The extent of the impact of exchange rate fluctuations on stock returns at the Nairobi Securities Exchange (NSE)

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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 Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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ABSTRACT

The purpose of this study is to establish whether changes in the exchange rate are sufficient in explaining stock returns at the Nairobi Securities Exchange (NSE). Previous scholars have determined a causal relationship between the NSE and the exchange rate (domestic currency to US dollar). Other studied macroeconomic variables have been determined not to be significant in explaining stock returns. This study introduces two new variables: the interbank rate and the trade balance. Monthly time series data was collected from January 2018 to May 2024 for use in the analysis. An Autoregressive Distributed Lag (ARDL) model was employed to examine the short- and long-run dynamics of the effects of the exchange rate, interbank rate and the trade balance on stock return behavior at the NSE. In the short run, changes in the exchange rate and the previous monthly change in the trade balance are revealed to have significant negative relationships with NSE stock returns. The study established a negative long-term relationship between changes in the exchange rate and stock returns. Moreover, the study found a positive long-term relationship between changes in the trade balance and stock returns. Policymakers may use the findings of the study to pursue policies that stabilize the exchange rate to support investor confidence and stock market performance. Investors may use the results to monitor developments in the stock market by observing the foreign exchange market and the goods market.

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CHAPTER 1

INTRODUCTION

1.1. Background of the study

The prime motivation for investors to participate in capital markets is to realize substantial returns (Moosa & Bhatti, 2010). For the attainment of such aspirations, it is important for investors to undertake close examination of factors that may influence the movements of these markets. In Kenya, the Nairobi Securities Exchange (NSE) remains heavily monitored by fund managers, institutional traders and foreign investors. Previous research has attempted to attribute the performance of the NSE to changes in macroeconomic variables where asset markets are determined to have linkages with the exchange rate (Brandimarte, 2018).

Investors are interested in the manner with which exchange rates interact with the stock market. Particularly, Camanho *et al.* (2018) explain that foreign investors adjust their portfolio allocations to foreign stocks as informed by developments in the foreign exchange market. Portfolio adjustments occur when foreign equity returns are different from domestic equity returns. When foreign equity returns exceed domestic returns, investors repatriate their funds invested in foreign equity (Camanho *et al*., 2002). These adjustments are made to reduce exposure to the risk that foreign asset values will be affected by fluctuations in the exchange rate (Moosa & Bhatti, 2010). Moreover, these adjustments have implications on developments in the NSE where trading is dominated by foreign investors (Ochenge *et al*., 2020).

Additionally, researchers monitor interactions between the stock prices and exchange rates in an attempt to establish a significant relationship, Franck and Young (1972) launched one of the earliest investigations into the link between developments in the foreign exchange market and stock price movements. The study tested for stock market reactions (prices of multinational companies' stocks) to movements in exchange rates. The results detailed that there was no significant relationship between adverse changes in the exchange rate and stock prices. Dornbusch and Fischer (1980) investigated the

relationship between asset markets and the exchange rate through the current account. The study proposed a flow-oriented model, where currency depreciation made domestic goods competitive due to lower export costs, positively affecting the domestic firms' stock prices. Branson (1981) suggested that a better performing stock market will attract foreign inflows, and therefore, strengthen the domestic currency.

Phylaktis and Ravazzolo (2005) is a subsequent study to Branson (1981) following portfolio balance theory. From theory, investors make portfolio adjustments due to stock price changes caused by exchange rates. The study established a positive relationship between the domestic stock prices of Pacific Basin countries in the 1990s, the exchange rate and US stock prices.

In the Kenyan context, Kisaka and Mwasaru (2012) revealed that exchange rate (domestic currency to the dollar) had a causal relationship with the NSE stock prices during the period between 1993 and 1999. Kirui *et al*. (2013) observed the relationship during the period between 2001 and 2010. The results showed that stock returns had a negative relationship with the exchange rate. The exchange rate was determined to have a significant effect on the volatility of stock returns. Nonetheless, Kirui *et al.* (2013) suggests that other macroeconomic factors such as interest rates may have an effect on stock returns. Sichei *et al.* (2012) explains that interbank markets enable banks to manage liquidity and risks to pursue profitable lending transactions. This implies that the interbank rate may affect stock returns at the NSE where many liquid stocks are commercial bank stocks.

Ultimately, the general consensus among academics in this research space is that exchange rate interactions with stock prices exhibit peculiarities. Oftentimes, these interactions make it difficult for traders and other market participants to follow exchange rate movements and markets linked to the foreign exchange market such as the goods market (Brandimarte, 2018). Generally, an appreciation in the domestic currency negatively affects the competitiveness of exports, and overall, exporting companies in the NSE. Conversely, a stronger currency implies a stronger economy, attracting foreign inflows and foreign investors to the stock market (Brandimarte, 2018). These peculiarities suggest

that there is a need for further investigation into the interactions between the exchange rate, current account, interbank rate and the NSE.

1.2. Motivation for the study

The Nairobi Securities Exchange (NSE) experienced increased trading activity following an improvement in the strength of the Kenya shilling in 2024. The shilling had weakened radically against the dollar during the fourth quarter of 2023 and continued to weaken into 2024. In January, the shilling was trading at KES 160 to the U.S dollar due to increased importer demand and the CBK's efforts at concealing the value of the shilling as sourced from Refinitiv.

