NELSON MANDELA UNIVERSITY

# EXCHANGE RATE VOLATILITY AND BANK PERFORMANCE: THE CASE OF SOUTH AFRICA

by

**ZUKISWA ROZANI**

"Research is subject to a confidentiality agreement"

April 2022

NELSON MANDELA UNIVERSITY

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by

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In accordance with Rule G5.11.4, I hereby declare that the above-mentioned treatise/ dissertation/ thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

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**DATE: 13 December 2021**

## DEDICATION

I dedicate this research study to my family with special gratitude to my late paternal grandparents; Gilbert Rozani and Nonkoliseko Rozani, maternal grandparents; Nokwedini Mdeni and Nongezile Sikhethe Mdeni, both my parents, Pakamisa Simpiwe Rozani and Nomalizo Nosakhele Rozani and lastly, my siblings Abongile Fikile Rozani and Babalwa Linamandla Rozani. Thank you for your support and encouragement throughout this journey.

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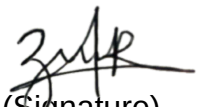
Acknowledged by: Zukiswa Nokulunga Rozani.

Signed at **Port Elizabeth** on the **13th** day of **December 2021.**



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## ABSTRACT

The increasing financial liberalisation since the collapse of the Bretton Woods regime in the 1970s has made exchange rates in both developing and industrialised countries unpredictable. As a result, both researchers and policymakers have become increasingly interested in the consequences and causes of exchange rate volatility. Fluctuations in foreign exchange rates may be a significant source of concern for banking institutions. In the worst case, significant losses in foreign exchange could result in financial crises, apart from causing significant constraints on the revenue growth of banks.

This research study sought to investigate the volatility of exchange rates in South Africa and how this volatility affects commercial banks' performance. The study was guided by both theoretical and empirical literature to achieve its main objective. This investigation is rooted in two theories: The Purchasing Power Parity theory, and the International Fishers Effect theory. The purchasing power parity (PPP) theory expresses that, homogeneous goods, in various countries, cost equally in similar countries when estimated in terms of the same currency (Brunnermeier and Pedersen, 2009). The theory postulates that if two homogeneous goods are traded at various costs in various countries, the arbitrage opportunity would be exploited, which prompts convergence of the deviations from Purchasing Power Parity towards equilibrium without arbitrage costs. The International Fisher Effect stipulates that the distinction in returns between two countries is simply equivalent to the distinction in inflation rates (Ross, Westerfield, Jaffe, & Jordan, 2008). The theory proposes that foreign currencies with relatively high-interest rates would depreciate on grounds that the high nominal interest rates reflect anticipated inflation. The nominal interest rates would likewise fuse the risk of an investment (Majok, 2015).

The research adopts two econometric models namely: The EGARCH technique in modelling volatility, and the NARDL method to investigate the relationship.

Results from the NARDL model reveal the occurrence of a long-run relationship between exchange rate volatility and bank performance. However, the influence of exchange rate on bank performance varies, depending on the type of proxy employed to measure bank performance. Four commercial banks revealed evidence of cointegration among the variables in the model in the short run, and indicated the

speed of adjustment in the short run towards the long run. Nedbank's return on equity, however, has an insignificant short-run relationship.

Therefore, the study recommends that management of banks should place a greater emphasis on assessing and overseeing economic exposure, and factoring this into strategies in decision making.

**Key words**: Exchange rate volatility, bank performance, EGARCH and NARDL.

## Table of Contents


**DECLARATION BY CANDIDATE** ..... i

**DEDICATION** ..... ii

**ACKNOWLEDGMENTS** ..... iii

**ABSTRACT** ..... iv

**LIST OF TABLES** ..... ix

**LIST OF FIGURES** ..... ix

**LIST OF ACRONYMS** ..... x

**CHAPTER 1** ..... 1

**INTRODUCTION** ..... 1

**1.1. Introduction and Background** ..... 1

**1.2. Research Problem** ..... 4

**1.3. Research Objective** ..... 5

**1.4. Hypotheses** ..... 5

**1.5. Significance of the study** ..... 6

**1.6. Organisation of the study** ..... 8

**CHAPTER 2** ..... 9

**OVERVIEW OF EXCHANGE RATE VOLATILITY AND BANK PERFORMANCE IN SOUTH AFRICA** ..... 9

**2.1. Introduction** ..... 9

**2.2. Definition of Exchange rate** ..... 9

**2.3. Exchange rate regime** ..... 11

**2.4. Exchange rate regime evolution in South Africa** ..... 14

**2.5. Inflation targeting and Exchange rate** ..... 17

**2.6. Rationale for adopting inflation targeting** ..... 19

**2.7. An Overview of the Volatility of the Rand** ..... 21

**2.8. Overview of the banking sector in South Africa** ..... 22

**2.9. Background of the five major commercial banks** ..... 24

**2.9.1. Amalgamated Banks of South Africa (ABSA)** ..... 25

**2.9.2. First National Bank (FNB)** ..... 25

**2.9.3. Nedbank** ..... 25

**2.9.4. Standard Bank** ..... 26

**2.9.5. Capitec Bank** ..... 26

**2.10. Overview of the bank performance in South Africa** ..... 27

**2.11. Chapter Summary** ..... 28

**CHAPTER 3** ..... 30

**LITERATURE REVIEW** ..... 30
**3.1. Introduction** ..... 30
**3.2. Theoretical literature** ..... 30
**3.2.1 Purchasing Power Parity Theory** ..... 30
**3.2.2. International Fisher Effect Theory** ..... 32
**3.2.3. The Balassa-Samuelson Model and External Debt (B-S)** ..... 34
**3.2.4. Law of One Price** ..... 35
**3.2.5. Quantity Theory of Money** ..... 35
**3.2.6 Arbitrage Pricing Theory (APT)** ..... 38
**3.2.7. Keynes Liquidity Preference Theory** ..... 40
**3.2.8. Interest Rate Parity Theory** ..... 42
**3.2.9. The Monetary Approach** ..... 44
**a. The Monetary Approach to Balance of payment** ..... 45
**b. The Monetary Approach under Flexible Exchange Rates** ..... 46
**3.3. Determinants of financial performance** ..... 47
**3.3.1. Asset quality** ..... 47
**3.3.2. Capital strength** ..... 48
**3.3.3. Operational efficiency** ..... 48
**3.3.4. Bank liquidity** ..... 48
**3.4. Empirical literature** ..... 49
**3.4.1. Developed countries** ..... 49
**3.4.2. Developing countries** ..... 53
**3.4.3. South African study** ..... 58
**3.5. Chapter Summary** ..... 59
**CHAPTER 4** ..... 60
**RESEARCH METHODOLOGY** ..... 60
**4.1. Introduction** ..... 60
**4.2. Variable Description and Data Sources** ..... 60
**4.3. Unit root test** ..... 62
**4.4. Model Specification and Estimation Procedures** ..... 63
**4.4.1 EGARCH Model** ..... 63
**4.4.2 Non-linear Autoregressive Distributed Lag Model** ..... 64
**4.6. Chapter Summary** ..... 68
**CHAPTER 5** ..... 70
**EMPIRICAL RESULTS** ..... 70
**5.1. Introduction** ..... 70

