange rates and real interest differentials, which in many instances the expected positive association suggested by most models. The study failed to focus on market sentiment and information asymmetry which were conceptual gaps.

Clark (2004) studied the effect of exchange rate volatility on trade flows. The study found that overall, there was no robust evidence of a large negative effect of exchange rate volatility on trade. The impact of the study was that exchange rate volatility was not likely to be a major policy concern. This study contrasted with MacDonald and Swagel (2000), Kamalyan & Davtyan (2022) and agreed with Idris et al. (2019) and Baxter and Stockman (1989). The study failed to focus on market sentiment and information asymmetry which were conceptual gaps.

Ulm and Hambuckers (2021) examined whether interest rate differentials (IRD) drove the volatility of exchange rates. The study adopted an extended stochastic volatility model to six pairs of currencies between January 1999 and December 2017. According to the results, there were

different effects of changes to IRD on low and high-interest-rate currencies. More specifically, there was a strong and positive correlation between exchange rate volatility in the low-interest rate, which was aligned with the unwinding of carry trade positions but contrasted with Bonga-Bonga and Maake (2021) who found that there was volatility spill-over between carry trade returns and asset market returns. However, increases in high interest rates responded negatively and in significantly smaller measures. This study was limited by its different geographical context; the different period of study; the different research methodology; and the lack of focus on market sentiment and balance of trade position.

The third indicator of economic cycles is consumer spending. Consumer spending refers to the aggregate value of the money spent by households in an economy in a given period (Berger *et al.*, 2018). A study was carried out on exchange rate volatility and domestic consumption by Chisti *et al.* (2019). This was a comparative study of developed, developing, and emerging economies where panel data was collected for the period between 1995 and 2017. Brush-Pagan and Hausman tests were applied for each set of chosen economies. The results showed that changes in exchange rates were found to have significant effects on the domestic consumption of developed economies which was similar to the findings of Han (2020). In contrast, there is no significant correlation between changes in exchange rates and domestic consumption in developing and emerging economies. This study's main knowledge gaps were the generalized geographical context; the choice of research methodology; and the lack of focus on market sentiment, information asymmetry, and balance of trade position.

Baxter and Stockman (1989) New York conducted a study of business cycles under different exchange rate regimes and found that there was little evidence of systematic differences in the behaviour of macroeconomic aggregates or international trade flows under alternative exchange-rate systems. The study utilised cross country correlational analysis. This finding contrasted with MacDonald and Swagel (2000) and agreed with Idris *et al.* (2019). The different research design represented a methodological gap, while the lack of focus on market sentiment and information asymmetry were conceptual gaps.

2.3.5 The Moderating Effect of Balance of Payment Position on the Drivers of Exchange Rate Volatility in Kenya.

The balance of payment position is defined as the record of all international financial transactions made by the residents of a country. There are three main categories of the BOP the current account, the capital account, and the financial account (Investopedia). Balance of trade is the most important component of the balance of payment. Accordingly, a positive balance of trade is established when the value of the exports exceeds that of the imports, which is the more favourable position, while the reverse is true for negative balance of trade positions when the value of imports exceeds that of the exports (Nuraini, 2019). The BOP influences the purchasing power of an organisation in the international market such that those countries with negative BOP will tend to be borrowers rather than lenders thereby be experience higher foreign exchange risk. Additionally, negative BOP will invariably have low foreign reserves which will limit their ability to cushion themselves from adverse effects of foreign exchange volatility thereby demonstrating its value as a moderating variable in this study.

The first indicator of balance of trade position is the number of imports. Imports refer to goods or services which are sold in a country that is different from the country where they were originally produced (Bakari & Mabrouki, 2017). Nguyen and Do (2020) investigated the impact of exchange rate shocks, inward Foreign Direct Investment (FDI), and import on export performance. The study adopted a time-series sample dataset for the period between 2009 and 2018 from the General Statistics Office of the Ministry of Planning and Investment in Vietnam. According to the results, there was a short-run positive correlation between the increased value of imports and export performance, however, this correlation was insignificant in the long-run which was aligned with Esaku (2021). The different research design represented a methodological gap, while the lack of focus on exchange volatility, market sentiment, economic cycles and information asymmetry were conceptual gaps.

Kandil (2009) in an IMF journal postulated that lack of measures to stimulate export growth in developing countries and given their high dependency on imports, the current account balance deteriorates with respect to currency depreciation. Further currency appreciation increases imports and deteriorates the current account balance across developing countries. The sample of countries

includes 21 developing and 25 developed countries. The sample period for investigation was 1971-2000. The study used OLS method to arrive at its findings. The study looks at the balance of payment as the dependent variable. This study differs from Nguyen and Do (2020) on the order of the variables which are conceptual gaps, while the different research design was a methodological gap. It contradicted the findings of Bahmani-Oskooee *et al.* (2013).

Bahmani-Oskooee *et al.* (2013) studied the effects of exchange rate volatility on commodity trade between the US and Brazil. Secondary data was collected on bilateral export and import flows between the US and Brazil for the period between 1971 and 2010 and applied the cointegration analysis technique to determine the impact of the risk associated with these trade flows. The findings indicated that most of the investors in this bilateral trade were unaffected by exchange rate volatility in the long run while the majority of those that were affected responded positively to the heightened risk which was similar to Bosupeng *et al.* (2024). Additionally, the exchange rate volatility risk was found to affect different industries in the two countries differently, for instance, the agricultural sector in Brazil was susceptible to this risk while the machinery imports in the US were impervious to this risk. This study was inconsistent with Kandil (2009). This study was limited by its different geographical context; the different research methodology; the different period of study; and the lack of focus on market sentiment.

The second indicator of balance of trade position is the number of exports. Exports are goods or services that are produced by a given country and sold to another country (Aghion *et al.*, 2018). Bahmani-Oskooee *et al.* (2017) conducted a study on exchange rate volatility and international trade performance in 12 African countries (Burundi, Kenya, Tanzania, Egypt, Lesotho, Nigeria, Sierra Leone, Ethiopia, Mauritius, Morocco, South Africa, and Tunisia). The study adopted time series data from 12 African countries for the period between the early 1970s and 2015. It examined the impact of exchange rate volatility by focusing on real-world income, relative prices, and exchange rate volatility as determinants of real exports. According to the results, exchange rate volatility was found to have a positive and significant impact on real exports in the long run in Egypt, Ethiopia, and Lesotho, while the relationship was found to be negative for Nigeria and Sierra Leone. In the short run, the correlation between exchange rate volatility and exports was found to be significant for all the countries except Kenya, Burundi, Tanzania, and Tunisia. Additionally, the short-run impacts were found to be negative for all countries other than Egypt.

Further, the depreciation of exchange rates increased exports for only Egypt, Lesotho, and Nigeria in the long run. This study was similar to Bahmani-Oskooee *et al.* (2013) in their finding and approach. This study's main knowledge gaps were the expanded geographical context; the different research methodology; the different periods of study; and the lack of focus on market sentiment, information asymmetry and economic cycles.

Nguyen and Dang (2022) studied the impact of exchange rate on the balance of payment with a focus on Vietnam. The study applied Auto-Regressive Distributed Lag (ARDL), and Granger Causality Test to evaluate the impact of the foreign exchange rate on the balance of payment. The results showed that Vietnam's foreign exchange rate had a significant positive impact on the balance of payment. This study agreed with Kandil (2009) and contradicted the findings of Bahmani-Oskooee *et al.* (2013). This study focused on the balance of payment as dependent variable rather than as a moderator variable and other predictor variables were used representing conceptual gaps.

The third indicator of balance of trade position is the level of factor endowments. Factor endowments refer to the value of a given country's factors of production including labour, land, capital and entrepreneurship in a given period (Shen *et al.*, 2022). Mosbei *et al.* (2021) investigated the effect of exchange rate volatility on intra-East Africa Community regional trade. The study collected differentiated panel data which was analysed using a GARCH model. The study found that intra-EAC trade was influenced by money supply, population, exchange rate, and FDI; and that foreign exchange volatility was evident in the region which was similar to the findings of Adam *et al.* (2014). Additionally, factor endowments were critical towards the attraction of FDI, thereby indirectly affecting the exchange rate volatility by acting as a stabilising factor. This study was limited by the expanded geographical context which was a contextual gap, while the lack of focus on market sentiment, information asymmetry, and economic cycles were conceptual gaps.

A study was conducted by Mbula (2021) on factors influencing bilateral trade between Kenya and her trading partners. The study adopted a descriptive survey and collected secondary and primary data from nine countries. The secondary data included data on trade and economy from the Kenya National Bureau of Statistics and the World Bank Database. The data was analysed using the Standard Gravity model. The study found that among the key determinants of bilateral trade

included the scale of factor endowments, the level of development, current account restrictions, and fixed exchange rates which was similar to the findings of Baxter and Kouparitsas (2005). Additionally, the colonial connection between countries was a significant determinant of bilateral trade such that those countries which shared Kenya's British colonial history were bigger trading partners regionally than those that did not. However, the study did not find a strong linkage between exchange rate volatility and bilateral trade. This study had several knowledge gaps including the lack of focus on market sentiment, information asymmetry and economic cycles; the different research methodologies; and the investigation of international trade as a dependent variable.

2.4 Research Gaps

The literature review revealed several research gaps. Muguto *et al.* (2022) had contextual gaps such as the different geographical context of Johannesburg, South Africa; a conceptual gap between the different theoretical foundations; and a methodological gap. Dumiter *et al.* (2023) had methodological gaps such as the restricted duration of the time interval examined; contextual gaps such as the different geographical context of the US; and conceptual gaps such as the restricted focus on news sentiment rather than market sentiment in general. Mwangi (2017) had conceptual gaps - its lack of concentrated focus on economic cycles as an independent variable and the lack of a theoretical foundation. Subanti *et al.* (2019) had a conceptual gap – its failure to investigate the impact of market sentiment on exchange rate volatility; and a contextual gap - it was conducted in a different geographical context.