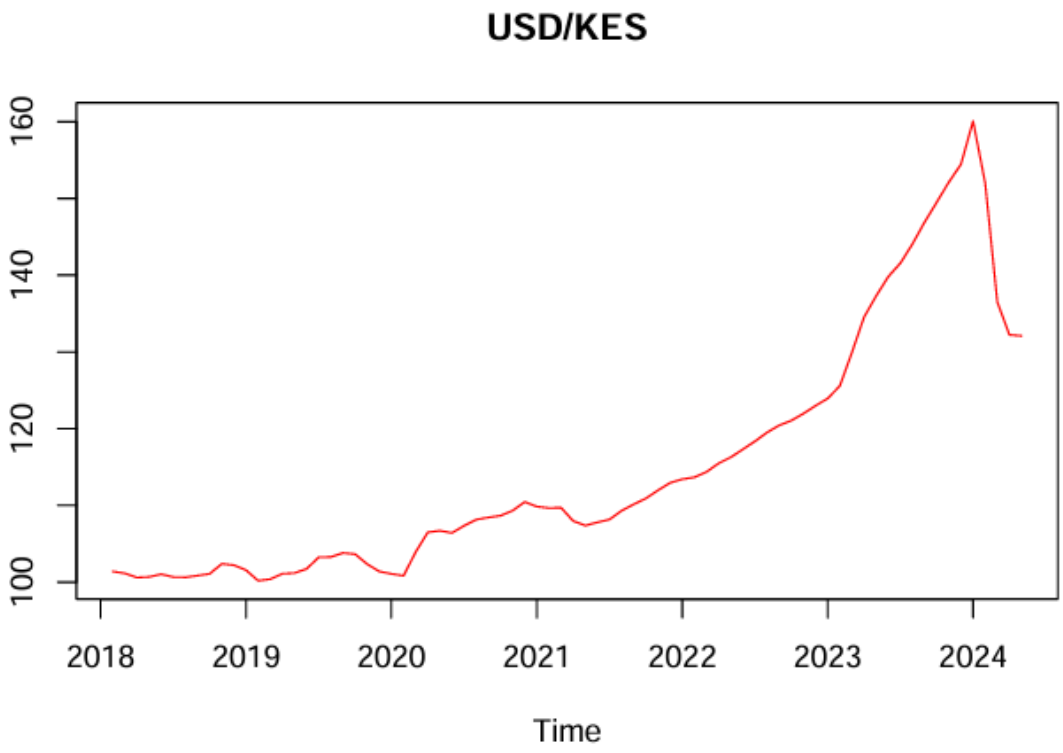

Figure 1: Monthly USD/KES spot rates for the period January 2018 to May 2024

Economic prospects and foreign investor confidence improved after the Government of Kenya sold an additional Eurobond to buy back the Eurobond maturing in June 2024. Moreover, the government floated a high-yielding infrastructure bond in February 2024. These two events brought foreign inflows into the Kenyan bourse and enabled the usual

participants to begin easing out of the bond market. Generally, from these events, prices seem to be largely driven by foreign investors' sentiments, the current account and large financial institutions, consistent with Ochenge *et al.* (2020) findings that foreign inflows positively impact liquidity in the NSE.

1.3. Statement of the problem

The interactions between the NSE and exchange rate remain of interest to researchers and investors. Investigations into these interactions and linkages between the NSE, current account and interest rates bring about a desire to understand movements within the bourse. Existing literature has attempted to attribute NSE performance and the volatility of returns to macroeconomic variables. Kirui *et al.* (2013) evaluated the relationship between stock returns, inflation, Gross Domestic Product (GDP), treasury bill rates, money supply and the exchange rate. Kirui *et al.* (2013) finds that the exchange rate was the only variable that was significant in explaining stock return behavior. Therefore, it becomes necessary to further probe the link between the NSE and the foreign exchange market.

The question that arises is whether changes in interest rates and the current account contribute to stock price movements in the securities exchange. Currency appreciation is characterized by rises in domestic interest rates relative to foreign interest rates (Kuttner & Mosser, 2002). Studies such as Kirui *et al.* (2013) and Mutwiri *et al.* (2021) have mainly focused on macroeconomic effects on stock returns. However, these studies did not investigate linkages between the NSE and the interbank market.

Therefore, an examination of the relationship between the foreign exchange market, interbank rate and stock returns can be conducted. The interbank rate is an important determinant in the overnight market and captures the trading of funds between banks. Furthermore, currency appreciation associated with the current account may attract foreign inflows while negatively affecting the profitability of listed exporting companies. Overall, the evaluation of these asset market linkages with the NSE is crucial in ascertaining factors influencing stock returns in the securities exchange.

1.4. Research Objectives

The objectives of conducting this study are as follows:

I. To determine whether the USD/KES exchange rate has a significant impact on stock returns in the Nairobi Securities Exchange
II. To determine the effect of changes in the interbank rate on stock returns in the Nairobi Securities Exchange.
III. To determine the effect of changes in the trade balance on stock returns in the Nairobi Securities Exchange.

1.5. Research Objectives

The questions that guide the study are:

I. What impact does the USD/KES exchange rate have on stock returns in the Nairobi Securities Exchange?
II. How do changes in the interbank rate affect stock performance in the Nairobi Securities Exchange?
III. How do changes in the trade balance affect stock returns in the Nairobi Securities Exchange?

1.6. Significance of the research

The primary goal of this study is to contribute to the ongoing inquiry into the driving forces of the NSE. The study provides a fresh perspective on the interaction between the NSE and the foreign exchange market. This study aims to contribute to previous literature through the analysis of the effect of changes in the current account and the interbank rate on stock returns in the NSE. Therefore, the results of this study are relevant and useful to investors and policymakers. Investors can construct investment frameworks that can be used to make informed investment decisions. Additionally, the Central Bank of Kenya, concerned with monetary policy transmission mechanisms, may use the findings from this study to inform policies affecting asset markets and the exchange rate.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

The interconnection between the foreign exchange market and the Nairobi Securities Exchange may provide a framework for investors to anticipate movements in stock prices. As a consequence, the motivation to ascertain the link between these markets has inspired research to examine the relationship between these two markets. This chapter will highlight the development of theories explaining the interaction between the stock market and the foreign exchange market. It will discuss theories that were constructed from the Mundell-Fleming model as well as other relevant theories. Additionally, this section will provide a review of existing studies investigating the linkages between the stock market and the foreign exchange market.

2.2. Theoretical Framework

2.2.1. Mundell-Fleming Model

The Mundell-Fleming model was conceptualized in 1976 by Rudi Dornbusch. Dornbusch integrated contributions by Robert Mundell and Marcus Fleming in the 1960s, on the role of capital flows on the Keynesian model of macroeconomic policy (Boughton, 2002). Mundell (1963) assumes an open economy with perfect capital mobility to identify the role played by trade and capital flows in exchange rate determination. All securities are assumed to be perfect substitutes, existing exchange rates are to remain unchanged, and there is an absence of purchasing power parity. Under flexible exchange rates, monetary policy through open-market purchases of domestic securities or foreign reserves, lowers interest rates and induces capital outflows (Mundell, 1963). Consequently, the domestic currency depreciates and an improvement in the trade balance occurs as exports become competitive.

The model brings forward the implications of changes in interest rates. Mundell (1963) implies that changes in wealth, capital flows, and asset markets are influenced by changes in interest rates. Mishkin (2001) explains that when interest rates are lowered, stock prices

soar as there is increased demand for stocks as bonds become unattractive. An increase in interest rates attracts capital inflows from low-yielding countries as there is increased demand for domestic assets. This results in currency appreciation and the worsening of the trade balance.