**5.2. Descriptive Statistics and Stationarity Tests** ..... 70
**5.3. EGARCH Model** ..... 72
**5.4. NARDL** ..... 73
**5.4.1. Bound F-Test** ..... 73
**5.6. Long-run and Short-run results** ..... 74
**5.6.1 Long-run relationship results** ..... 74
**5.6.2 Short-run relationship results** ..... 76
**5.7. Diagnostic Tests** ..... 78
**5.8. CUSUM and CUSUM of Square Results** ..... 80
**5.8.1. ABSA Bank** ..... 80
**5.8.2. Capitec Bank** ..... 80
**5.8.3. First National Bank and Nedbank** ..... 81
**5.8.4. Standard Bank** ..... 81
**5.9. Chapter Summary** ..... 81
**CHAPTER 6** ..... 83
**CONCLUSIONS, POLICY RECOMMENDATIONS, AND FUTURE RESEARCH** ..... 83
**6.1. Introduction** ..... 83
**6.2. Summary and Conclusion** ..... 83
**6.3. Main Findings** ..... 84
**6.4. Policy Implications and Recommendations** ..... 85
**6.5. Possible Areas for Future research** ..... 85
**List of Sources** ..... 86
**APPENDIX** ..... 125
**Appendix A: CUSUM and CUSUM of Square Results** ..... 125
**Appendix B: SUMMARY OF THE TURNITIN REPORT** ..... 131
**Appendix C: DECLARATION BY LANGUAGE EDITOR** ..... 134

## LIST OF TABLES

**Table 2. 1: Exchange Rate Policies in South Africa ..... 16**

**Table 4. 1: Variable names, descriptions, and sources ..... 60**

**Table 5. 1 Descriptive Statistics and Unit Root Results ..... 71**
**Table 5. 2: EGARCH results ..... 73**
**Table 5. 3: Bound F-Test Results ..... 74**
**Table 5. 4: Long-Run Results ..... 75**
**Table 5. 5: Short-Run Results ..... 77**
**Table 5. 6: Diagnostic Test Results ..... 79**

## LIST OF FIGURES

**Figure 1: The trends of inflation and exchange rate since the adoption of floating exchange rate regime and inflation targeting ..... 19**
**Figure 2: SA Rand/ US Dollar Exchange Rate fluctuation (2002 – 2019)s ..... 22**
**Figure 3: Number of banks in South Africa over ten years ..... 24**

**Figure 5. 1: ABSA ..... 125**
**Figure 5. 2: CAPITEC ..... 126**
**Figure 5. 3: FNB ..... 127**
**Figure 5. 4: NEDBANK ..... 128**
**Figure 5. 5: STANDARD BANK ..... 129**

## LIST OF ACRONYMS

| | |
|---|---|
| **ADF** | Augmented Dickey-Fuller |
| **APT** | Arbitrage Pricing Theory |
| **ARDL** | Autoregressive Distributed Lag Model |
| **ARIMA** | Autoregressive Integrated Moving Average |
| **CAPM** | Capital Asset Pricing Model |
| **CIP** | Covered Interest Parity |
| **CUSUM** | Cumulative Sum of recursive residuals |
| **EGARCH** | Exponential Generalised Auto Regressive Conditional Heteroscedasticity |
| **EPS** | Earnings Per Share |
| **EX** | Exchange rate |
| **GARCH** | Generalised Auto Regressive Conditional Heteroscedasticity |
| **GDP** | Gross Domestic Product |
| **IFE** | International fisher Effect |
| **IMF** | International Monetary Fund |
| **INFL** | Inflation rate |
| **INT** | Interest rate |
| **IRP** | Interest Rate Parity |
| **LOP** | Law of One Price |
| **NARDL** | Non-linear Autoregressive Distributed Lag Model |
| **NEG** | Negative |
| **NIM** | Net Interest Margin |
| **NSE** | National Stock Exchange |
| **OLS** | Ordinary Least Square |

| | |
|---|---|
| **ROA** | Return on Asset |
| **ROE** | Return on Equity |
| **P/E Ratio** | Price Earnings Ratio |
| **POS** | Positive |
| **PPP** | Purchasing Power Parity |
| **PPPA** | Purchasing Power Parity Absolute |
| **PPPR** | Purchasing Power Parity Relative |
| **SUR** | Seemingly Unrelated Regression |

# CHAPTER 1

# INTRODUCTION

## 1.1. Introduction and Background

The increasing financial liberalisation since the collapse of the Bretton Woods regime in the 1970s has made exchange rates in both developing and industrialised countries unpredictable. As a result, both researchers and policymakers have become increasingly interested in the consequences and causes of exchange rate volatility. In March 1995, South Africa liberalised its capital account following the elimination of the dual exchange rate system that had been in place since the mid-1980s.

The volatility of foreign exchange rates is conceivably an interesting component that drives the level of profitability of commercial banks and influences banks' intermediation process. Exchange rates are a crucial microeconomic variable and backbone of trade (Adetayo, Dionco, and Oladejo, 2004). A variation in exchange rates plays an imperative role in the assurance of balance of trade. Exchange rates, such as some other exchange of products, depend on the demand and supply of currency. Domestic currency supply changes, because of a nation's fiscal and monetary approaches (Berger and Bouwman, 2010). The demand for a currency can be impacted by several variables, including inflation, interest rates, and perspectives on approaching government regulations. The proceeding, with increments on the world trade and capital volatility, has made exchange rates one of the primary determinants of business benefit and value costs (Bradley and Moles, 2002).

Exchange rates play a significant role in the economy, as they directly affect the domestic price level, the profitability of traded goods and services, allocation of resources, and investment decisions. The instability of the exchange rate is today daunting the bedrock of all economic activities due to the volatility risk. Exchange rate volatility is defined as the persistent fluctuations of the exchange rate. According to Omagwa (2005), exchange rate fluctuations can affect actual inflation as well as expectations about future price fluctuations. These fluctuations in the exchange rate tend to directly affect the domestic prices of imported goods and services.