Omokehinde *et al.* (2017) had conceptual gaps – its failure to focus on economic cycles and balance of trade positions; contextual gap - it had a different geographical context, and methodological gap - it had a different research methodology. Perera (2016) had several knowledge gaps including contextual - the different geographical context; and conceptual gaps - the inverted relationship between the variables where the exchange rate volatility was the independent variable while the stock return volatility was the dependent variable; and the lack of focus on economic cycles and balance of trade position.

The main points of divergence for Idris *et al.* (2019) were: conceptual gaps which included the different theoretical framework; the lack of focus on market sentiment, information asymmetry,

and balance of trade; and a contextual gap of the different geographical context. Lubis *et al.* (2017) had a contextual gap - its different geographical context; and conceptual gaps - the inverted correlation between exchange rate (as the independent variable) and GDP (as the dependent variable); the lack of focus on market sentiment, information asymmetry and balance of trade position; and the lack of a theoretical framework. The main knowledge gaps in Chisti *et al.* (2019) were: contextual - the generalised geographical context; methodological - the choice of research methodology; and conceptual - the lack of focus on market sentiment, information asymmetry, and balance of trade position.

Nguyen and Do (2020) had several knowledge gaps including contextual - the different geographical context; methodological - the different research methodology; and conceptual - the lack of a theoretical framework; and the lack of focus on market sentiment and information asymmetry. Bahmani-Oskooee *et al.* (2013) had a contextual gap - its different geographical context; methodological gap - the different research methodology, and the different periods of study; and conceptual gap - the lack of focus on market sentiment. The main knowledge gaps in Bahmani-Oskooee *et al.* (2017) were: contextual - the expanded geographical context; methodological - the different research methodology and the different periods of study; and conceptual - the lack of focus on market sentiment, information asymmetry, and economic cycles.

Mpofu (2015) had a contextual gap - its different geographical context; and conceptual gaps - its lack of focus on market sentiment, information asymmetry, economic cycles and balance of trade position. Nguse *et al.* (2021) had a contextual gap - its different geographical context; conceptual gaps - its lack of focus on market sentiment, information asymmetry and economic cycles; and a methodological gap - the different period of study.

The literature on exchange rate volatility has exposed several gaps. Mwega and Ndung'u (2001) focused on the correlation between foreign exchange volatility and manufacturing performance while Maurer *et al.* (2023) was a more generalised study. Irungu (2017) focused on the impact of interest rates and inflation on exchange rate volatility while Abdi *et al.* (2020) extended their study to encompass remittances. Karuoro (2018) conducted a univariate and multivariate analysis that featured the Granger causality test; while Maana *et al.* (2015) applied the GARCH process to model the volatility in the exchange rate returns. Onyango (2014) found that exchange rate

volatility positively impacts on GDP growth but is not significant in affecting GDP growth rate. The result differed from Musyoki *et al.* (2012) found a negative relationship between exchange rate volatility and economic growth in Kenya.

The research on the drivers of exchange rate volatility has indicated several gaps. John *et al.* (2022) found that the two determinants of stock returns were investors' behavioural factors as well as fundamentals: conversely. Musembi *et al.* (2020) studied investor sentiment as an independent variable while Mugenda (2023) examined the moderating effect of investor sentiment. Bhatia and Kaur (2023) applied a panel regression to investigate the variables for the period between 2015 and 2021, while Spina (2019) conducted an empirical desktop review. Ibrahim and Alagidede (2020) examined the correlation between long-run or short-run periods of economic shocks and information asymmetry; however, Abdel-Wanis and Rashed (2023) studied the correlation between capital structure and information asymmetry.

The literature on the Balance of Trade has also revealed several gaps. Barkat *et al.* (2022) contextualised around the GCC countries which have unique characteristics that made the findings different from those of Bao *et al.* (2023) which was conducted in India. Aliyu *et al.* (2015) found that there was a correlation between currency devaluation and the enhancement of trade balance; in contrast, Sanusi *et al.* (2023) ascertained that the attainment of sustainable economic development is dependent upon the promotion of effective policies for the improvement of exports, the reduction of the dependence on imports, and creation of favourable macroeconomic conditions. Vallance and Fabrice (2016) determined that there was a positive quadratic correlation between the exchange rate and the country's balance of trade position while Kamugisha and Assoua (2020) found that there was only a short-run effect of changes in real exchange rates on trade balances while incomes had a more long-term effect on trade balances.

The summary of knowledge gaps is captured in Table 2.1.

Table 2. 1: Summary of Knowledge Gaps

Study	Focus of Study	Findings	Research Gap	Focus of Current Study
Muguto <i>et al.</i> (2022)	The impact of investor sentiment on sectoral returns and volatility: Evidence from the Johannesburg stock exchange.	Owing to the lack of general, clear and standard understanding of investor sentiment, there have been numerous proxies that have been adapted as representations of investor sentiment that are founded on controversial theoretical explanations.	Had contextual gaps such as the different geographical context of Johannesburg, South Africa; a conceptual gap between the different theoretical foundations; and a methodological gap.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Dumiter <i>et al.</i> (2023)	The impact of sentiment indices on the stock exchange – The connections between quantitative sentiment indicators, technical analysis, and stock market	There is a strong connection between news sentiment indices, technical analysis, and the stock market which suggests that the behavioural finance aspect is a very important aspect in the analysis of the stock market.	Had methodological gaps such as the restricted duration of the time interval examined; contextual gaps such as the different geographical context of the US; and conceptual gaps such as the restricted focus on news sentiment rather than market sentiment in general.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Mwangi (2017)	The effects of exchange rate changes on the stock market performance in the NSE.	According to the results, there was an unstable foreign exchange rate movement on average during the period under review.	Had conceptual gaps - its lack of concentrated focus on economic cycles as an independent variable and the lack of a theoretical foundation.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.

Subanti <i>et al.</i> (2019)	Exchange rate volatility and exports: A panel data analysis for 5 ASEAN countries.	The findings show that the exchange rate volatility has negative impact on exports.	Had a conceptual gap – its failure to investigate the impact of market sentiment on exchange rate volatility; and a contextual gap - it was conducted in a different geographical context.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Omokehinde <i>et al.</i> (2017)	Asymmetric information and volatility of stock returns in Nigeria.	Share-return volatility determines the extent of symmetry or asymmetry of a given stock market in terms of how responsive it is to information whether negative or positive.	Had conceptual gaps – its failure to focus on economic cycles and balance of trade positions; contextual gap - it had a different geographical context, and methodological gap - it had a different research methodology.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Idris <i>et al.</i> (2019)	The relationship between exchange rate and gross domestic product in Nigeria.	According to the results, there was no correlation between the country's GDP and its official exchange rate movement.	Had conceptual gaps which included the different theoretical framework; the lack of focus on market sentiment, information asymmetry, and balance of trade; and a contextual gap of the different geographical context.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Chisti <i>et al.</i> (2019)	Exchange rate volatility and domestic consumption.	The results showed that changes in exchange rates were found to have significant effects on the domestic consumption of developed economies.	Had contextual gaps - the generalised geographical context; methodological - the choice of research methodology; and conceptual gaps - the lack of focus on market sentiment,	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.

			information asymmetry, and balance of trade position.	
Nguyen and Do (2020)	The impact of exchange rate shocks, inward Foreign Direct Investment (FDI), and import on export performance.	According to the results, there was a short-run positive correlation between the increased value of imports and export performance, however, this correlation was insignificant in the long-run.	Had several knowledge gaps including contextual - the different geographical context; methodological - the different research methodology; and conceptual - the lack of a theoretical framework; and the lack of focus on market sentiment and information asymmetry.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Bahmani-Oskooee <i>et al.</i> (2013)	The effects of exchange rate volatility on commodity trade between the US and Brazil.	The findings indicated that most of the investors in this bilateral trade were unaffected by exchange rate volatility in the long run while the majority of those that were affected responded positively to the heightened risk.	Had a contextual gap - its different geographical context; methodological gap - the different research methodology, and the different periods of study; and conceptual gap - the lack of focus on market sentiment.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Mpofu (2015)	Exchange rate volatility, employment and macroeconomic dynamics in South Africa.	The results indicated that there was a significant but contradictory correlation between exchange rate volatility and employment growth.	Had a contextual gap - its different geographical context; and conceptual gaps - its lack of focus on market sentiment, information asymmetry, economic cycles and balance of trade position.	The moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya.
Nguse <i>et al.</i> (2021)	The influence of exchange rate levels and volatility on	According to the results, there was a negative and significant	Had a contextual gap - its different geographical context; conceptual gaps - its lack of focus on market	The moderating effect of the balance of payment position on the drivers of

	international trade in Ethiopia.	correlation between exchange rate level and international trade.	sentiment, information asymmetry and economic cycles; and a methodological gap - the different period of study.	exchange rate volatility in Kenya.
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2.5 Conceptual Framework

A conceptual framework establishes a foundation for what is important or relevant for a given piece of research to enable the provision of responses to research questions (Ravitch & Riggan, 2016); or a structure that ensures the linkage with concepts, empirical literature and significant theories applied in articulating the researcher’s intended knowledge in a systematic manner (Adom, Hussein & Agyem, 2018). The conceptual framework of the study is illustrated in Figure 2.1.