Dornbusch (1976) examined short- and long-run exchange rate determination under the same framework. Dornbusch (1976) explains that the clearing of asset markets and expectations influences the short-run exchange rate equilibrium. When the exchange rate is expected to rise, the domestic interest rates will be greater than foreign interest rates to compensate domestic asset holders (Dornbusch, 1976). The holders of domestic assets will be compensated as a result of the currency depreciation. Higher interest rates negatively impact investments, capital accumulation, and therefore, firms' prospects. However, the Mundell-Fleming model has been criticized on the grounds that it ignores money stock equilibria in the determination of the exchange rate. These criticisms have led to the emergence of asset models of exchange rates.

2.2.2. Portfolio Balance Models

In the 1970s, after economies made the switch from fixed to flexible exchange rates, the relationship between the current account and the exchange rate revealed wealth effects associated with the current account. Particularly, the relationship indicated the existence of a "portfolio-balance" effect. The traditional theory surrounding this relationship posits that a current account surplus may influence the transfer of wealth from foreign residents to domestic residents (Moosa & Bhatti, 2010).

Portfolio balance models constructed from this theory assume that market participants have the same portfolio preferences, domestic and foreign securities are imperfect substitutes and changes in the net foreign asset positions are equal to the current account (Moosa & Bhatti, 2010). A current account surplus in a country is characterized by an increase in net foreign asset positions and shifts in wealth. Shifts in wealth affect the demand for these assets through the exchange rate. In portfolio balance models, movements in the exchange rate clear asset markets and define a short-run equilibrium in asset markets.

Since domestic and foreign assets are assumed to be imperfect substitutes, portfolios can be constructed from these assets with weights that depend on their rates of return — risk premium. A rise in wealth occurs when foreign assets are accumulated where foreign asset accumulation is defined to be equivalent to saving. Therefore, a current account surplus implies saving in the form of an increase in foreign currency asset claims. A current account deficit leads to currency depreciation, as domestic residents exchange foreign assets for domestic assets. (Moosa & Bhatti, 2010)

2.2.3. Conventional Theory

Exchange rate movements have several effects on business operations and companies that are exposed to translation risk. Fluctuations in exchange rates have an effect on the balance sheets of domestic companies and companies that have foreign operations. Adverse movements in the exchange rate can erode the value of assets and liabilities. Conversely, these movements may inflate the value of assets and liabilities of a domestic company or a company with foreign subsidiaries. (Moosa & Bhatti, 2010)

For companies with foreign operations, the consolidation of financial statements between the parent company and its subsidiaries often entails paper exchange gains or losses as the exchange rate fluctuates during the accounting period (Jacque, 1981). As a consequence, companies have to assume foreign exchange risk. The risk that movements in the exchange rates may shrink company profits, and ultimately, impact the share price of the company..

2.2.4. Arbitrage Pricing Theory

The arbitrage pricing theory (APT) was conceptualized by Stephen Ross in 1976. The theory was an extension to the Capital Asset Pricing Model as it introduces multiple factors to the equilibrium model. Ross (1976) elaborates that returns to an asset or a portfolio of assets can be explained by multiple factors.

$$\tilde{r_i} = \alpha_i + \beta_{i1}\tilde{F}_1 + \beta_{i2}\tilde{F}_2 + \beta_{i3}\tilde{F}_3 + \cdots + \beta_{in}\tilde{F}_n \quad (2.1)$$

Where i is an asset or portfolio, β_is are sensitivities of the factors and $\tilde{F}_i s$ are systemic factors.

APT does not specify which factors should be selected in modeling returns. Therefore, the model depends wholly on the selection of relevant factors. These factors can be macroeconomic variables such as interest rates or changes in the inflation rate (Brandimarte, 2018).

2.3. Empirical Literature Review

The common theme within existing empirical literature is that exchange rates are shown to be interlinked with stock markets in developed and emerging economies. Movements in the foreign exchange market have an effect on developments in the stock market and these developments can, in turn, influence changes in the exchange rate.

2.3.1. Empirical Studies on Foreign Stock Markets

Franck and Young (1972) investigated the relationship between the stock prices of multinational companies in the U.S and the exchange rate. The study examined 280 large U.S. industrial companies and grouped them into two company categories, "high-international-activity" and "low-international-activity". The purpose of the investigation was to further extend the Rhomberg (1966) model explaining net earnings through the proportion of sales denominated in domestic currency to sales in foreign currency terms as well as price level and exchange rate changes, to a model explaining the reaction of stock prices to exchange rate changes. Franck and Young (1972) established that there was no clear pattern between the price movements of these multinational companies and exchange rate movements. The study explains that decisions to raise equity capital and affect the cost of capital should not be constructed from expectations about exchange rate re-alignments. However, Frank and Young (1972) acknowledge that the study did not adjust for all economic events and failed to incorporate ratio variables evaluating foreign accounting items to domestic accounting items (such as sales and purchases). Frank and Young (1972) could not establish a clear relationship between the stock market and changes in the exchange rate from a microeconomic perspective.

Phylaktis and Ravazzolo (2005) observed the long-run and short-run dynamics of the relationship between the exchange rate and stock prices. The analysis was constructed using data on six Pacific-Basin countries: Indonesia, Singapore, Hong Kong, Thailand,

Malaysia and Philippines. These 6 countries were examined during the period between 1980 and 1998. Phylaktis and Ravazzolo (2005) employed a Vector Autoregressive Regression (VAR) model in testing for the "stock" and "flow" approaches. The "stock" approach is built from the theory that there exists a channel through which the stock markets in the Pacific-Basin countries are influenced by movements in the U.S. stock market through the exchange rate. The "flow" approach explains that there exists a channel through which Pacific-Basin stock markets are affected by changes in the current account, and consequently, the exchange rate. The model uses U.S. stock prices and the real exchange rate for the Pacific-Basin countries to explain movements in stock market indices. The study revealed that the real exchange rate and U.S. stock prices had a positive relationship with domestic stock prices. However, Phylaktis and Ravazzolo (2005) could not identify a clear long-run relationship between the real exchange rate and the Pacific-Basin stock markets.

Jawaid and Haq (2012) examined the effects of changes in exchange rate and interest rate on banking stock prices in Pakistan. The study was conducted using monthly data collected from 2004 to 2010. Jawaid and Haq (2012) tested for effects of short and long-term interest rates, as well as the exchange rate, on the stock prices of the Pakistani banking industry. The study controlled other variables in their model such as the trade balance, the inflation rate, foreign reserves, foreign private investment and remittances. Further analysis was done to test volatility effects associated with the interest rate and the exchange rate using a GARCH (1,1) model. Jawaid and Haq (2012) established that the short-term interest rate and the exchange rate have a negative relationship with banking stock prices. Moreover, Jawaid and Haq (2012) found that there is a bidirectional causal relationship between the exchange rate and stock prices, and a unidirectional causal relationship between the short-term interest rate and stock prices. Additionally, the study adds that volatile interest rates and exchange rates translate into higher banking stock prices.