Under a freely floating exchange rate system, estimation of foreign currency, as with any product or service being sold in the market, is dictated by the force of demand and supply (Nydahl, 1999). Under a fixed exchange rate framework, a parity value rate is set between the local currency and the foreign currency by the central bank. The parity value might be changed occasionally (Reid and Joshua, 2004).

The bank sector is a backbone for a country's economy, as its performance can generate spill over effects on different sectors (Ngure, 2014). A firm financial sector permits the expansion of existing companies and encourages the development of new companies by permitting the lending of capital and loans. Furthermore, maintaining good profit figures, banks can generate public confidence to stakeholders, depositors, and potential shareholders. Financial stability is therefore significant for banks, as it captures the interest of government and other parties such as bankers, shareholders, and investors.

Since the attainment of constitutional democracy in 1994, commercial banks in South Africa have undergone massive regulatory and technological changes. South African banks are faced with dramatic effects on their performance due to countless factors, such as increasing competition and rising costs because of regulatory requirements, financial and technological innovation, entry of large foreign banks in the retail banking environment, and challenges of the recent financial crisis (Kumbirai and Webb, 2010).

Commercial banks play an important role in the economic resource allocation of countries. As financial intermediaries, they channel funds from depositors to investors continuously. The soundness of the chain of activities, where surplus funds are moved into productive ventures, is crucial for development. Commercial banks assume a critical role of directing and activating funds from surplus monetary units (holders) to deficient financial entities (borrowers). They embrace the intermediary function that has a continuous outcome on the efficiency and financial prosperity of a country (Kamau, 2013). They can do so, on the off chance of generating the necessary income to take care of operational expenses acquired in due course. For sustainable intermediation function, banks need to be profitable. Beyond the intermediation function, the financial performance of banks has a critical implication for the financial development of nations. Sound financial performance can help reward investors for their investments. This, in turn, supports additional investment and brings about

financial development. However, a poor financial performance can prompt financial failure and crises that have negative repercussions on the financial development of the banks.

This investigation is rooted on two theories: The Purchasing Power Parity theory, and the International Fishers Effect theory, which were previously mentioned. The Purchasing Power Parity (PPP) theory expresses that homogeneous goods, in various countries, cost equally in similar countries when estimated in terms of the same currency (Brunnermeier and Pedersen, 2009). The theory postulates that if two homogeneous goods are traded at various costs in various countries, the arbitrage opportunity would be exploited, which prompts convergence of the deviations from Purchasing Power Parity towards equilibrium without arbitrage costs. The International Fisher Effect states that the distinction in returns between two countries is simply equivalent to the distinction in inflation rates (Ross, Westerfield, Jaffe, and Jordan, 2008). The theory proposes that foreign currencies, with relatively high interest rates, would depreciate on grounds that the high nominal interest rates reflect anticipated inflation. The nominal interest rates would likewise fuse the risk of an investment (Majok, 2015).

The profitability of banks is measured using a variety of ratios, where return on assets (ROA), also referred to as a return on investment, return on equity (ROE), and net interest margin (NIM), are the major ones (Murthy and Sree, 2003). The return on assets, or investments, is an indicator of how profitable a company is relative to its total investments. It presents an idea as to how efficient management is at using its assets to generate earnings (Mutua, 2013). The return on equity is a major ratio, which indicates the profitability of a bank and measures the ability of an organisation's management to generate income by utilising company assets at their disposal. The return on equity refers to how much profit a company earned compared to the total amount of shareholder equity invested or found on the balance sheet. Shareholders look at ROE for return on their investment. Lastly, the net interest margin measures the difference between the interest income by banks, and the amount of interest paid out to their lenders, comparative to the amount of their assets. The net interest margin is expressed as a percentage of what the financial institution earns on loans in a specific period, as well as other assets, minus the interest paid on borrowed funds

divided by the average amount of the assets on earned income in that period (Olweny, and Shipho, 2011).

Financial performance is imperative to a company's investors. Isaac (2015) points out that the end goal of banks is to sustainably carry out their intermediation function. Banks need to be profitable, also considering the significant impact of exchange rate volatility on banks intermediation as seen by Ngerebo (2012). The functions of banks go past intermediation and their financial performance. Banks have a critical impact on the financial development of countries. As opined by Ongore, and Kusa (2013), poor financial performance can prompt financial disappointment and crisis that has undesirable results on economic growth. Subsequently, exchange rates significantly affect the economic growth of all countries (Adeniran, Yusuf and Adeyemi, 2014).

Likewise, the exchange rate volatility is observed to have a critical effect on the performance of banks (Isaac, 2015). Osundina, Ademola, Olamide, and Moses (2016) observed that a rise in the estimation of the U.S. dollars, versus the different baskets of foreign currency, can improve earnings of U.S. based organisations. Bakare (2011) further presumed there is a critical yet negative relationship between floating foreign exchange and private domestic investment. Even so, Babazadeh and Farrokhnejad (2012) discovered that exchange rate was a major determinant of profits on Iran's banks. Kiganda (2014) presumed that macroeconomic elements (such as real GDP and exchange rate) have an immaterial impact to the bank's profitability. Contrary to Kiganda's (2014) studies by Flamini, Schumacher and McDonald (2009), Zhang and Dong (2011), they found that macroeconomic variables, such as inflation and GDP, have a significant impact on banks profitability.

## 1.2. Research Problem

Exchange rate volatility can be a source of risk to a business, including banks. This can negatively affect the business's expected cash flow and stock returns (Isaac, 2015).

According to Adler and Dumas (1980), a bank's asset value and activities are exposed to exchange rate volatility. Exchange rates mostly affect banks with foreign currency transactions and foreign operations. Banks are still affected indirectly by exchange

rates through their influence on foreign competition, demand for loans and other aspects of banking conditions (Chamberlain, Howe, and Popper, 1997).

In South Africa, the Rand was particularly volatile in the 1990s. Exchange rate volatility is the result of several factors, such as sharp currency depreciation, a deterioration in foreign reserves, an increase in interest rates, or, a combination of these. The management of exchange rate volatility has been a challenge facing developing countries, including South Africa. Countries that depend largely on foreign trade and investments are negatively affected during periods of excessive exchange rate volatility. Consequently, this has an impact on the overall macroeconomy and variables such as GDP growth, inflation, and interest rates, to name a few. This subject therefore requires a great deal of research attention.