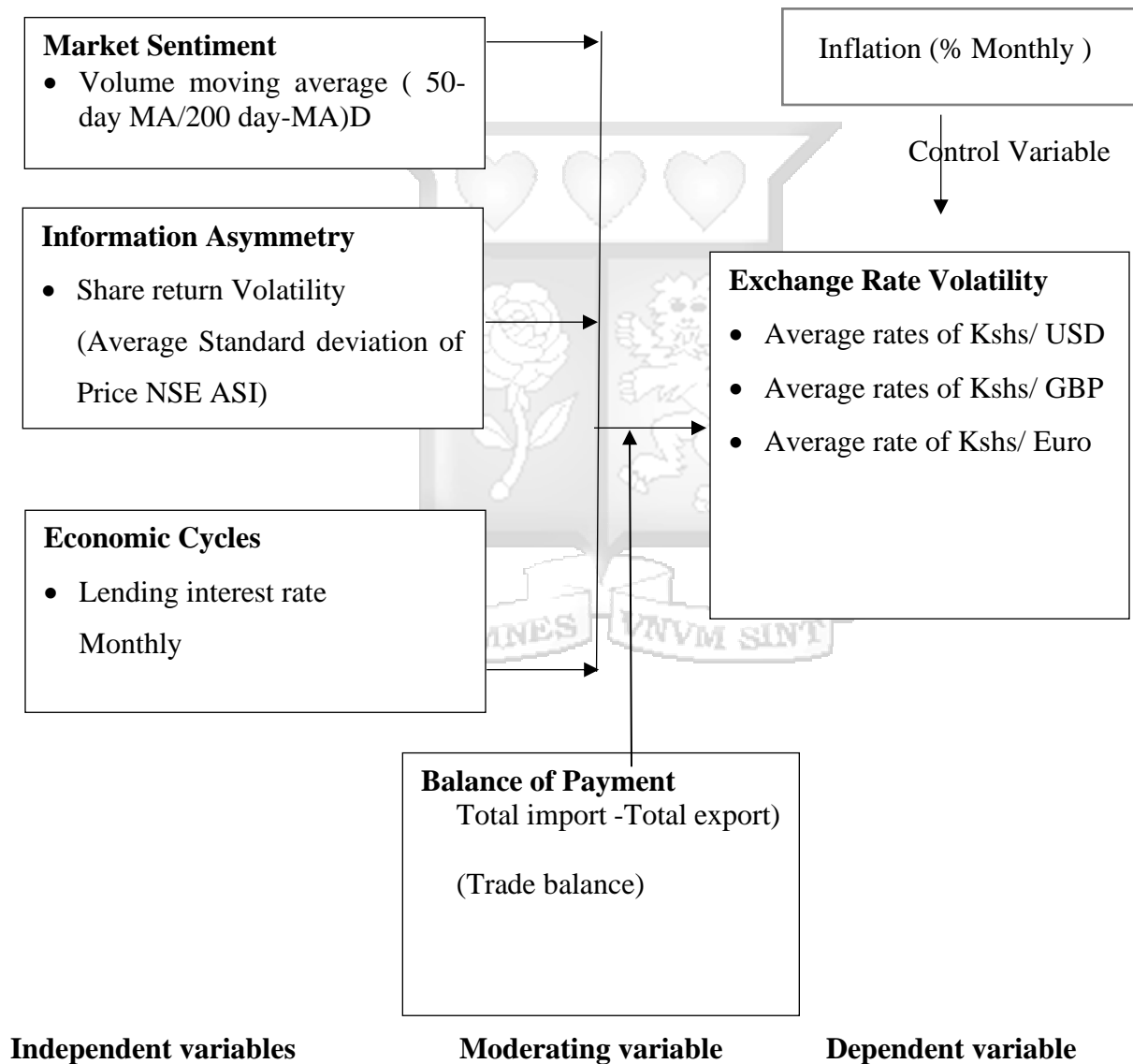


Figure 2. 1: Conceptual Framework

2.5.1 Operationalisation of Variables

Rao and Reddy (2013) defined operationalisation as the process through which research concepts and constructs are defined and the procedures involved in the measurement of these concepts and constructs. Tariq (2015) explained that variables are operationalised when a valid, measurable and quantifiable index is applied in defining them and can be used in their manipulation. The operationalisation of the variables is presented in Table 2.1 below.

The currency pair selected for this study are the USD , Euro and GBP. The justification for the use of this currencies is supported by a study by Kamau and Ngugi (2013) in their study of exchange response to policy new in Kenya. They pointed out that By Law, Kenya is required to hold foreign reserve holding to cover a minimum of up to four months of import. The foreign reserve holdings are held in three main currencies the US dollar (68.4%), Euro (6.45%.) and Sterling Pound (16.3 %.) as of June 2013. As such this study focused on the key reserve curries as enumerated above.

2.6 Chapter summary

The study relied on purchasing power parity theory as the foundation of the study for its theoretical under pinning due to the versatile application and linkage of the theory to the study variables. Key studies evaluated in the empirical review section have been found to have contextual and conceptual gaps. Research gaps have been enumerated and a summary provided. The key Gaps being that most of the studies have been conducted in different geographies and none of the studies have used all their independent variable used in this study. Moderating effect has not been tested before. Additionally, all the studies involving balance of payment have reverse variable position thus a gap as to the effect of balance of payment on exchange rate has not been investigated. Finlay justification of the use of their key carriers pairs is due to their reserve contribution which is a manifestation of their contribution to international transaction settlement

Table 2. 2: Operationalisation of Variables

Variable	Variable definition	Indicator	Measurement scale	Supporting literature	Supporting theories
Market Sentiment	Relates to the general attitude of investors towards financial markets	Volume moving average (VMA) of NSE all share index	If index is >1, : 1 If index is >1 , :1 ; proxy of -1 and 1	Mobeen (2013) ; Hyo et al (2022) ; Plakandaras et al (2015) ; Musembi et al. (2020)	Classical Financial Theory; Behaviour Theory
		VMA = 50 daily movement average / 200 daily movement average : If VMA ratio is < 1 = negative market sentiment : If VMA ratio is > 1 = positive sentiment		John et al. (2022) ; Dumiter et al. (2023) : Agénor (2005) ; Mwangi (2017)	

<p>Information Asymmetry</p>	<p>A situation whereby one party in a relationship has superior information, either in terms of quality or quantity, to the other</p>	<p>Share return Volatility (Price) ; high volatility indicates a high cost of adverse selection, which implies greater information asymmetry among investors</p>	<p>Standard deviation of Monthly Price Movement : STD,VE (Month PX)</p>	<p>Othman et al (2022) ; Sarno et al (2021) ; Liming et al (2020) ; Ranaldo and Somogyi (2021) ; Ishfaq et al. (2022) ; Omokehinde et al. (2017) ; Batta (2014)</p>	<p>Random Walk Theory; Modern Portfolio Theory; the Capital Asset Pricing Model; the Efficient Market Hypothesis; the Arbitrage Pricing Theory</p>

Economic Cycles	refer to phenomena that are characterised by economy-wide variations in the level of production or economic activity over an extended period	Commercial banks' lending interest rates	%monthly	MacDonald and Swagel (2000); Baxter and stockmanz (1989) ; Hayk and Vahagn (2022) ; Idris et al. (2019) ; Lubis et al. (2017)	Keynesian Economics : Real business cycle theory
Balance of Payment Position	Reflects the difference between imports and exports in each country	Trade balance = total exports – imports in a country	Net imports	Kandil (2009) ; Nguyen and Do (2020) ;Bahmani-Oskooee et al. (2013)	Balance of payment theory

Exchange Rate Volatility	Refers to the sharp rise and fall of the exchange rate of local currencies to foreign currencies	Average Monthly rates of Kshs ; Average Monthly rates of Kshs ; Average monthly rates of Ksh	Indirect quote : FX/Ksh	Kemoe et al. (2023) ; Wadada (2022) Eklou (2023) ; Irungu (2017) ; Maurer et al. (2023)	Foreign Exchange Exposure theory; PPP theory
Inflation	the rate of increase in prices over a given period	Consumer Price Index (CPI)	%monthly	Irungu (2017)	Demand-pull theory

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter contains a description of the various aspects of research methodology that relate to the study. The chapter is organised as follows. Section 3.2 features the research philosophy; section 3.3, the research design; section 3.4 is concerned with the target population; section 3.5 focuses on the data collection methods. section 3.6 captured the research quality; section 3.7 discussed the data analysis; section 3.8 articulated the diagnostic tests which included the multicollinearity test, normality test, cointegration test, linearity test, correlation test and causality test.; and section 3.9 covered the ethical considerations.

3.2 Research Philosophy

Given that this research is quantitative it applied a positivist research philosophy as suggested by Fox (2008). Fox (2008) explained that the positivist philosophy explains a perspective of knowledge that is based on the nature of reality thus representing both an epistemological and ontological position.

3.3 Research Design

As suggested by Seeram (2019), the study applied a correlational research design since it purposed to establish the nature of the relationship that exists between the research variables.

3.4 Data Collection Methods

Ubaidullah (2015) defined data collection as the mechanism through which information about a study is gathered to either confirm or contradict the facts. Kothari (2004) explained that secondary data collection features the use of methods such as journals, periodicals, books, published sources, magazines, newspapers, weblogs, diaries, letters, government records, census data, e-journals, and public sector records. This study used secondary data which was sourced from Bloomberg, Kenya Bureau of Statistics, and the Central Bank of Kenya.

3.5 Research Quality

Cooper and Schindler (2014) defined research quality as the research procedures conducted to ensure adherence to laid down standards of data collection and analysis, and the ultimate achievement of research objectives. This study adopted the following procedures to ensure research quality: seeking approval to conduct the study, collecting data, and carrying out the data analysis.

3.6 Data Analysis

Data was collected from the various sources including share trading volume and price of the NSE ASI was obtained from Bloomberg in a monthly fashion r. monthly exchange rate for USD, GBP, EURO and Monthly inflation were obtained from the Central Bank of Kenya website published results. BOP was obtained from the Central Bank of Kenya's foreign trade summary report.