In the investigation of the relationship between stock market performance and macroeconomic variables, Mouna and Anis (2016) examined the relationship between financial sector returns, interest rates and exchange rates. The analysis was constructed

from data collected during the Great Financial Crisis. The study used data from eight countries: the U.S., Germany, UK, Italy, Spain, France, China, and Greece spanning from 2006 to 2009. Mouna and Anis (2016) employed the use of a VAR-GARCH-in-mean model to investigate the interactions between the three variables. The study established that there is a causal-in-mean relationship between interest rates, the exchange rate and stock returns in the financial sectors of these countries. Mouna and Anis (2016) found that index returns of the financial sectors are influenced by changes in average market returns, interest rates and the exchange rate.

Qing and Kusairi (2019) introduced a new variable with money market linkages in explaining stock market movements. The study evaluated the relationship between the real effective exchange rate, interest rate spread between Malaysia and the U.S., money supply and stock returns. In the analysis, monthly data collected from 1997 to 2019 was used. An Autoregressive Distributed Lag (ARDL) model was employed to capture short- and long-run dynamics and a GARCH model was used to test for volatility effects. Qing and Kusairi (2019) found that money supply and the exchange rate had a positive relationship with stock returns. However, the interest rate spread had a negative relationship with stock returns.

Lakshmanasamy (2021) examined the relationship between three foreign exchange rates and stock returns in India. The study analyzed the effects of changes in the USD/INR rate, EUR/INR rate, and GBP/INR rate on the BSE30 stock market index using data collected from 2010 to 2015. Within the analysis, a log-linear model was used to ascertain the effects of these rates on the stock returns. Additionally, ARCH and GARCH models were employed to test for volatility effects. Lakshmanasamy (2021) established a negative relationship between the USD/IND and the EUR/INR rates and stock returns. The GBP/INR rate had a positive relationship with the BSE30 index. However, the relationship between the USD/IND and stock returns was not statistically significant. Lakshmanasamy (2021) adds that the volatility effects were persistent and stock return volatility is heavily influenced by lagged values of stock returns.

Javangwe and Takawira (2022) employed an ARDL model in evaluating the relationship between stock returns and the exchange rate in South Africa. This present study used

quarterly data collected from 1980 to 2020 to investigate the effects of the Consumer Price Index (CPI), short-term interest rates and USD/ZAR exchange rate on stock returns in the Johannesburg Stock Exchange (JSE). Javangwe and Takawira (2022) established that the CPI had a negative relationship with stock returns. Similarly, stock returns were found to have a negative relationship with the interest rate. The study concluded that in the short-run, the exchange rate had a positive impact on stock returns and that the converse was true in the long-run.

Similar conclusions were arrived at by El-Diftar (2023) in an investigation into the impact of exchange rates on stock returns in the seven largest emerging economies (E7). The study used daily data collected from 2019 to 2022 to examine the effects of the exchange rates in each of seven countries: China, Brazil, Turkey, India, Indonesia, Mexico and Russia. El-Diftar (2023) selected an ARDL model to analyze the effects of exchange rate fluctuations (USD per domestic currency) on the performance of relevant stock markets. ARCH and GARCH models were employed to test for volatility effects in these markets. El-Diftar (2023) established that the exchange rate had a positive influence on developments in the stock markets of the E7 countries except for Indonesia. The study elaborates that a stronger currency will positively affect stock returns in these countries and that discrepancies in Indonesia's findings can be attributed to the country's previous status as a majorly exporting country. El-Diftar (2023) found persistent volatility effects in stock return behavior and the volatility of stock returns is more dependent on its lagged values than news shocks.

2.3.2. Empirical Studies on the Nairobi Securities Exchange

A study done by Kisaka and Mwasaru (2012) investigated the causal relationship between the exchange rate and NSE stock prices. Kisaka and Mwasaru (2012) studied the relationship using monthly NSE stock prices and the prevailing monthly USD/KES rates from 1993 to 1999. Within the analysis, a bivariate VAR model was employed to identify linkages between the exchange rate and the stock prices. Kisaka and Mwasaru (2012) found that the exchange rate and the stock prices during the examined period are cointegrated. The study explains that volatility in the exchange rate translates to volatility in the NSE. The conclusion from this study is that the exchange rate Granger-causes NSE

stock prices and implies a unidirectional causality between these two variables. Kisaka and Mwasaru (2012) established a relationship between the exchange rate and NSE stock prices. However, the analysis did not identify other factors that may influence movements in the NSE.

Kirui *et al.* (2013) examined the relationship between the NSE and a few macroeconomic variables. The analysis observed the relationship between stock returns, the Gross Domestic Product (GDP), the 91-day Treasury Bill Rate, the USD/KES exchange rate, and the inflation rate. Moreover, Kirui *et al.* (2013) analyzed the effects of variations in these macroeconomic factors on the volatility of stock returns using quarterly data from 2000 to 2012. The analysis was constructed from a log-linear model that regressed stock returns against macroeconomic variables. For a more comprehensive analysis, Kirui *et al.* (2013) tested volatility effects of these variables using a Threshold Generalized Autoregressive Conditional Heteroskedasticity (TGARCH) model. The TGARCH model tested for the persistence of volatility in stock returns and leverage effects caused by a positive or negative news shock. The study determined that stock returns had a negative relationship with the exchange rate. However, within the same study, other macroeconomic factors were deemed insignificant in explaining NSE stock returns. Moreover, Kirui *et al.* (2013) concluded that there were leverage effects due to the asymmetric impact of news. Negative news informing variations in macroeconomic factors was shown to have a larger effect on stock return volatility than positive shocks.

Kamande (2015) is another study that attempts to determine the relationship between NSE stock returns and macroeconomic variables. The study evaluated the relationship between the NSE-20 Index, the USD/KES exchange rate, the inflation rate, government spending and oil prices. The analysis used a log-linear regression model to identify the relationship between stock returns and these macroeconomic variables. Kamande (2015) opted to test volatility effects using a Power GARCH model. The study corroborated Kirui *et al.* (2013) findings that stock returns and the exchange rate have a negative relationship. However, Kamande (2015) found that positive shocks had a larger impact on NSE stock return volatility than negative shocks. Furthermore, the analysis revealed that only the exchange rate was significant in explaining the stock returns, supporting Kirui *et al.* (2013) findings.