## 1.3. Research Objective

The general objective of this study is to establish the effects of exchange rate volatility on the financial performance of commercial banks in South Africa. However, specific objectives are:

- To investigate short term and long-term exposure of commercial banks performance on exchange rate volatility.
- To investigate the exposure of domestic small banks compared to domestic large banks to exchange rate volatility.

## 1.4. Hypotheses

- $H_0$: Commercial banks' performance is not exposed to short- and long-term exchange rate volatility.
- $H_1$: Commercial banks' performance is exposed to short- and long-term exchange rate volatility.
- $H_0$: There is no difference in exposure to exchange rate volatility of domestic small banks compared to domestic large banks.

- $H_{1:}$ There is a difference in exposure to exchange rate volatility of domestic small banks compared to domestic large banks.

## 1.5. Significance of the study

The global financial crisis provides a realistic argument for calculating the variance in the volatility of returns in extremely fluctuating stock markets that may show different characteristics from the relatively stable market.

Sabina, Manyo, and Ugochukwu (2016) opined that the profitability of a bank on exchange rate transactions is influenced by numerous factors resulting from policy reforms and regulations that include bank-specific (internal) and macroeconomic (external) fundamentals. Macroeconomic factors are also utilised as indicators of the conduct of the economy, and variables such as the exchange rate, interest rate, inflation rate, and gross domestic product (Karl, Ray, and Shannon, 2009). Taiwo and Adesola (2013) discovered the influence of exchange rates on interest rates and the impact on profitability indirectly through loanable funds costs. High currency rates increase the amount that commercial banks earn from the trade of foreign currency, resulting in improved profitability. High-interest rates will result in higher interest income for commercial banks but will also result in low demand for loans and therefore lower interest income (Sayedi, 2013). These indirect factors are uncontrollable and may have a significant effect on the profitability of the bank and may be caused by bank regulations.

Ojo and Alege (2014) argued that the exchange rate affects the prices and/ or profitability of traded and non-traded goods and affects the distribution of capital in the short to medium term as a relative price. The role of foreign exchange rate and currency convertibility in the nation-wide economy, and the interrelationships between banks as active financial institutions in foreign exchange markets, must be understood in terms of the risk of exchange rate changes (Babazadeh and Farrokhnejad, 2012).

Most studies (Combey and Togbenou (1916), Vong and Chan (2009), Moyo (2018), Alagidede and Ibrahim (2017), Aye, Gupta, Moyo and Pillay (2015)) in both developed and developing countries have focused on the effect of exchange rate volatility and banks profitability with other macroeconomic factors. However, a limited number of studies (Wong, Wong, and Leung, 2008; Lagat and Nyandema; 2016; Chamberlain,

Howe, and Popper, 1997; Isaac, 2015; De Wet and Gebreselasie, 2004) have explored the relationship between exchange rate volatility on the financial performance of four South African commercial banks (ABSA, Standard Bank, First National Bank (FNB), and Nedbank). For instance, De Wet and Gebreselasie; 2004) who examined the exchange rate exposure of major commercial banks in South Africa, revealed that all the four commercial banks (ABSA, Standard Bank, First National Bank (FNB), and Nedbank) they investigated, exhibited significant foreign exchange risk. These studies thus informed the current research and, therefore, the researcher sought to further fill the knowledge gap on the effect of exchange rate volatility and financial performance of major commercial banks in South Africa. The current study further explores the exchange rate volatility impact on the financial performance of major commercial banks in South Africa, including another significant South African bank (Capitec Bank) that is not considered in previous studies. As opposed to other studies on the phenomenon in the case of South Africa, this study makes use of accounting principles to econometrically investigate the exchange rate exposure of the five major commercial banks in South Africa.

This study will be of benefit for commercial banks managers, and it will also shed light on exchange rate loss mitigation policies and strategies. The findings of this study will inform and further enlighten the South African government policymakers on the formulation of policies for a strong and resilient banking industry. The study will contribute to existing literature by presenting new empirical evidence on the effects of the exchange rate volatility on the financial performance of commercial banks in South Africa

The study is essential to stakeholders in the financial sector, as the study aims to provide insight into implications of risk management strategies for banks and will assist in giving better advice to financial institutions on the best hedging practices to undertake to limit their exchange exposure. Lastly, the study will be useful to researchers, as it will provide information that can be used for further research areas.

## 1.6. Organisation of the study

The rest of the study is organised as follows:

- Chapter two deals with the overview of exchange rate volatility in South Africa.
- Chapter three provides reviews of both theoretical literature and empirical literature concerning the effect of exchange rate exposure and bank performance.
- Chapter four is the methodology that provides a model specification and review of relevant statistical estimation techniques and concepts for this study, as well as variables used and their sources.
- Chapter five analyses data using the econometric methods as mentioned in chapter four.
- Chapter six provides conclusions, policy recommendations, and future research for the study.

# CHAPTER 2

# OVERVIEW OF EXCHANGE RATE VOLATILITY AND BANK PERFORMANCE IN SOUTH AFRICA

## 2.1. Introduction

The purpose of this chapter is to present an overview of exchange rate volatility in South Africa over the period (2002-2019) and bank performance. This chapter also seeks to provide information on how the exchange rate regimes have evolved over the years, as well as that of commercial banks in South Africa. According to De Lange (2013), over the past two decades, the banking industry has changed dramatically resulting in several amalgamations between banks. Under the current inflation-targeting monetary policy system of the South African Reserve Bank (SARB), the South African Rand is a free-floating currency with its value determined by market forces (Khomo, 2018). The South African Rand value is determined by the interaction of demand and supply in a freely floating exchange rate system (Mtonga, 2011). According to Takaendesa, Tsheole, and Aziakpono (2006) and Sekantsi (2011), a small open economy such as South Africa, with a floating exchange rate, as well as an outward-looking trade policy, currency movements can affect its economic activity.

The next section 2.2 defines the exchange rate. Section 2.3 presents the exchange rate regime in South Africa, while inflation targeting, and exchange rate are presented in section 2.4. Section 2.5 provides the rationale for adopting inflation targeting. Section 2.6 presents an overview of the volatility of the Rand again the US dollar. Section 2.7 provides an overview of the South African banking sector. Lastly, section 2.8 is an overview of the bank performance in South Africa.