To obtain market sentiment, a sentiment index was created using the 50day/200day moving average index from the volume traded of the NSE ASI (Nairobi securities exchange all share index). For information asymmetry the monthly standard deviation of the NSE ASI price was used. For the Economic cycle, the log of interest rate (Lending) was used while for BOP the natural log of net Import from CBK data was used. The relationship was better modelled by taking the log due to the vast numbers involved and eliminating negative values.

The analysis used a multiple regression model to capture the variables of the study as follows:

$$FX_t = \beta_0 + \beta_1ms_t + \beta_2Ia_t + \beta_3Ec_t + \varepsilon_t \dots\dots\dots (i)$$

$$= \beta_0 + \beta_1ms_t + \beta_2Ia_t + \beta_3Ec_t + \beta_4Bop_t + \varepsilon_t \dots\dots\dots (ii)$$

Were.

FX = the dependent variable (Exchange Rate Volatility in time t), β_1ms_t = the first independent variable (Market Sentiment in time t), β_2Ia_t = the second independent variable (Information Asymmetry in time t), β_3Ec_t = the third independent variable (Economic Cycles in time t), β_4Bop_t = the moderating variable (Balance of Payments in time t), ε_t = the error term in time t , β_0 = the constant term, β_{1-4} = the Beta coefficient.

Since the moderating variable is supposed to be multiplied with each of the independent variables, the model changes to equation (iii) as shown below:

This represents the interaction between the independent variables and the moderating variables.

$$FX = \beta_0 + \beta_1 ms_t + \beta_2 Ia_t + \beta_3 Ec_t + \beta_4 Bop_t + \beta_5 inf_t + \beta_1 ms_t * Bop_t + \beta_2 Ia_t * Bop_t + \beta_3 Ec_t * Bop_t + \varepsilon_t$$

Where:

FX = the dependent variable (USD, Euro, and GBP)

(Exchange Rate Volatility in time t), $\beta_1 ms_t$ = the first independent variable (Market Sentiment in time t), $\beta_2 Ia_t$ = the second independent variable (Information Asymmetry in time t), $\beta_3 Ec_t$ = the third independent variable (Economic Cycles in time t), $\beta_4 Bop_t$ = the moderating variable (Balance of Payments in time t), $\beta_5 inf_t$ = (the control variable in time t) ε_t = error term β_0 = the constant term, β_{1-5} = the Beta coefficient.

3.8 Diagnostic Tests

The study conducted autocorrelation, multicollinearity, normality unit root tests, cointegration, vector error correction, correlation and causality to confirm the appropriateness of the multiple regression model for the study. These are explained in more detail in the following sections.

3.8.1 Autocorrelation

Autocorrelation refers to a condition whereby the errors of a time-series research design are correlated rather than being independent of each other which would render the conclusions drawn from the associated analyses misleading without some corrective action (Huitema & Laraway, 2006). The significance of autocorrelation is based on three facts: it can influence the validity of inferential statements linked with traditional hypothesis tests and confidence intervals; awareness of autocorrelation can lead a researcher to the selection of a more appropriate statistical analysis; and information related to autocorrelation can also enhance the accuracy of forecasts made using regression equations (Kuhlmann, 2001).

The study conducted the Breusch Godfrey LM test to confirm if there was autocorrelation as recommended by Powell (1986) who affirmed that the Breusch Godfrey LM is a more powerful tool for testing high-order serial correlation. If the p-values were less than 0.05 for the Chi-square statistic, then the residuals of the empirical model auto-correlated.

3.8.2 Multicollinearity Test

According to Shrestha (2020), multicollinearity is a phenomenon that occurs when several variables that correlate significantly both with each other and with the dependent variable are included in the multiple regression analysis. Multicollinearity can result in skewness and faulty results when the researcher seeks to establish the extent of the effectiveness of each factor in explaining the response variable in a statistical model. Thus, three techniques can be applied in detecting multicollinearity: using the pairwise scatterplot and correlation coefficients, the variance inflation factor (VIF), and the eigenvalue method. Using the pairwise scatterplot and correlation coefficients, whenever the correlation coefficient value is higher (typically close to a Pearson correlation coefficient of 0.8) with the pairwise variables, then there is multicollinearity.

The study applied the VIF method for detecting multicollinearity. EViews was used for calculating a VIF for each independent variable. VIFs start at 1 and have no upper limit. A value of 1 indicates that there is no correlation between this independent variable and any others. VIFs between 1 and 5 suggest that there is a moderate correlation, but it is not severe enough to warrant corrective measures. VIFs greater than 5 represent critical levels of multicollinearity where the coefficients are poorly estimated, and the p-values are questionable.

3.8.3 Normality Test

Ghasemi and Zahediasl (2013) explained that normality tests are used to establish whether the assumption of normality, that the data follows a normal distribution, holds. Normality can be undertaken using visual methods by visually inspecting the distribution of the data in histograms, stem-and-leaf plots, boxplots, probability-probability (P-P) plots, and quantile-quantile (Q-Q) plots. Thus, if the shape of the distribution of the data is construed to be bell-shaped then this is a normal distribution. However, owing to the inherent inaccuracies in the visual methods, more accurate statistical normality tests can be conducted including the Kolmogorov-Smirnov (K-S)

test, Lilliefors corrected K-S test, the Shapiro-Wilk test, the Anderson-Darling test, just to name a few. The most popular of these are the K-S and the Shapiro-Wilk test. These tests make comparisons between sample scores and a set of normally distributed scores with identical mean and standard deviation. The data is interpreted to be not normally distributed if the test is significant. The K-S test is usually applied when the sample size is more than 50 while the Shapiro-Wilk test is used when the sample size is less than 50.

According to Thadewald and Buning (2007), one of the most popular tests of normality of regression residuals is the Jarque and Bera (1980) test whose test statistic (JB) is defined by the following equation:

$$JB = \frac{n}{6} \cdot \left(S^2 + \frac{(K - 3)^2}{4} \right)$$

Where: The sample skewness $S = \hat{\mu}_3 / \hat{\mu}_2^{3/2}$ is an estimator of $\beta_1 = \mu_3 / \mu_2^{3/2}$ and the sample Kurtosis $K = \hat{\mu}_4 / \hat{\mu}_2^2$ which estimates $\beta_2 = \mu_4 / \mu_2^2$, μ_2 and μ_3 are the theorised second and third central moments, respectively, with its estimates:

$$\hat{\mu}_j = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^j, \quad j = 2, 3, 4.$$

JB is considered to be asymptotically chi-squared distributed with two degrees of freedom since it is the sum of two asymptotically independent standardised normals. The implication is that H_0 must be rejected at level α if $JB \geq \chi^2_{2, \alpha}$. The study evaluated the normality of the data using Jarque-Bera. If the p-value obtained is less than 0.05 then the data was deemed to be not normally distributed.

3.8.4 Stationarity Test/ Unit Root Test

Baum (2009) explained that a unit root test seeks to establish whether a time series variable is non-stationary and possesses a unit root where the null hypothesis is defined as the presence of a unit root while the alternate hypothesis is defined as the absence of a unit root, or stationarity. In this case, a unit root is defined as a unit of measurement that computes the level of stationarity in a time series model. Testing for non-stationarity is critical for several reasons including stationarity

can have a strong impact on the behaviour of a series and its properties such as the possibility of having infinite persistence of shocks in non-stationary series; the likelihood of spurious regressions such as if two regressions are trending over time, one's regression on another could have a high R^2 even if the two are completely unrelated.; and lack of stationarity can render standard assumptions for asymptotic analysis invalid.

The study conducted a stationarity test to establish the presence of a unit root using Augmented Dickey-Fuller (ADF) tests and the Phillips-Perron (PP) unit root test. The test was done to facilitate the avoidance of the problem of spurious and inconsistent regression results. In general, a p-value of less than 5% will imply rejection of the null hypothesis that there is a unit root. The calculated DF-r statistic was compared with the tabulated critical value. If the DF-r statistic was more negative than the table value, the null hypothesis of a unit root was rejected. It is important to note that the more negative the DF test statistic, the stronger the evidence for rejecting the null hypothesis of a unit root

3.9 Ethical Considerations

Akaranga and Makau (2016) referred to ethics as a concept that encompasses activities, rules, values and practices that establish whether something is right or wrong. Ethical issues include informed consent which establishes whether a person has provided their consent knowingly, voluntarily and intelligently, beneficence which establishes whether individuals have committed to ensuring that they do no harm, respect for anonymity (making sure that the identity of an individual is protected), confidentiality (keeping the sensitive information about an individual secret), respect for privacy (an individual's right to control which information can be shared), concern for vulnerable groups of people, not interviewing minors unless with the express consent of their guardians or parents, and conducting research competently. This study addressed ethical issues by seeking informed and voluntary consent from all participants in advance, committing to doing no physical or mental harm, and respecting anonymity and confidentiality as well as privacy. Permission to conduct research was also obtained from the university as well as the National Commission for Science, Technology and Innovation (NACOSTI). Additionally, ethical review committee approval was sought.

3.10 Chapter summary

In this chapter the various methodology applied in the study have been discussed. In summary Given that this research is quantitative it applied a positivist research philosophy, the study applied a correlational research design since it purposed to establish the nature of the relationship that exists between the research variables. Secondary Monthly data was collected on the study variable from 2014 to 2023 a total of 120 observation was used. Descriptive and inferential analysis was conducted using EViews12 and presented in graph and charts . the following diagnostics test were applied before regression analysis; autocorrelation, multicollinearity, normality unit root tests Cointegration, Vector error correction, Correlation and causality.



CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

In this chapter, the research findings are presented. The study sought to determine the moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya. The research findings include general information about the results, the results of the diagnostic tests, and the descriptive statistics. The presentation of the findings will involve the data from EViews12 on each of the variables in tables then the analysis and interpretation of the same and a summary of the findings.