Koskei (2021) sought out to investigate the relationship between NSE stock returns, the inflation rate and the 91-day treasury bill rate during the COVID-19 pandemic. The study examined the effects of the USD/KES exchange rate, the inflation rate and the 91-day treasury bill rate on the NASI index. In the analysis, a multiple linear regression model was employed to identify the relationship between these variables. The analysis was founded on daily data collected from January 2020 to May 2020. Koskei (2021) concluded that the exchange rate had a negative relationship with stock returns. However, the investigation established that the relationship was insignificant while the inflation rate and the treasury bill rate effects are shown to be significant. These results are different from the findings of Kisaka and Mwasaru (2012), Kirui *et al.* (2013) and Kamande (2015). The model used in Koskei (2021) is susceptible to econometric problems such as multicollinearity and endogeneity. Therefore, Koskei (2021) findings are subject to skepticism due to potential issues that arise from the choice of the model.

Evidently, empirical studies have attempted to explain movements in the Nairobi Securities Exchange using macroeconomic variables. The general conclusion within this body of research is that the exchange rate is a key variable in anticipating movements in the exchange. Previous attempts at identifying other macroeconomic linkages have been unsuccessful. Nonetheless, the issue of using macroeconomic variables to predict movements in the NSE remains unsettled. The search for variables that are significant in explaining stock return behavior continues and further inquiry is necessary.

2.4. Conceptual Framework

This study aims to establish whether other macroeconomic variables related to the interbank market and goods market can be used as proxies in the prediction of the performance of the NSE. As established by Kirui *et al.* (2013) and Kisaka and Mwasaru (2012), there is causality in the relationship between the exchange rate and NSE stock returns. Moreover, short-term interest rates are potentially effective in examining stock return behavior as determined by Javangwe and Takawira (2022). In theory, Mundell (1963) and Dornbusch (1976) suggest that changes in the interest rates are associated with changes in wealth and investment. Conclusively, portfolio balance theory explains that

changes in the current account are related to shifts in wealth as well as changes in asset positions.

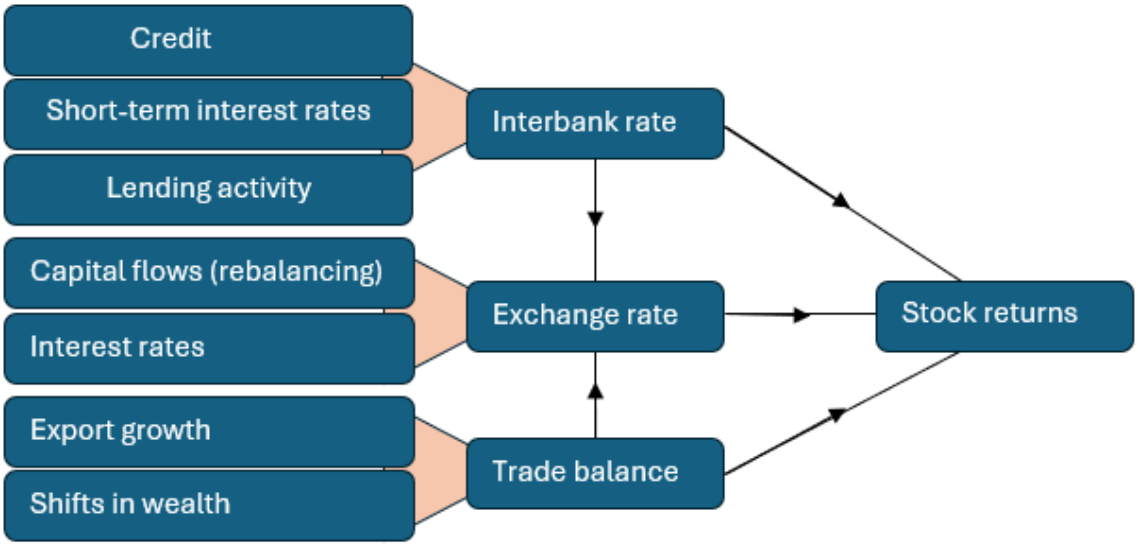

Figure 2: Conceptual Framework

Therefore, this study focuses on the effects of changes in the exchange rate, interbank rate and the current account on NSE stock returns. The variables of interest include:

I. The NSE stock returns (informed by the NSE-20 index) are transformed into log-returns and is the variable to be measured in the study after varying other selected variables. The NSE-20 index is constructed from the most liquid stocks as the securities exchange. The transformed index is the dependent variable.

II. The USD/KES exchange rate (domestic currency per dollar) is log-transformed for use in the study as an independent variable.

III. The interbank rate, sourced from the Central Bank of Kenya, defines the rate at which commercial banks lend and borrow from each other. The interbank rate is an independent variable in the study.

IV. The trade balance is defined as exports less imports and is selected as an independent variable. The trade balance was not controlled as previously done by Jawaid and Haq (2012). The figures are log-transformed.

CHAPTER 3

METHODOLOGY

3.1. Introduction

The aim of this study is to determine the effects of changes in the interbank lending rate and the trade balance on stock returns at the Nairobi Securities Exchange. The interaction between these variables may reveal linkages between the interbank market and the stock market. Additionally, the study explains the impact of the current account on the stock market and evaluates the significance of the relationship between stock returns and the exchange rate. The choice of variables is mainly influenced by the NSE-20 index comprising the most traded stocks. The index consists of exporting firms, commercial banks, telecommunication companies, energy companies and other companies exposed to foreign exchange risk.

3.2. Research Design

The study follows a quantitative research approach. The purpose of the study was to establish new macroeconomic linkages present in the Nairobi Securities Exchange through markets influenced by monetary policy transmission mechanisms. The study seeks to explain stock return behavior at the Nairobi Securities Exchange through incorporating the dynamics of short-term borrowing and lending of funds between commercial banks as well as the trading activity of exporting firms. An ARDL model was employed to test for significant relationships between the selected variables: (1) USD/KES rate; (2) interbank rate; (3) trade balance and NSE stock returns.

3.3. Population and Sampling

The study used monthly time series data collected from January 2019 to May 2024 on the trade balance, NSE-20 index, interbank rate and USD/KES exchange rate. All data was retrieved from secondary sources. Data on the NSE-20 index and the USD/KES exchange rate was sourced from Refinitiv. Trade balance figures are extracted from the Central Bank of Kenya Statistical Bulletins and monthly interbank rates are obtained from the Central Bank of Kenya. This period was appropriate for the study as there were economic events that led to increased volatility in the exchange rate and in the stock market.