## 2.2. Definition of Exchange rate

The exchange rate, according to Demburg and McDougall (1980) cited in Ngerebo (2012), is defined as the domestic price of foreign currency, which can be determined either administratively or by the market forces of demand, and the supply of foreign currency through imports and exports on the foreign exchange market. The significance of this definition is that it focuses on the concept of price as the nature of the exchange rate. There are numerous diverse exchange rate measures. The

nominal and real exchange rate, the bilateral and effective exchange rate, and the Purchasing Power Parity (PPP) are the commonly known measures. According to Nelson (2013), the nominal exchange rate is the rate at which one currency can be exchanged in terms of another currency. Nominal exchange rates play a significant role in regulating relative international prices and balancing external accounts (Zhang, 2018). The real exchange rate is the product of the nominal exchange rate between the two currencies (for example, the dollar price of a euro) and the price ratio between the two countries (Catäo, 2007:47). The value of one currency in terms of another currency is known as the bilateral exchange rate. On the other hand, the effective exchange rate is the value of a currency against a weighted average of a basket of foreign currencies (Nelson, 2013).

The basis for the determination of the exchange rate was the concept of purchasing power parity (PPP) as set out in Cassel (1918). The theory of purchasing power parity (PPP) defines the exchange rate as the amount of one country's currency that endows the holder with the same amount of purchasing power. The purchasing power parity theory, interpreted differently, notes that the same set of goods purchased with different currencies will have the same cost as measured in any currency (Cooper and Fraser, 1990). The short-term effect of the PPP is that the currency of a nation will tend to depreciate in the foreign exchange market when its inflation rate exceeds that of other nations (Cookey, 1997).

Normally, the definition is expressed in absolute form (PPPA), or relative form (PPPR), where PPPA is the ratio of domestic demand (Pd) to world price, or that of a major trading partner (Pp). According to relative PPP, the change in the nominal exchange rate over time is proportionate to the relative change in the domestic and international price levels over the same period (Wong, 1993).

## 2.3. Exchange rate regime

Since the end of the Bretton Woods Era, in the early 1970s, four major distinctive exchange rate regimes and monetary policy structures have existed in South Africa (Van der Merwe, 2004).

These include: (1) a period of direct monetary controls and an attempt to maintain the stability of the Rand exchange rate throughout the 1970s; (2) a transition to more market-oriented policies and the introduction of targets for money supply in the 1980s; (3) a phase of informal inflation targeting and controlled Rand floating in the 1990s; (4) the official introduction in February 2000 of targeting inflation and a floating exchange rate system (Kutu and Ngalawa, 2017).

When considering which exchange rate regime to adopt, policymakers must adopt one that they believe is the best to balance with all other macroeconomic policies (Ng'ambi, 2015). With fixed exchange rates, the authorities rigidly fix (peg) the local exchange rate to the foreign currency of choice. Under the floating exchange rate, the currency may be determined by market demand and supply. A floating noninterventionist policy has been adopted by the South Africa Reserve Bank (SARB) but retains some control by being able to buy or sell other currencies to defend the local Rand (Ng'ambi, 2015; Adrino, 2012).

Bénassy-Quéré, Fontagné, and Lahrèche-Révil (2001) postulate that the exchange rate system is a determinant of the composition of portfolios. However, equity investors will be inattentive to the system given that their exposures are hedged by derivatives. International direct investors, on the other hand, consider and pay attention to the exchange rate system because they are unable to hedge their long-term exposures to the horizon. Prior studies by Mussa, (1986); Flood and Rose, (1999); Carrera and Vuletin, (2002) and Kočenda and Valachy (2006), observed differences in exchange rate behaviours under the different regimes. Mussa (1986) recognises that the real and nominal exchange rate volatility alternates significantly and consistently with the exchange rate regime. Furthermore, Mussa (1986) shows that the variation seen in the real exchange rate is of greater magnitude with floating exchange rates as opposed to fixed.

The uncertainty of monetary policy under a floating regime causes exchange-rate instability (Kodongo and Ojah, 2014). Kočenda and Valachy (2006) emphasise that,

although the exchange rate regime is a strong contributor to the volatility of the exchange rate, and more so under the floating regime, it can also be driven by country-specific effects. Flood and Rose (1999) pointed out that more volatility is caused by floating exchange rates than by fixed. Flood and Rose (1999) support Friedman's (1953) statement that an exchange rate's volatility is an indication of an inherently unstable economic system, and that if macroeconomic conditions are stable, floating exchange rates do not lead to a wavering exchange rate.

Carrera and Vuletin (2002), on the contrary, found that fixed regimes cause more instability than floating regimes. They found that the level of commitment to the regime has a linear impact on exchange rate stability. However, when the government maintains its commitment to a fixed exchange rate, the volatility is lower than floating, but if the central reserve bank is not committed to the fixed regime, the volatility is higher (Carrera and Vuletin, 2002). Furthermore, a study by Grilly and Kaminsky (1991) argues that the volatility of the real exchange rate depends not on the exchange rate regime, but on the historical period.

According to Gregorio, Tokman, and Valdés (2005), while the floating regime causes exchange rate fluctuations in the short term, the long-term exchange rate irregularity in Chile was lower than in other countries that adopted a floating regime.

In February 2000, South Africa adopted inflation targeting as a new monetary policy operating system. The implementation of the inflation-targeting framework allowed a highly competitive foreign exchange market to determine the exchange rate of South Africa. Despite South Africa's previous exchange regime (single controlled float system), the liberalisation of the foreign exchange sector would have remained largely incomplete unless exchange restrictions were fully eliminated (de Villiers, 2015). As part of the inflation-targeting framework, the monetary policy is implemented based on the inflation benchmark set. Moreover, the inflation targeting regime has increased policy efficiency (SARB, 2012). For this reason, to maintain the value of the Rand, the SARB ceased its foreign exchange market interventions policy.

This was supported by the closing of the negative net forward position of the SARB in May 2003 and the end of its foreign exchange forward position in February 2004 (Mboweni, 2004). South Africa's exchange-rate system has remained unchanged since the year 2000. From 2005 till early 2006, the Rand remained strong. The Rand

strength may have been the result of the SARB introduction of an increase in the foreign exposure cap on collective investment schemes in 2005. Although the exchange rate regime remained the same, foreign exposure controls were loosened by the SARB. In 2005, the foreign exposure ceiling on collective investment schemes was increased from 20 percent to 25 percent of total retail assets, as well as a 15 percent to 25 percent increase for fund managers in total retail assets. This has allowed South African residents to diversify their investment portfolios through domestic channels. The increase in overall foreign exposure caps on total retail assets resulted in an increased demand for the South African currency.