4.2 General Information

Monthly secondary data for the period between 2014 and 2023 which included 120 observations on stock data from Bloomberg, average rate of USD, GBP and EUR, interest rate, Balance of trade and inflation figures was collected from the Central Bank of Kenya. It included data on the relationship between the various indicators of exchange rate volatility (USD, GBP and EUR) and each of the independent variables (market sentiment, information asymmetry, and economic cycles). Additionally, it captured data on the moderating effect of the balance of payments on the relationships. Data on inflation was used as a control variable in the analysis. The analysis of the data was done using the least squares technique. Finally, the findings are interpreted accordingly.

4.3 Descriptive Statistics

The results of the descriptive statistics of the study are presented in Table 4.1. A review of the maximum and minimum values for USD indicates that there was a change of 78.7% in the USD/KES exchange rate during the period under study. The GBP/KES exchange rate had a minimum of 125.47 and a maximum of 194.98 indicating a change of 55.4% in the GBP/KES exchange rate during the period under study. The EURO/KES exchange rate had a minimum of 99.41 and a maximum of 167.98 indicating a change of 69.0% in the exchange rate during the period under study. The market sentiment had a minimum of -1 and a maximum of 1 indicating a change of 200% in the level of market sentiment during the period under study. Information

asymmetry had a minimum of 0.4422 and a maximum of 11. indicating a change of 2,392.2% in information asymmetry during the period under study. The economic cycles had a minimum of 11.75 and a maximum of 18.30 indicating a change of 55.1% during the period under study, BOP had a maximum of 12.04 and a minimum of 10.78 indicating a change of 11.7% in the BOP during the period under study. Finally, inflation had a maximum of 8.78 and a minimum of 4.53 indicating a change of 93.8% in the inflation during the period under study.

The standard deviations for the USD, GBP and EURO are 13.79961, 12.59112 and 13.88797 indicating a wide dispersion of the values from the mean while the standard deviations of market sentiment, information asymmetry, economic cycles BOP and inflation were 0.995227, 1.624171, 1.932406, 0.244457 and 1.110196 indicating a narrow dispersion of the values from the mean. The skewness of the data showed that the skewness for USD, GBP, EURO, and information asymmetry, were all positive while the skewness for market sentiment, economic cycles and inflation were slightly positively skewed while BOP was slightly negatively skewed. However, given the low levels of skewness, it can be inferred that the skewness was moderate. The Kurtosis values for USD Euro, GBP and information asymmetry were ≥ 3 indicating a positive Kurtosis, while the Kurtosis values for market sentiment, economic cycles, BOP and inflation were ≤ 3 indicating a negative Kurtosis.

The Jarque-Bera statistics for the study showed that values were all above 0.05 indicating that the data series for all the variables were normally distributed. Finally, the sum of squares of deviations values for the data series for USD, GBP, EURO, information asymmetry, economic cycles, inflation and BOP were all large indicating that the variances from the mean were large while the sum of squares for the data series for BOP were relatively smaller indicating smaller variances from the mean

Table 4. 1: Descriptive Statistics of the Study

Date: 04/27/24 Time:

12:19

Sample: 1 120

	USD	EURO	GBP	MS	IA	EC	BOP	INF
Mean	106.81	121.55	143.87	-0.13	2.62	13.85	11.48	6.45
Median	103.14	118.11	141.97	-1.00	2.32	13.23	11.50	6.43
Maximum	154.09	167.98	194.98	1.00	11.02	18.30	12.04	8.78
Minimum	86.21	99.41	125.47	-1.00	0.44	11.75	10.78	4.53
Std. Dev.	13.80	12.59	13.89	1.00	1.62	1.93	0.24	1.11
Skewness	1.47	1.59	1.40	0.27	1.67	0.94	-0.11	0.30
Kurtosis	5.50	5.85	5.30	1.07	8.13	2.57	2.80	2.39
Jarque-Bera	74.42	91.13	65.89	20.03	187.36	18.74	0.42	3.70
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.16
Sum	12817.4	14585.7	17264.4	-16.0	314.1	1661.6	1378.1	773.8
Sum Sq. Dev.	22661.1	18866.1	22952.2	117.9	313.9	444.4	7.1	146.7
Observations	120	120	120	120	120	120	120	120

4.4 Diagnostic Tests Findings

4.4.1 Autocorrelation Test Findings

The results of the autocorrelation diagnostic test for equation 1 USD are presented in Table 4.2. According to the results, the p-value is ≤ 0.05 indicating the presence of autocorrelation and rejecting the null hypothesis as suggested by Bartels and Goodhew (1981). This indicates that there is autocorrelation between the USD time series data and the independent variables during the period under study.

Table 4. 2: Breusch-Godfrey Serial Correlation LM Test (Equation 1 USD)

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	290.8811	Prob. F(2,112)	0.0000
Obs*R-squared	100.6274	Prob. Chi-Square(2)	0.0000

To solve for serial autocorrelation as seen above in Table 4.2 the model was run from ordinary covariance conditions to Newey–West covariance condition. According to Stata.com the Newey–West variance estimator handles autocorrelation up to and including a lag of m , where m is specified by stipulating the lag() option. Thus, it assumes that any autocorrelation at lags greater than m can be ignored. Newey (1993) stated that the estimator can be used to improve the ordinary least squares (OLS) regression when the residuals are heteroscedastic and/or autocorrelated. The model was run on EViews with the Newey-West fixed and autocorrelation was solved as shown below in Table 4.3

Table 4. 3: Breusch-Godfrey Serial Correlation LM Test (Equation 1 USD, Newey- west)

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 4 lags

F-statistic	7.362297	Prob. F(4,108)	0.1081
Obs*R-squared	25.49636	Prob. Chi-Square(4)	0.0945

The results of the autocorrelation diagnostic tests for equation 2 EURO are presented in Table 4.4. According to the results, the p -value is ≤ 0.05 indicating the presence of autocorrelation and rejecting the null hypothesis again as suggested by Bartels and Goodhew (1981). This indicates that there is autocorrelation between the EURO time series data and the independent variables during the period under study.

Table 4. 4: Breusch-Godfrey Serial Correlation LM Test (Equation 2 EURO):

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	346.6790	Prob. F(2,112)	0.0004
Obs*R-squared	103.3118	Prob. Chi-Square(2)	0.0005

To solve for serial autocorrelation as seen above in Table 4.4 the model was run from ordinary covariance conditions to Newey–West covariance condition. Newey's (1993) estimator thus can be used to improve the ordinary least squares (OLS) regression when the residuals are heteroscedastic and/or autocorrelated. The model was run on EViews with the Newey-West fixed and autocorrelation was solved as shown below in Table 4.5

Table 4. 5: Breusch-Godfrey Serial Correlation LM Test (Equation 2 EURO Newey- west):

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 4 lags

F-statistic	2.303771	Prob. F(4,108)	0.0630
Obs*R-squared	9.355408	Prob. Chi-Square(4)	0.0528

The results of the autocorrelation diagnostic tests for equation 3 GBP are presented in Table 4.6. According to the results, the p-value is ≤ 0.05 indicating the presence of autocorrelation and rejecting the null hypothesis again as suggested by Bartels and Goodhew (1981). This indicates that there is autocorrelation between the GBP time series data and the independent variables during the period under study.

Table 4. 6: Breusch-Godfrey Serial Correlation LM Test (Equation 3 GBP):

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	203.5871	Prob. F(2,112)	0.0003
Obs*R-squared	94.11273	Prob. Chi-Square(2)	0.0002

To solve for serial autocorrelation as seen above in Table 4.6 the model was run ordinary covariance conditions to Newey–West covariance condition. Newey's (1993) estimator thus can be used to improve the ordinary least squares (OLS) regression when the residuals are heteroscedastic and/or autocorrelated. The model was run on EViews with the Newey-West fixed and autocorrelation was solved as shown below in Table 4.7

Table 4. 7: Breusch-Godfrey Serial Correlation LM Test (Equation 3 GBP Newey- west):

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.227190	Prob. F(2,110)	0.2971
Obs*R-squared	2.597242	Prob. Chi-Square(2)	0.2729

4.4.2 Multicollinearity Test Findings

The results of the multicollinearity test are shown in Table 4.8 for the dependent variables, independent variables, control variable and moderator variable. According to the results, the VIF values (for the centred VIF) for all the scenarios are all between 1 and 2 indicating that they were all way below the threshold of below 10 and proving that there is no multicollinearity in all the series under all scenarios as recommended by Shrestha (2020). All the tests returned the same result for multicollinearity as shown in Table 4.4.

Table 4. 8: Dependent variables: MS, IA, EC, BOP INF

Variance Inflation Factors

Date: 04/25/24 Time: 22:26

Sample: 1 120

Included observations: 120

Variable	Coefficient Variance	Uncentered VIF	Centred VIF
MS	6.77E-05	1.153	1.132
IA	2.51E-05	4.055	1.121
EC	2.62E-05	87.154	1.651
BOP	0.001499	3370.575	1.514
INF	6.65E-05	48.457	1.384
C	0.217137	3699.451	NA

4.4.3 Normality Test Findings

The findings about the normality test for the relationship between the USD and the Moderation of BOP, control variable INF with other independent variables is shown in Figure 4.1. According to the results, the probability value is ≥ 0.05 indicating that the assumption of normality has been fulfilled or that the data is normally distributed per the Jarque-Bera test.