Examples of such events include the COVID-19 pandemic and the partial repayment of the Eurobond that was maturing in June 2024.

3.4. Diagnostic Tests

Before an ARDL model can be run, the variables used in the analysis have to satisfy certain requirements and have certain properties to ensure the reliability of model results.

3.4.1. Augmented Dickey-Fuller Test

The use of stationary variables in time series models is encouraged to ensure that models do not produce spurious results. Stationarity requires a constant distribution of the error term. A constant distribution constructed from a constant mean and variance. Moreover, the correlation between past and current values of the error term should be constant. The Augmented Dickey-Fuller test is employed to evaluate whether the monthly times series data is stationary and to identify the order of integration of the series. The order of integration defines the number of times that a time series data needs to be differenced for it to be stationary. An $I(0)$ series is stationary and does not need to be differenced. An $I(1)$ series is integrated of order 1 and is stationary after the first difference.

Having determined the order of integration of the time series data using unit root tests, the optimal lag length can then be established. The optimal lag length is informed by the Akaike Information Criterion (AIC).

3.4.2. Other Tests

Other tests are conducted to check for the stability and reliability of the ARDL model. Primarily, the distribution of residuals in the model is examined. The residuals are tested for serial correlation, heteroskedasticity and normality. A Breusch-Godfrey and Ljung-Box test are used to test for serial correlation in the residuals. Subsequently, a Breusch-Pagan and Shapiro-Wilk test are used to test for heteroskedasticity and normality respectively. Following the examination of residuals, a cointegration test was run for the model and Ramsey's RESET test was run to evaluate the overall stability of the model.

3.4.3. Empirical Model

To investigate the effects of changes in the exchange rate, interbank rate and trade balance on stock returns, an ARDL model was employed. The model provides a framework for the observation of short- and long-run dynamics between these variables. An ARDL model makes provision for the treatment of cointegrated variables and non-stationarity in the error term within the analysis. This model is preferred to other candidate models as it captures these dynamics even with limited data and can be employed even when some of the variables are non-stationary. Furthermore, an ARDL model provides a framework that captures the relationship between these variables in a single-reduced form equation. The empirical model to be estimated is as follows:

$$SR_t = \alpha_t + \beta_1 ER_t + \beta_2 IR_t + \beta_3 TB_t + \epsilon_t \quad (3.1)$$

Where:

SR_t is the market return at time t

ER_t is the exchange rate at time t

IR_t is the interbank rate at time t

TB_t is the trade balance at time t

ϵ_t is the error term at time t

The empirical model can be specified as an ARDL model as follows:

$$lnSR_t = \beta_0 + \sum_{i=1}^{p} \beta_i lnSR_{t-i} + \sum_{j=0}^{q_1} \beta_{2j} lnER_{t-j} + \sum_{k=0}^{q_2} \beta_{3k} IR_{t-k} + \sum_{l=0}^{q_3} \beta_{4l} lnTB_{t-l} + \epsilon_t \quad (3.2)$$

Where p and q_is are maximum admissible lag lengths for the variables.

3.4.3. The Error Correction Model and ARDL Bounds Test

Two variables are cointegrated when they share the same stochastic trend or long-run relationship. The stochastic trend can be eliminated through differencing the time series so that it becomes stationary. After determining the optimal lag of the time series data, an ARDL bounds cointegration test can be carried out (Javangwe & Takawira, 2022). The cointegration test established whether a long-run relationship exists between the exchange rate, interbank rate, trade balance and stock returns.

$$\Delta lnSR_t = \beta_0 + \sum_{i=1}^{p-1} \beta_i \Delta lnSR_{t-i} + \sum_{j=0}^{q_1-1} \beta_{2j} \Delta lnER_{t-j} + \sum_{k=0}^{q_2-1} \beta_{3k} \Delta IR_{t-k} + \sum_{l=0}^{q_3-1} \beta_{4l} \Delta lnTB_{t-l} + \delta_1 lnSR_{t-1} + \delta_2 ln\, IR_{t-1} + \delta_3 lnTB_t + \epsilon_t \quad (3.3)$$

Where Δ is the difference operator and δ_is are "speed-of-adjustment" coefficients

The introduction of an error correction term in the model ensures that the long- and short-run dynamics of stock returns are captured. When the bounds test fails to determine whether a time series is cointegrated or not, the significance of the error term is used to establish the presence of cointegration. (Javangwe & Takawira, 2022)

$$\Delta lnSR_t = \beta_0 + \sum_{i=1}^{p-1} \beta_i \Delta lnSR_{t-i} + \sum_{j=0}^{q_1-1} \beta_{2j} \Delta lnER_{t-j} + \sum_{k=0}^{q_2-1} \beta_{3k} \Delta IR_{t-k} + \sum_{l=0}^{q_3-1} \beta_{4l} \Delta lnTB_{t-l} + \gamma Z_{t-1} + \epsilon_t \quad (3.4)$$

Where Z_{t-1} is the lagged error correction term and γ is the coefficient.

Given the existence of a cointegrating relationship between the variables and the significance of the error term, the long-run coefficients can be estimated as follows:

$$Long\ run\ coefficient = \frac{Short\ run\ coefficient}{-ECT} \quad (3.5)$$

Where ECT is the error correction term.

3.5. Definition of variables

The independent variables in this study are the USD/KES exchange rate, interbank rate and trade balance. The dependent variable is the NSE-20 index. The index is used to observe stock return behavior at the NSE. The definition of these variables is outlined in Table 1 below.

Table 1: Definition of variables

Variable	Definition	Measurement
Stock returns (SR)	The NSE-20 index is constructed from the most liquid stocks at the NSE.	Monthly stock returns are obtained from a monthly average of daily stock returns. Daily NSE-20 index figures are obtained from Refinitiv.
Exchange rate (ER)	The domestic currency per dollar rate (USD/KES)	Monthly USD/KES rates sourced from Refinitiv.
Interbank rate (IR)	The rate at which commercial banks lend funds to other banks or borrow funds from other banks.	Monthly rates are calculated from an average of daily interbank rates sourced from the Central Bank of Kenya
Trade balance (TB)	The difference between exports and imports.	Millions of Kenyan Shillings. Trade balance figures are collected from CBK Statistical Bulletins

CHAPTER 4

RESULTS AND ANALYSIS

4.1. Introduction

This chapter effectively answers the research questions upon which the study is formed from and meets the objectives of the study. This section will discuss the findings on the relationship between the interbank rate, trade balance, exchange rate and NSE stock returns. This chapter presents the effect of changes in the USD/KES exchange rate, interbank rates, and the trade balance on NSE stock returns.