Nevertheless, the Rand started to depreciate in 2006; it continued to decline but only slightly during 2007. However, the Rand fell by more than 17 percent in the second half of 2008. This was the result of the 2007 to 2008 international credit crisis, which gained momentum. As a result of risk aversion, foreign investors decided to withdraw funds from developing countries.

This continued outflow of funds contributed to exchange rate volatility. Bhorat, Hirsch, Kanbur and Ncube (2013) maintain that the fluctuation in the Rand's exchange rate increased significantly since the introduction of the inflation targeting system with a free-floating exchange rate. While many claim that the inflation target mechanism is South Africa's best policy tool, as it can absorb external shocks in the economy and give monetary policy great stability, the exchange rate remains extremely volatile. As noted by Bah and Amusa (2003:4), the inflation targeting framework has already caused a significant increase in the volatility of the security prices in South Africa.

According to Mishkin (2001:1), inflation targeting is a recent monetary policy approach that encompasses five key elements:

- Public declaration of inflation targets in medium-term.
- An institutional obligation to price stability is the primary objective of monetary policy, to which other objectives are subordinated.
- A robust knowledge strategy in which several variables, not just monetary aggregates, or exchange rates, are used to determine policy instruments.
- Increased transparency of monetary policy strategy through public and market communication on the plans, objectives, and decisions of monetary authorities

- Increased accountability of the central bank to meet its inflation targets.

However, inflation targeting requires more than setting a numerical target over a given time horizon. A more specific concept of inflation targeting is given in a recent paper by Carare and Stone (2003). Three inflation-targeting regimes are distinguished: namely fully-fledged inflation targeting, eclectic inflation targeting and inflation targeting lite. Full-fledged inflation targeting is defined according to Mishkin's interpretation of inflation targeting. This is an explicit commitment to meet a specified inflation rate or range within a specified period. The central bank is held accountable for meeting the target. Moreover, "eclectic inflation targeting" and "inflation targeting lite", are also considered to be inflation targeting regimes.

Eclectic inflation-targeting countries are described as being countries with credibility that can sustain low and stable inflation without complete transparency and accountability regarding an inflation target. Their record of low and stable inflation and high levels of financial stability gives them the flexibility to pursue the goal of stabilizing output, as well as price stability (Carare and Stone, 2003:3). Inflation targeting countries announce a broad inflation target but are unable to maintain inflation as the primary policy objective due to relatively low credibility (Carare and Stone, 2003:3). They differ substantially in their objectives regarding the functioning of monetary policy, and are usually prone to economic shocks, financial instability, and a weak policy structure.

Although all these countries are considered full-fledged inflation targets and have some commonalities, there are also many differences in the design and operation characteristics of targets among them.

## 2.4. Exchange rate regime evolution in South Africa

South Africa's exchange rate management is characterised by numerous changes in the regime, namely, that exchange rate regimes have evolved from fixed, floating management, dual, and finally, free-floating in 2000 (Oladipo, 2017). Mtonga (2011) charged that these changes are rooted in a myriad of causes, the most important of these being Apartheid, political instability, and international isolation. Socio-political events that hindered the development of the foreign exchange market in South Africa

from the end of 1984 to 1994, mainly influenced the choice of the exchange rate regime (Aron, Elbadawi, and Kahn, 1997).

As seen from table 2.1, exchange rates remained fixed in the 1960s, and the majority of the 1970s, with adjustable parities at various times to either the US Dollar or British pound. Though the exchange rate regime temporarily shifted to a crawling peg exchange rate in June 1974, it returned in 1975 to a fixed peg against the US dollar. The exchange rate stability was an objective at that time, partly because South Africa signed the Brenton Woods Agreement to manage fixed exchange rates (Wakeford, 2002; Van der Merwe, 1996; De Kock Commission, 1985), as was the case for the rest of the world. According to Jones and Muller (1992), the government, however, also sought to maintain an overvalued currency to aid the importing of cheap capital goods to support the rapid industrialization program.

The 1970 to 1979 period marks the end of the Bretton Woods system and the attempt by policymakers to maintain a relatively stable exchange rate (De Villiers, 2015). In 1977, the De Kock commission was appointed to investigate South Africa's monetary policy. The South African President in 1977 named the Commission of inquiry into the Monetary System and Monetary Policy in South Africa, to be known as the De Kock Commission. The exchange rate mechanism was prioritized by this Commission. As a countermeasure to capital outflows, in 1979, the authorities implemented a dual exchange rate structure. The commercial and financial Rand rates were composed of the dual exchange rate regime. As postulated by Van der Merwe (1996), the Commission believed that such an exchange rate structure would have major advantages for the South African economy, such that: It would depoliticize the exchange rate; it would allow the Reserve Bank more freedom to control the foreign reserve of the country; it would contest speculative capital movements; and, it would allow the authorities to implement counter-cyclical or growth policies more consistently and efficiently by adjusting the exchange value of the set. The commission's primary objective was to evaluate the exchange rate system of South Africa.

The period from 1985 to 1994 was a period whereby the social and political environment of South Africa forced the authorities to revert to more direct control measures to manage the exchange rate. After the first successful democratic elections in 1994, during which South Africa normalized its international financial relations,

South Africa adopted a single, managed, floating exchange rate system in 1995. The year 1994 was the first successful transition of political peace in the history of South Africa. From September 1985 until now, South Africa has changed the exchange rate regimes several times. From September 1985 to February 1995, the country adopted three main regimes, namely a dual exchange rate regime, the unitary managed exchange rate regime from March 1995 to January 2000, and a free-floating rate regime with inflation targeting in February 2000 (Sibanda, 2012). In February 2000, in search of low inflation, inflation targeting was introduced as the operating structure for monetary policy. As such, it can be defined as an explicit inflation targeting time (Burger and Marinkov, 2008). Inflation targeting in South Africa was officially implemented with the announcement of a target of three to six percent for 2002.