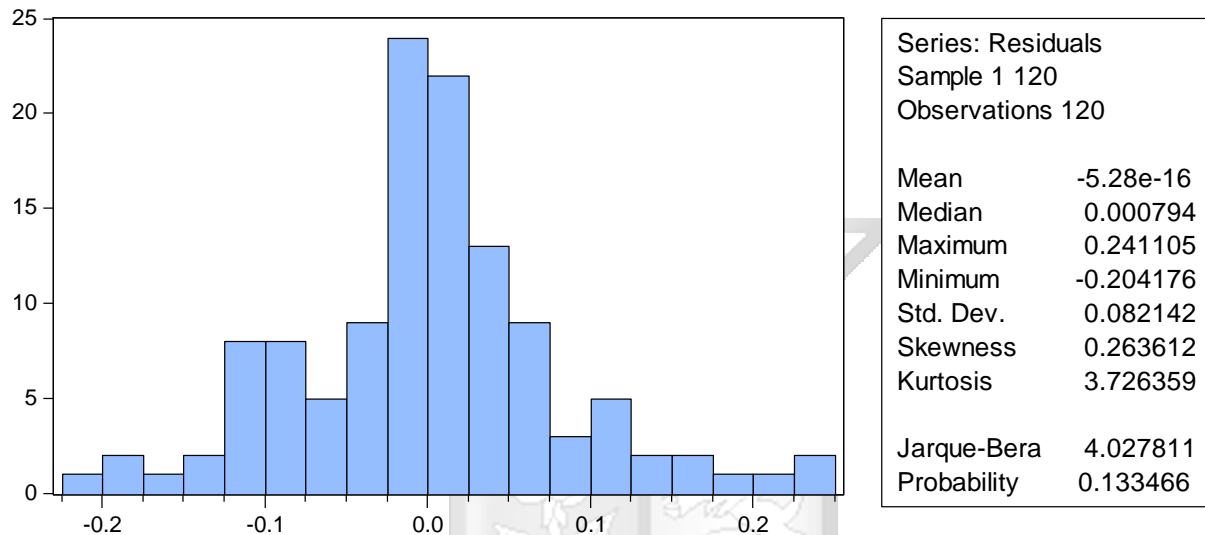


Figure 4. 1: Normality Test - Equation 1:USD MS, IA, EC, BOP, INF.

The findings about the normality test for the relationship between the EURO and the Moderation of BOP, control variable INF with other independent variables is shown in Figure 4.2. According to the results, the probability value is ≥ 0.05 indicating that the assumption of normality has been fulfilled or that the data is normally distributed per the Jarque-Bera test.

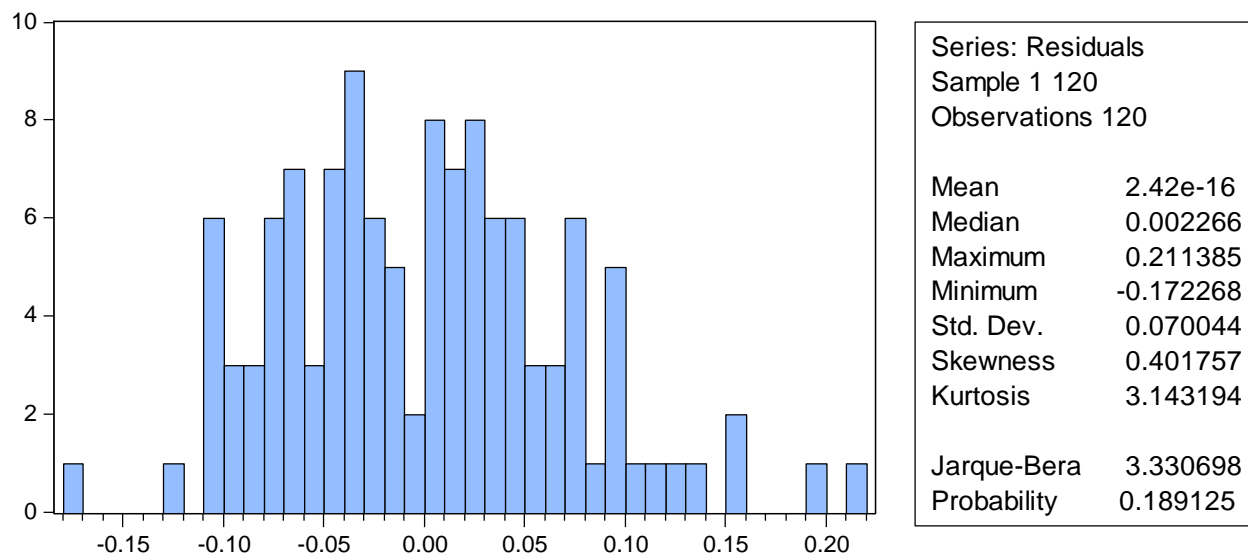


Figure 4. 2: Normality Test - Equation: Euro MS, IA, EC, BOP, INF.

The findings on the normality test for the relationship between the GBP and the Moderation of BOP with other independent variables are shown in Figure 4.3. According to the results, the probability value is ≥ 0.05 indicating that the assumption of normality has been fulfilled or that the data is normally distributed per the Jarque-Bera test.

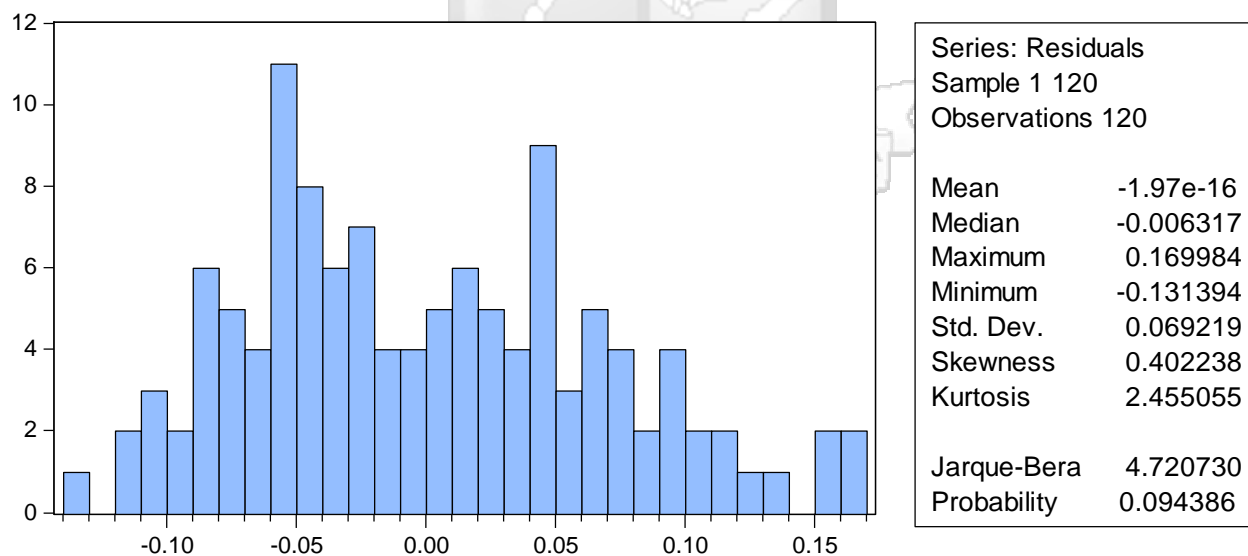


Figure 4. 3: Normality Test – GBP, MS, IA, EC, BOP, INF

4.4.4 Stationarity/ Unit Root Test

The stationarity/ unit root tests were run using Augmented-Dickey-Fuller (ADF). The results, which are captured in Table 4.9 show the ADF unit root results at level and at first difference. The ADF unit root test results at level with a constant show that the probability values for LNUSD, LNEURO, LNGBP, economic cycles, BOP and INF were all ≥ 0.05 indicating a violation of the stationarity assumption and concluding that the data series of these variables is non-stationary. Thus, the only variables at a level with constant whose probability values were ≤ 0.05 were market sentiment and information asymmetry indicating that there was no violation of the stationarity assumption and concluding that the data series pertaining to these variables is stationary.

The ADF unit root test results at level with constant and trend show that the probability values for LNUSD, LNEURO, LNGBP, economic cycles and INF were all ≥ 0.05 indicating a violation of the stationarity assumption and concluding that that the data series about these variables is non-stationary. Thus, the only variables at a level with constant whose probability values were ≤ 0.05 were market sentiment, information asymmetry, and BOP indicating that there was no violation of the stationarity assumption and concluding that the data series pertaining to these variables is stationary. The ADF unit root test results at level without constant and trend show that the probability values for all the variables except market sentiment were ≥ 0.05 indicating a violation of the stationarity assumption and concluding that that the data series pertaining to these variables is non-stationary.

The ADF unit root test results at first difference with constant, constant and trend, without constant and trend, show that the probability values for all the variables were all ≤ 0.05 indicating that there was no violation of the stationarity assumption and concluding that the data series pertaining to these variables is stationary

Table 4. 9: Augmented-Dickey-Fuller (ADF) Unit Root Test Results

UNIT ROOT TEST RESULTS TABLE (ADF)
Null Hypothesis: the variable has a unit root

		<u>At Level</u>							
		LNUSD	LNEURO	LNGBP	MS	IA	EC	BOP	INF
With Constant	t-Statistic	1.565	0.249	0.132	-6.063	-	-1.749	-2.704	-2.546
	Prob.	0.999	0.9746	0.967	0.000	0.000	0.404	0.076	0.107
With Constant & Trend	t-Statistic	0.402	-1.463	-0.460	-6.034	-	-0.954	-4.234	-2.537
	Prob.	0.999	0.837	0.984	0.000	0.000	0.945	0.006	0.310
Without Constant & Trend	t-Statistic	2.785	1.134	1.025	-6.026	-	-0.747	0.582	-0.339
	Prob.	0.999	0.933	0.919	0.000	0.072	0.391	0.841	0.561
		<u>At First Difference</u>							
		d(LNUSD)	d(LNEURO)	d(LNGBP)	d(MS)	d(IA)	d(EC)	d(BOP)	d(INF)
With Constant	t-Statistic	-6.030	-7.335	-8.124	-	-	-	-16.648	-4.241
	Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
With Constant & Trend	t-Statistic	-6.269	-7.603	-8.401	-	-	-	-16.582	-4.237
	Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
Without Constant & Trend	t-Statistic	-5.228	-7.239	-8.058	-	-	-	-16.682	-4.267
	Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Key: LN – log of the dependent variable, MS – Market Sentiment; IA – Information Asymmetry; EC – Economic cycles; BOP – Balance of Payments INF -Inflation.