4.2. ARDL Model

Before running the model to estimate the effects of the interbank rate, trade balance and the exchange rate on NSE stock returns, lag selection is necessary. The optimal lag lengths were determined according to the Akaike Information Criterion (AIC) and other information criteria. The chosen model has an autoregressive (AR) order of 2 with the following lag orders:

Table 2: Optimal lags

Variable	AIC*	HQ*	SC*	FPE*	Selected lags
lnSR	-6.367904653	-8.363201963	0.408219	-3.93150282	2
lnER	-6.34168536	-8.297653731	0.4737673	-3.86595459	1
IR	-6.301551479	-8.19731902	0.534071	-3.80360321	1
lnTB	0.001715782	0.000233364	1.5045742	0.01961988	4

*Optimal outputs

Table 2 shows the selected lag orders of the variable that specify an ARDL(2,1,1,4) model. The orders of integration and the descriptive statistics of the variables are shown in Tables 10 and 11 in Appendix 1 respectively.

4.2.1. Autocorrelation tests

A Breusch-Godfrey and Ljung-Box test was used to test serial correlation in the model and residuals up to the specified order.

Table 3: Autocorrelation tests

Breusch-Godfrey Test		Ljung-Box Test	
Ho: no serial correlation		Ho: no auto correlation	
Ha: residuals are serially correlated		Ha: autocorrelation in residuals	
LM test	0.053138	X-squared	0.014702
df1	1	df	1
df2	59		
p-value	0.8185	p-value	0.9035

The high p-values associated with the Breusch-Godfrey (0.8185) and Ljung-Box (0.9035) are much larger than 0.05 as presented in Table 3. The null hypotheses fail to be rejected at the 5% significance level, indicating no significant autocorrelation in the residuals of the model.

4.2.2. Heteroskedasticity test

The Breusch-Pagan test examined whether there was presence of heteroskedasticity in the residuals of the model. The presence of heteroskedasticity in the residuals would invalidate the model and indicate that the model is not adequate.

Table 4: Heteroskedasticity test

Breusch-Pagan Test	
Ho: no heteroskedasticity	
Ha: presence of heteroskedasticity	
BP	13.479
df	11
p-value	0.2632

As shown in Table 4, the p-value associated with the test, 0.2632, indicates that the null hypothesis of homoskedasticity cannot be rejected at the 5% significance level. Therefore, there is no presence of heteroskedasticity in the residuals of the selected model.

4.2.3. Normality test

To test for normality in the residuals of the model, a Shapiro-Wilk test was utilized. A model with residuals that follow a normal distribution suggests that the model is specified appropriately and is stable.

Table 5: Normality test

Shapiro-Wilk Test	
Ho: residuals are normal	
Ha: residuals do not follow a normal distribution	
W	0.97427
p-value	0.1465

The p-value extracted from Table 5, 0.1465, indicates that the null hypothesis states that the residuals of the model follow a normal distribution cannot be rejected at the 5% significance level. Therefore, the residuals of the selected model are approximately normally distributed.

4.2.4. Cointegration test

To test whether a long-run relationship exists between the variables and for evidence of cointegration, a Pesaran, Shin and Smith test was conducted.

Table 6: Cointegration test

F-test	I(O)	I(1)
10% critical value	2.482	3.334
5% critical value	2.946	3.862
1% critical value	4.048	5.092
F-statistic	7.81204035022689	

The F-statistic in Table 6, ~7.812, exceeds the critical value at the upper bound $I(1)$ at the 5% significance level. The null hypothesis of no cointegration is rejected, providing strong evidence of cointegration between variables. Therefore, there exists a long-run equilibrium relationship between NSE stock returns and the independent variables.

4.2.5. Model stability

Ramsey's RESET test was used to test model stability given the selected lag orders for the model.

Table 7: Stability test

Ramsey's RESET Test	
Ho: model is correctly specified	
Ha: model is not correctly specified	
RESET	0.044027
df1	1
df2	63
p-value	0.8345

Table 7 presents a high p-value, 0.8345, suggesting that the model is correctly specified at the 5% level of significance. The test results indicate that the model does not suffer from specification errors. Other tests for the stability of the parameters of the model are shown in Appendix 2.

4.2.6. Model Results

The short-run coefficients for the selected model are shown in Table 8 below.

Variable	Coefficients	Std.Error	t-Statistic	Prob.
DLOG(SR(-1))	0.156226	0.109626	1.425	0.159
DLOG(ER)	-1.2471	0.254063	-4.909	6.64e-06***
DIR	0.005321	0.003427	1.553	0.1254
DLOG(TB)	0.0513	0.027698	1.852	0.0686*
DLOG(TB(-1))	-0.105172	0.041066	-2.561	0.0128**
DLOG(TB(-2))	-0.016664	0.037251	-0.447	0.6561
DLOG(TB(-3))	0.030162	0.026407	1.142	0.2576
ECM(-1)	-1.110761	0.149009	-7.454	2.95e-10***
***significant at 1%				
**significant at 5%				
*significant at 10%				
Multiple R-squared	0.6078			
Adjusted R-squared	0.5588			
F-statistic	12.4			
p-value	1.526e-10			

In the short run, changes in the interbank rate and historical stock returns at the NSE do not have a statistically significant impact on NSE-20 returns. However, changes in the exchange rate and trade balance have statistically significant effects on stock returns. Changes in the exchange rate have a negative effect on stock returns at the 5% significance level. These findings are consistent with the results from Kirui *et al.* (2013). Stock returns have a negative relationship with previous monthly changes in the trade balance at the 5% level of significance. The first lag of the trade balance has a significant negative impact, implying that past trade balance changes reduce stock returns.

The value of $ECM(-1)$ in Table 8 indicates the speed of adjustment of the model towards its long-term equilibrium after short-term deviations. The coefficient of the error term, -1.110761, is negative and significant at the 5% level of significance. The error correction term, $ECM(-1)$, implies a strong adjustment speed, suggesting that approximately 111% of the disequilibrium is corrected in the following month.

Table 9: Long-run estimates extracted from ECM

Variable	Coefficients	Std.Error	t-Statistic	Prob.
LOG(SR(-1))	-1.1107613	0.155041	-7.164	1.31e-09***
LOG(ER(-1))	-0.8457184	0.317753	-2.662	0.00997***
IR(-1)	0.0025430	0.001501	1.694	0.09549*
LOG(TB(-1))	0.2332224	0.112869	2.066	0.04312**

The derivation of the long-run coefficients from the error correction model suggests that the exchange rate has a negative long-term relationship with stock returns. The model estimates that a 1% increase in the exchange rate leads to a 0.85% decrease in stock returns in the long run as presented in Table 9. These results are consistent with Kirui *et al.* (2013) and Kamande (2015) findings. The findings suggest that a Kenyan shilling depreciation against the U.S. dollar translates to smaller returns at the NSE.