### Table 2. 1: Exchange Rate Policies in South Africa

| Date | Exchange rate regime |
|---|---|
| Feb 1961- July 1971 | Fixed exchange rate regime: Rand pegged to the British pound |
| Aug 1971- Nov 1971 | Fixed exchange rate regime: Rand pegged to the US dollar |
| Dec 1971- Sept 1972 | Fixed exchange rate regime: Rand pegged to the British pound |
| Oct 1972- May 1974 | Fixed exchange rate regime: Rand pegged to the US dollar |
| June 1974- May 1975 | Crawling peg Rand: Rand pegged to a basket of currencies |
| June 1975- May 1979 | Fixed exchange rate regime: Rand pegged to the US dollar |
| June 1979- Jan 1983 | Dual exchange rate regime: Crawling peg commercial Rand and free-floating financial Rand |
| Feb 1983- Aug 1985 | Unitary exchange rate: Managed float Rand |
| Sept 1985- Feb 1995 | Dual exchange rate regime: managed float commercial and free float commercial and free financial Rand |
| Mar 1995- Jan 2000 | Unitary exchange rate: Managed float Rand |
| Feb 2000- present | Unitary exchange rate: free floating Rand, with inflation-targeting framework of monetary policy |

Source: Adopted from Mtonga, (2011:3)

## 2.5. Inflation targeting and Exchange rate

In 2000, South Africa introduced a formal inflation targeting system. The lower and upper bands, respectively, are about three and six percent. The main objective was to maintain price stability as the main goal of monetary policy, and any other policy that would be subordinated to it (Heever, 2001). According to Ng'ambi (2015), the established benefits of inflation targeting are enhancing government and central bank management on the same inflation target, plus increasing central bank efficiency and reliability. The drawbacks, given that inflation targeting relies heavily on forecasts, are not always accurate (Mishkin, 2000; Van der Merwe, 2004). As South Africa pursues the inflation target, the central bank increases interest rates at any expense and this destabilizes the macroeconomic variables. From economic theory, inflation can affect exchange-rate fluctuations through the exposed convergence of interest rates. Literature explores the context of targeting inflation, so the volatility in the exchange rates draws various conclusions (Mishkin, 2000; Edwards, 2006; Kočenda and Valachy, 2006; Rose, 2007). Most economists argue that exchange rate variability is because, under the inflation-targeting policy, the exchange rate must be permitted to float, which causes volatility (Mishkin, 2000; Gregorio, Tokman and Valdés, 2005; Rose, 2007; Berganza and Broto, 2012).

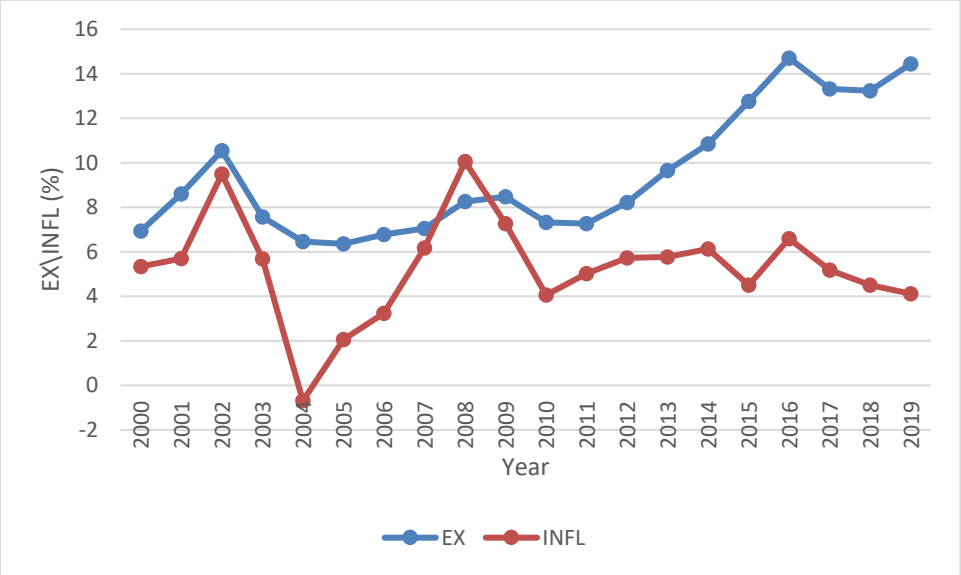
According to Mishkin (2000), the effect of inflation targeting policies on exchange rates cannot be ignored by the emerging economies; under inflation targeting exchange rate volatility is inevitable. Kočenda and Valachy (2006) relate exchange rate fluctuations to inflationary increases and, maintaining steady and low inflation, encourages less exchange rate volatility. Berganza and Broto (2012) compare the effects of inflation targeting on exchange rate volatility in countries that use inflation targeting as a monetary policy with those that do not, by modelling a panel data set for thirty-seven emerging countries. With inflation targeting as a binary dummy variable, the effects of regression were positive and significant, contributing to the assumption that targeting inflation causes volatility in exchange rates. In addition, Berganza and Broto (2012) stated that, beyond the cost of accelerated volatility in the exchange rate under inflation targeting, there is the benefit of being able to control it through foreign exchange intervention by the central bank.

Edwards (2006), however, points out that a free float exchange rate regime is a precondition for targeting inflation, but contends that for the countries in the study, implementation of inflation targeting does not increase nominal exchange rate variability, and has reduced conditional volatility in most countries, as policy predictability mitigates shocks.

However, to answer the issue whether inflation targeting arrives at the expense of exchange rate volatility, Rose (2007) regressed exchange rate volatility against a binary dummy variable for countries that use inflation targeting as monetary policy, and zero for otherwise. The stated regression coefficients were all negative, so a conclusion was made that under an inflation targeting exchange rate, volatility is considerably less. Rose (2007) also found out that, in addition to a decreased volatility in the exchange rates, there were fewer reversals or abrupt stops of capital in countries that pursued inflation targeting.

In February 2000, South Africa started implementing an explicit inflation targeting regime. In coordination with the SARB, the South African government set an inflation target based on the consumer price index for all metropolitan areas (Comert and Epstein, 2011). Mboweni (2003) pointed out that towards the closing stages of 2001, the exchange rate depreciated by about 37 per cent and was responsible for the increase of CPIX inflation by 11.3 per cent in November 2002. The Rand weakened from 2002 to 2007, and that was followed by a year-on-year inflation increase for the same period. The inflation rate increased from -0.69 to 10.05 in 2004 and 2008, respectively. The inflation rate exceeded the upper-bound target and remained relatively high when commodity prices began rising, and the exchange rate depreciated. Following this, inflation declined from 10.05 in 2008 to 4.06 in 2010. While the SARB has, to a large degree, fulfilled its inflation-targeting framework, this is a continuing challenge. Due to the weak Rand and falling oil prices, inflation in South Africa had again risen above the target upper band of 6 per cent (Sibanda, 2012). The Rand exchange rate increased from 2010 to 2015, year on year, and declined from 2016. The inflation rate began to decline from 2016 to 2019, year on year, as shown in Figure 1.