4.5 Inferential Statistics

4.5.1 Regression Analysis

After conducting the Breusch-Godfrey Serial Correlation LM Test, as indicated in table 4.2, 4.4 and 4.6 the series for the respective dependent variable showed the presence of serial correlation. This was removed by using the Newey-West covariance criteria as shown in Tables 4.3, 4.5 and 4.7. Fixed Newey-West multiple linear regression was performed using the dependent variable USD, Euro and GBP with their corresponding independent variable of market sentiment, information asymmetry and economic cycle, further, the moderating term was included on the same equation as well as a control variable. Inflation was included in the model as a control variable as well, the interaction of the respective independent variables was done with the moderator variable.

Table 4.10 on regression findings, indicates that information asymmetry had a significant and positive effect on the USD/Ksh ($\beta = 0.477$, p-value = 0.0447). The regression findings also indicated that information asymmetry had a significant and positive effect on the Euro/Ksh. ($\beta = 0.495$, p-value = 0.0154). and that information asymmetry had a significant and positive effect on the GPB/Ksh. ($\beta = 0.485$, p-value = 0.0118). These findings imply that the more the information asymmetry, the more the weakening of the Ksh when compared to the world's strong currencies of USD, Euro and GBP.

Table 4.17 on regression findings, also indicates that economic cycles had a significant and positive effect on the USD/Ksh ($\beta = 0.716$, p-value = 0.0267). The regression findings also indicated that economic cycles had a significant and positive effect on the Euro/Ksh. ($\beta = 0.374$, p-value = 0.0478) and that economic cycles had a significant and positive effect on the GPB/Ksh. ($\beta = 0.451$, p-value = 0.0178). These findings imply that the more the economic cycles change, the more the weakening of the Ksh when compared to the world's strong currencies of USD, Euro and GBP.

Table 4.17 on regression findings, additionally indicates that Balance of payment had a significant and positive effect on the USD/Ksh ($\beta = 1.218$, p-value = 0.0027). The regression findings also indicated that the Balance of payment had a significant and positive effect on the Euro/Ksh. ($\beta =$

0.786, p-value = 0.0060) and that Balance of payment had a significant and positive effect on the GBP/Ksh. ($\beta = 0.868$, p-value = 0.0011). These findings imply that the more the Balance of payment changes, the more the weakening of the Ksh when compared to the world's strong currencies of USD, Euro and GBP.

Table 4.10 on regression findings, furthermore, indicates that inflation had a significant and positive effect on the USD/Ksh ($\beta = 0.049$, p-value = 0.0008). The regression findings also indicated that inflation had a significant and positive effect on the Euro/Ksh. ($\beta = 0.032$, p-value = 0.0083) and that Balance of payment had a significant and positive effect on the GBP/Ksh. ($\beta = 0.023$, p-value = 0.0097). These findings imply that the more the inflation changes, the more the weakening of the Ksh when compared to the world's strong currencies of USD, Euro and GBP.

moderator variable was defined by Hayes (2013) the effect of X on some variable Y is moderated by W if the size, sign or strength is dependent on or can be predicted by W. when one variable can change the direction of another variable it is potential candidate for moderator. The direction and strength of the coefficient provided evidence that BOP had a clear moderating effect. For market sentiment the coefficient become positive though not significant which implies that interaction of BOP and market sentiment worsened the KES shilling and strengthened the USD, EURO, GBP. The interaction between BOP and information asymmetry was significant but had a negative coefficient which implies that moderation changed and reduced the impact of information asymmetry of the Kenya shilling but since the coefficient is negative on USD, EURO, GBP, the coefficient veracity also reduced. The interaction between balance of payment and economic cycle was significant and negative implying the moderation changed the impact of economic cycles on exchange rate volatility in Kenya.

The moderating effect of BOP improved the relationship between the independent variables of information asymmetry, economic cycles and the dependent variable of USD/Ksh, Euro/Ksh and GBP/Ksh. BOP strengthened the Ksh against the world's major currencies of USD, Euro and GBP.

Table 4. 10: Regression Model with USD, Euro and GBP as the dependent variable

Variable	LNUSD		LNEURO		LNGBP		Interpretation
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	
C	-9.206	0.043	-4.203	0.191	-5.302	0.075	
MS	-0.353	0.471	-0.465	0.224	-0.348	0.333	
IA	0.477	0.045	0.495	0.015	0.486	0.012	Significant and positive
EC	0.716	0.027	0.374	0.048	0.451	0.018	Significant and positive
BOP	1.218	0.003	0.786	0.006	0.868	0.001	Significant and positive
INF	0.049	0.001	0.032	0.008	0.023	0.010	Significant and positive
MS*BOP	0.031	0.471	0.041	0.219	0.031	0.325	
IA*BOP	-0.042	0.046	-0.044	0.015	-0.043	0.012	Significant and negative
EC*BOP	-0.065	0.024	-0.034	0.041	-0.038	0.023	Significant and negative
R-squared	0.589		0.521		0.473		
Adjusted R-squared	0.559		0.486		0.435		
Prob (F-statistic)	0.000		0.000		0.000		

Note: detailed regression tables are in appendix 1,2 and 3.

4.6 Chapter Summary

This chapter dealt with the presentation of research findings which featured the general information, descriptive statistics, diagnostic test results, and inferential statistics. The general information encompassed information pertaining to the data. The descriptive analyses focused on Mean, Median, Standard Deviation, Skewness, Kurtosis, Jarque-Bera, and Probability Observations pertaining to the variables of the study. The diagnostic test results featured autocorrelation, multicollinearity, normality, stationarity, co-integration, vector error correction, granger causality, and correlation tests. Finally, the chapter covered the regression analyses.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study sought to evaluate the moderating effect of balance of payment position on the drivers of exchange rate volatility in Kenya. The identified drivers were market sentiment, information asymmetry and economic cycles. To achieve this, secondary data on eight variables were collected from Bloomberg and the Central Bank of Kenya and quantitative research methods were applied. This chapter discusses the results of the findings and contrasts them with the research objectives. This chapter is organised into a discussion of the data analysis, the conclusion of findings, recommendations, suggestions for further study and limitations of the study.

5.2 Summary of Findings

The first objective of the study was to determine the influence of market sentiment on exchange rate volatility in Kenya. According to the results, the relationship between market sentiment and exchange rate volatility was a negative and not significant indicating it was not a critical determinant of exchange rate volatility. The second objective of the study was to examine the influence of information asymmetry on exchange rate volatility in Kenya. The results indicated that positive and significant relationship between information asymmetry and exchange rate volatility. The third objective was to establish the significance of economic cycles on exchange rate volatility in Kenya. The results showed that economic cycles had a positive and significant relationship with exchange rate volatility. The fourth objective was to assess the moderating effect of the balance of payment position on the drivers of exchange rate volatility in Kenya. The results indicated that balance of payments had a positive and significant moderating effect on the drivers of exchange rate volatility.

5.3 Discussion of Findings

5.3.1 Market Sentiment and Exchange Rate Volatility

The study found a negative and insignificant relationship between market sentiment and exchange rate volatility indicating that market sentiment is not a strong determinant of exchange rate volatility. The implication is that market players do not consider market sentiment when making decisions related to exchange rate volatility. The study did not find strong linkages with either the PPP theory or the Asymmetric Information theory given that neither theory could explain the impact of market sentiment on exchange rate volatility. Further, it contradicted the findings of Menkhoff and Rebitzky (2008) who argued that market sentiments influence exchange rates in the long-run to incline towards the purchasing-power parity; as well as Musembi *et al.* (2020) who found a positive and significant correlation between investor sentiment and asymmetric information. These results were consistent with Rehman (2013), Makau and Jagongo (2018), and Han (2023) but contradicted Plakandaras *et al.* (2015), Audrino *et al.* (2020), and Muguto *et al.* (2020) who all found that investor sentiment was a critical determinant of exchange rate volatility.

5.3.2 Information Asymmetry and Exchange Rate Volatility

The study found a positive and significant relationship between information asymmetry and exchange rate volatility indicating that an increment in information asymmetry leads to increased exchange rate volatility. The implication is that market participants must always bear in mind information asymmetry when making decisions related to exchange rate volatility. The study established strong linkages with the Asymmetric Information theory given the fact that moral hazard and adverse selection considerations are factored into consideration by policy makers at the CBK when determining interventions to make when faced with spiralling exchange rate volatility. This was aligned with the findings of Othman *et al.* (2022) and Dada (2021). The findings were inconsistent with Kayani *et al.* (2023), Urgessa (2023), and Alagidede and Ibrahim (2016) who found that in the long-run, information asymmetry had no significant effect on exchange rate volatility.

5.3.3 Economic Cycles and Exchange Rate Volatility

The study found a positive relationship between economic cycles and exchange rate volatility indicating that an increment in the upheavals of economic cycles will result in a corresponding increment in the level of exchange rate volatility. The implication is that market participants should consider economic cycles when making decisions relating to exchange rates. The study established strong linkages with the Asymmetric Information Theory since depressed economic cycles are aligned with poor macroeconomic indicators including rising interest rates and exchange rate volatility during which times there is a lot of uncertainty, a characteristic of asymmetric information. This was consistent with Kamalyan and Davtyan (2022), Lubis *et al.* (2017), and Ulm and Hambuckers (2021); but contradicted Baxter and Stockmanz (1989), and Idris *et al.* (2019) who found that economic cycles were not the most critical determinant of exchange rate volatility.