Conversely, the trade balance has a positive long-term relationship with NSE stock returns. A 1% increase in the trade balance improves stock returns by approximately 0.23% in the long run as shown in Table 9. This implies that positive changes in the trade balance –exports growing faster than imports – are associated with positive changes in NSE stock returns. One can attribute this to improved market sentiments on exporting firms at the NSE as market participants anticipate greater profitability for the same firms.

CHAPTER 5

DISCUSSIONS AND CONCLUSION

5.1 Overview

The aim of this study was to further investigate the effects of changes in the exchange rate on stock returns at the NSE. Its secondary purpose was to establish the significance of the relationship between changes in the interbank rate, the trade balance and stock returns in the securities exchange. The analysis reveals long-term and short-term interactions between these variables.

5.2 Conclusion

As evidenced in the analysis, changes in the interbank rate and historical returns (returns in the previous month) do not have a significant impact on stock returns at the NSE in the short run. However, changes in the exchange rate and the trade balance in the previous month have a significant negative relationship with NSE stock returns. In the long run, the study presents a negative long-term relationship between changes in the exchange rate and stock returns as shown in Table 9. Generally, domestic currency depreciation against the U.S dollar negatively affects stock returns at the NSE. These findings corroborate Kirui *et al.* (2013) and Kamande (2015) results and may be due to the repatriation of funds by foreign investors.

Moreover, the study finds that in the long-run, changes in the trade balance have a positive long-term relationship with NSE stock returns. Positive changes in the trade balance imply a rise in the exports of goods more than a rise in imports. Positive changes indicate that exporting firms have increased their exporting activities, and as a result, foresee greater profitability. Greater profitability for these firms improves investors' sentiments on the associated stocks. Therefore, one may attribute positive changes in stock returns to greater exporting activity.

5.3 Policy implications

The study reveals that there exists a relationship between stock returns at the NSE and changes in the trade balance, and more broadly, the current account. The findings present a linkage between the bourse and the goods market. Particularly, these results offer new insights on the driving forces of stock price movements and stock returns at the NSE. These findings are therefore useful to investors and policymakers. Investors may construct investment frameworks that incorporate the effects of changes in the exchange rate and the current account in the decision-making process.

Furthermore, the Central Bank of Kenya, concerned with monetary policy transmission mechanisms, may use the findings from this study to inform policies affecting asset markets, the exchange rate, and consequently, the broader economy. The central bank may pursue policies with the aim of stabilizing the exchange rate to support investor confidence and stock market performance.

5.4 Limitations of the study

The study was constrained to the period between 2018 and 2024. The investigation could not be conducted at a higher frequency due to the availability of data. This may have affected the reliability of results as the selected lag orders for the ARDL model reduced degrees of freedom for the associated sample size. For further research, the analysis can be done at a higher frequency. At a higher frequency, the model can be complemented with volatility models in assessing the impact of these variables.

Given that the study was constructed on data collected between 2018 and 2024 to examine the effects of certain events, it does not examine the relationships between these variables comprehensively. A comparative approach that analyzes these relationships in different periods may provide better insights.

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Appendices

Appendix 1: Orders of integration and descriptive statistics

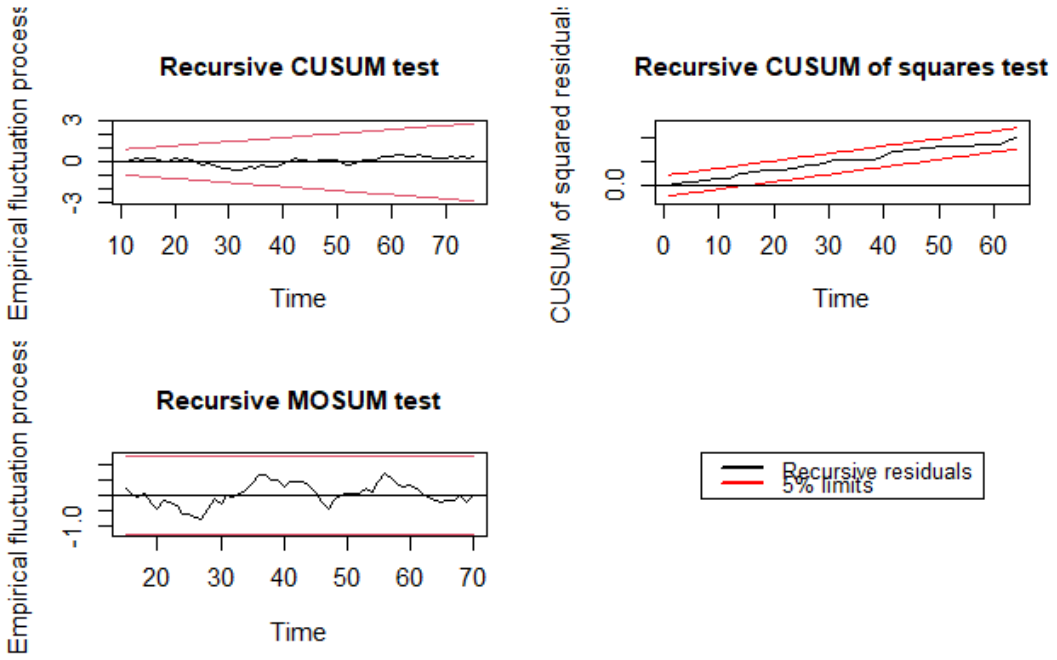
Table 10: ADF Test

Variable	Levels	First Difference	Order of Integration
Log SR	-4.3311	-	I(0)
Log ER	-2.1078	-4.3467	I(1)
IR	-0.5711	-4.0389	I(1)
Log TB	-4.6566	-	I(0)

Table 11: Descriptive statistics

	lnSR	lnER	IR	lnTB
Mean	-0.01	0	5.97	0.01
Std. Dev	0.04	0.02	3.12	0.16
Median	-0.01	0.01	5.02	0.01
Minimum	-0.17	-0.11	2.18	-0.35
Maximum	0.13	0.04	13.71	0.4
Range	0.3	0.14	11.53	0.74
Skewness	-0.53	-3.08	1.34	0.19
Kurtosis	3.53	16.27	0.66	-0.58
Observations	76	76	76	76

Appendix 2: Model stability



The parameters of the model remain stable over time

Appendix 3: Time series plots