5.3.4 The Moderating Effect of Balance of Payments on Drivers of Exchange Rate Volatility

The study found that balance of payments had a positive and significant moderating effect on the drivers of exchange rate volatility. This indicates that a healthy balance of payments enables a country to make timely interventions whenever adverse scenarios of exchange rate volatility are in play. The implication is that policy makers at the CBK should ensure as a healthy a balance of payments position as possible so as to enable effective interventions during exchange rate volatility. The study was aligned with the PPP theory since it related to the international trading position of a country. The findings were consistent with Nguyen and Do (2020), Bahmani-Oskooee *et al.* (2013), and Mosbei *et al.* (2021). However, it contradicted Kandil (2009) and Adam *et al.* (2014).

5.4 Conclusions

The findings of the study lead to the conclusion that balance of payment is a useful moderator of exchange rate volatility. This finding that information asymmetry was significant in explain exchange rate volatility in Kenya agreed with the findings of Othman et al (2022) and Onur (2008) and Ranaldo and Somogyi (2021) and Chen et al (2020). The study concurs with the existing body of literature based on the finding. The finding that information asymmetry had a significant and

positive effect on foreign exchange rates supports and validates the theory of purchasing power parity in that Arbitrage, which is driven by information asymmetry by occurring, influence exchange rate rather than market prices further since asset prices are known any deviation due to asymmetric effect will result in asset price movement to correct this. Likewise, the finding that economic cycles were found to be significant in explaining exchange rate volatility in Kenya agreed with the findings of MacDonald and Swagel (2000) Hayk and Kamalyan & Davtyan (2022) and Lubis et al. (2017) and disagreed with the findings of Clark and International Monetary Fund (2004) , Baxter and Stockmanz (1989) and Idris et al. (2019). The finding that economic cycles had a significant and positive effect on foreign exchange rates supports and validates the theory of purchasing power parity which posit the linkage between relative price levels and inflation rates to movements in the nominal exchange rate. Additionally, the use of PPP GDP can be linked to movement in aggregate demand of good and service excluding due to exclusion of non-tradable commodities. Finally the findings that balance of payment position was significant in explaining exchange rate volatility in Kenya agreed with the findings of Kandil (2009) Nguyen and Dang (2022) and Mwai (2015) and disagreed with the findings of Clark *et al* (2004) the finding that the Balance of payment had a significant and positive effect on foreign exchange rates supports and validates the purchasing power parti theory that advances the due to differential in factor product and productivity, appreciation or depreciation of a local currency relative to the foreign currency in which the transactions are conducted will influences a country's balance of payments. In conclusion the finding of the study is aligned and support the relative purchasing power parity.

We further concluded the causality relationship between USD, Euro and BOP suggests that these two currencies have a huge impact in causing the balance of payment imbalance and care should be taken on this two-currency impact on Kenya's current account. Finaly, we concluded that inflation is a useful control variable in the regression models.

5.4 Contribution to Knowledge

The study adds to the existing body of knowledge on drivers of exchange rate volatility in Kenya by providing fresh insights through the focus on non-fundamental variable that drive exchange rate volatility. Using a composite of this variable the study shows the effect of this element and provide anew insight on factors affecting exchange rate volatility in Kenya. Additionally, the

moderating effect of balance of payments and the interactions amongst market sentiment, information asymmetry and economic cycles in one single study are unique in terms of their influence on exchange rate volatility, thereby offering useful references to scholars, professionals and researchers.

5.5 Recommendations

5.5.1 Policy Recommendations

The Government needs to come up with means and measures to ensure proper dissemination of information. establish a reliable source of communication, find alternatives and interventions to ensure macroeconomic and policy decisions and government fiscal position are well articulated and information asymmetry concerning and regarding the country's economic indicators and key metrics are availed in time and in a proper way to reduce information asymmetry in the economy and market. Government regulatory agencies should ensure compliance with information disclosure and have policies on reporting on both financial and non-financial KPIs.

The government should come up with a policy that supports local production and ensure we limit or substitute importation for local production. This will result in the trade imbalance reduced and having a favourable trade balance will reduce the exchange rate volatility, further such action will result in an upward trajectory in productivity thus reducing interest rates thus having a favourable economic trajectory.

5.5.2 Managerial Recommendations

The Central Bank of Kenya should put guidelines on publicly listed or crucial payment networks to be transparent and open to questioning and audit to remove any element of information asymmetry. Secondly, organisations should adhere to IFRS and public accounting as well climate climate-friendly actions and report on this to reduce their exposure to negative news and reporting. Import substitution should be encouraged where possible.

5.7 Limitations of the Study

The study focused on the non-fundamental aspect of the drivers of exchange rate volatility which could be easily influenced by other factors. Market sentiment is difficult to ascertain since it is

based on individuals' attitudes. In a country like Kenya, we assume that information is usually late or comes to market after the fact this is a classic case of the weak form of a market hypothesis, thus, the information asymmetry aspect could be due to stale information.

Exchange rate volatility is influenced by several factors that were not considered in this study. The study did not consider public debt, foreign direct investment, government policy global political and economic situation additionally geo-political tensions. Further, in the Balance of payment position, the research relied on data using the USD owing to the assumption that it is the key driver.

Market sentiment relies on an index construction as an index based on moving average of volume traded, there are many factors that can influence volume traded not only market sentiment as such there is a need for a more robust index that can segregate the key drive of market sentiment without using lexicon and proxies. The availability of data especially on GDP was limited, it would be interesting to see how the outcome of the study with this variable for a 10- or 20-year period.

5.6 Suggestions for Further Studies

This study has focused on the interactions amongst market sentiment, information asymmetry, economic cycles and exchange volatility as well as the moderating effect of the balance of payments, future research needs to be focused on other moderators as well as other drivers of exchange rate volatility. This study was conducted between 2014 and 2023, other studies can be carried out over a more extensive period to establish the correlations between the variables. The study focused on the USD as the main dependent variable, further research may look at how to add this variable, especially the fundamental variables or use them as a control variable to establish a more significant outcome.

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APPENDIXES

Appendix 1 LNUSD_Regression

Dependent Variable: LNUSD

Method: Least Squares

Date: 04/28/24 Time: 15:05

Sample: 1 120

Included observations: 120

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.206243	4.503256	-2.044352	0.0433
MS	-0.353204	0.488236	-0.723429	0.4709
IA	0.476668	0.234774	2.030329	0.0447
EC	0.715765	0.318619	2.246458	0.0267
BOP	1.217627	0.397452	3.063582	0.0027
INF	0.049300	0.014265	3.456103	0.0008
MS*BOP	-0.030823	0.042628	0.723063	0.4712
IA*BOP	-0.041800	0.020699	-2.019413	0.0459
EC*BOP	-0.065054	0.028321	-2.297043	0.0235
R-squared	0.588576	Mean dependent var		4.663529
Adjusted R-squared	0.558924	S.D. dependent var		0.120699
S.E. of regression	0.080161	Akaike info criterion		-2.137531
Sum squared resid	0.713255	Schwarz criterion		-1.928470
Log likelihood	137.2519	Hannan-Quinn criter.		-2.052631
F-statistic	19.84935	Durbin-Watson stat		0.297876
Prob(F-statistic)	0.000000	Wald F-statistic		9.152503
Prob(Wald F-statistic)	0.000000			

Appendix 2 LNEuro_Regression

Dependent Variable: LNEURO

Method: Least Squares

Date: 04/28/24 Time: 15:07

Sample: 1 120

Included observations: 120

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
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C	-4.203094	3.192068	-1.316731	0.1906
MS	-0.465409	0.380758	-1.222322	0.2242
IA	0.495253	0.201330	2.459909	0.0154
EC	0.373843	0.210034	1.779921	0.0478
BOP	0.785913	0.280252	2.804314	0.0060
INF	0.032201	0.011975	2.689014	0.0083
MS*BOP	0.041320	0.033405	1.236932	0.2187
IA*BOP	-0.043825	0.017719	-2.473359	0.0149
EC*BOP	-0.033915	0.018577	-1.825598	0.0406
R-squared	0.520726	Mean dependent var	4.795429	
Adjusted R-squared	0.486183	S.D. dependent var	0.097126	
S.E. of regression	0.069621	Akaike info criterion	-2.419467	
Sum squared resid	0.538024	Schwarz criterion	-2.210405	
Log likelihood	154.1680	Hannan-Quinn criter.	-2.334566	
F-statistic	15.07501	Durbin-Watson stat	0.424242	
Prob(F-statistic)	0.000000	Wald F-statistic	4.733323	
Prob(Wald F-statistic)	0.000051			

Appendix 3 LNGBP_Regression

Dependent Variable: LNGBP

Method: Least Squares

Date: 04/28/24 Time: 15:11

Sample: 1 120

Included observations: 120

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.301740	2.953005	-1.795371	0.0753
MS	-0.348108	0.358186	-0.971864	0.3332
IA	0.485905	0.189869	2.559156	0.0118
EC	0.450658	0.187324	2.405762	0.0178
BOP	0.867693	0.259575	3.342740	0.0011
INF	0.022511	0.013460	1.672461	0.0097
MS*BOP	0.031069	0.031426	0.988638	0.3250
IA*BOP	-0.042709	0.016615	-2.570546	0.0115
EC*BOP	-0.038209	0.016588	-2.303389	0.0231
R-squared	0.473390	Mean dependent var	4.964613	
Adjusted R-squared	0.435436	S.D. dependent var	0.091552	
S.E. of regression	0.068790	Akaike info criterion	-2.443475	
Sum squared resid	0.525261	Schwarz criterion	-2.234413	
Log likelihood	155.6085	Hannan-Quinn criter.	-2.358574	
F-statistic	12.47277	Durbin-Watson stat	0.489472	

Prob(F-statistic)	0.000000	Wald F-statistic	5.254090
Prob(Wald F-statistic)	0.000014		