**Figure 1: The trends of inflation and exchange rate since the adoption of floating exchange rate regime and inflation targeting**




Source: Data compiled from World Bank, (2020)

## 2.6. Rationale for adopting inflation targeting

Through informal inflation targeting, substantial progress was achieved in getting the inflation rate down to lower rates. After the consumer price index had typically fluctuated at around 15 percent at the end of the 1980s and at the beginning of the 1990s, it dropped below double digits in December 1992, and decreased to an average annual rate of 5.2 percent in 1999 (SARB, 2004). The inflation target is set by the government after the SARB has been consulted. It requires announcing the inflation rate numerical point and a strong and credible commitment to price stability, more transparent and clearer public and market communication detailing the instruments to be used to achieve and maintain the inflation target (Oladipo, 2017).

According to Van der Merwe (2004), there are four reasons behind adopting the inflation targeting framework in South Africa. Firstly, the informal inflation targeting system occasionally created public uncertainty regarding the authorities' monetary policy stance. For example, for a considerable time, the growth in money supply and bank credit extension in the 1990s exceeded the authorities' guidelines. The market had predicted an increase in short-term interest rates under those circumstances. In assessing the situation, however, the authorities realised that the rapid growth in

monetary aggregates was mainly due to structural changes in the economy arising largely from the financial system liberalization. As a result, contrary to general expectations, more stringent monetary policy measures had not been implemented, which were difficult for the public to understand. Given South Africa's high levels of inequality and poverty, policymakers should be particularly concerned about this consequence. Potgieter (2010) pointed out that countries wanting to maximise growth and reduce inequality should coordinate their macroeconomic policies to limit inflation. In line with this view, the South African Reserve Bank (SARB) should minimise the macroeconomic instability and uncertainty caused by inflation.

Second, targeting inflation strengthens coordination between the monetary policy and other economic policies, given that the target is compatible with other objectives The improved coordination in the inflation-targeting system can be accomplished through the structured decision-making process to control inflation in pursuit of sustained high economic growth and job creation. According to Muhanna (2006), targeting inflation helps to discipline monetary policy and strengthens the accountability of the central bank. If targets are not met, the central bank must explain what went wrong. This leads to a better understanding by the public, based on what monetary policy decisions have been taken.

Thirdly, monitoring inflation helps guide monetary policy and improve transparency for the central bank. Specific goals that the central bank must achieve are set. When the real rate of inflation deviates from these expectations, then the central bank is accountable to justify what went wrong. It guides the central bank and contributes to a greater public understanding of why monetary policy decisions are made. Transparency can be improved through the bank's publications and periodic communications using the inflation targeting framework (Mishkin, 2000). The public can easily understand the objectives, making the regime transparent.

Lastly, adopting inflation targeting has an impact on inflation expectations, which encourages inflation reduction. If inflation expectations are perceived to be credible, they form the basis for the future setting of prices and wages. Therefore, inflation thresholds should, in principle, influence the increase in business operating costs as well as its price setting.

## 2.7. An Overview of the Volatility of the Rand

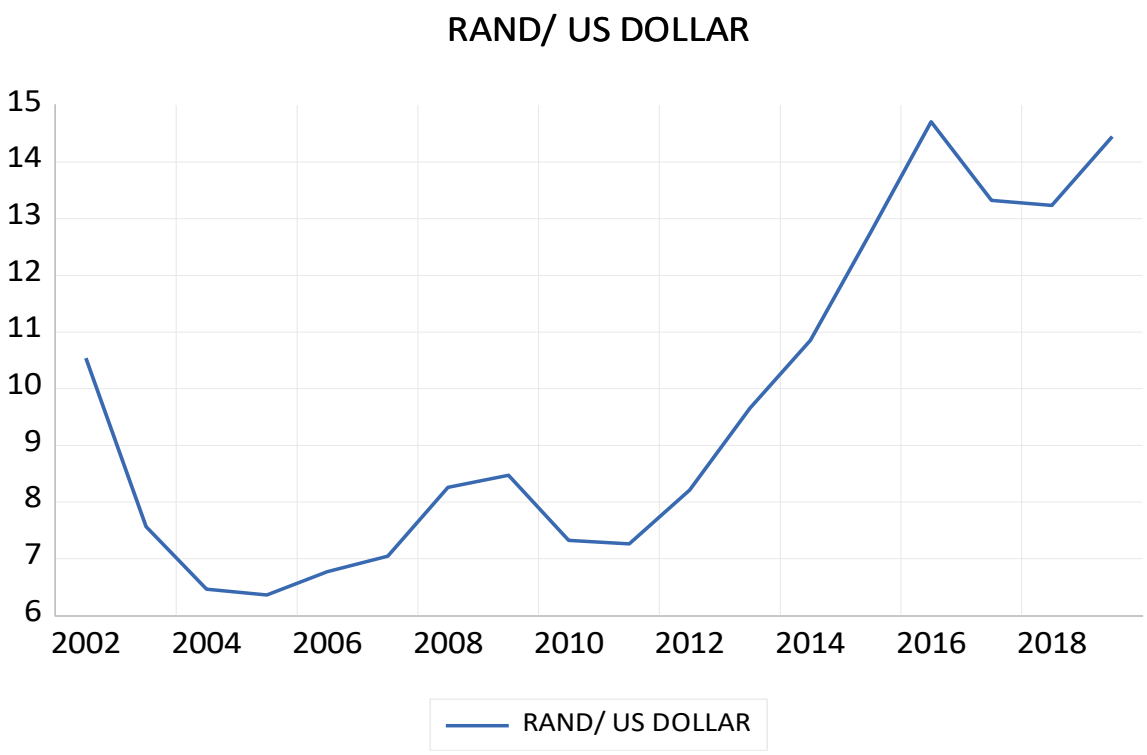
The South African authorities described currency volatility as one of the constraints on economic growth in South Africa (OECD, 2010). The reasons for uncertainty, or Rand volatility, are believed to be structural changes in global capital market conditions, combined with marginally high domestic interest rates (Hale and Hale, 2011:136). According to Mlambo, Maredza, and Sibanda (2013), the Rand's uncertainty, or volatility, is also triggered by massive fluctuations in financial flows.

Since the implementation of a floating exchange rate regime, in conjunction with the inflation-targeting monetary policy framework, there were significant changes in the exchange rate of the Rand. Since the year 2000, when the inflation targeting-flexible exchange regime was adopted, the Rand has undergone an era of excessive volatility.

Figure 2 shows the overall performance of USD/RAND from 2002 to 2019. It can be observed that between 2002 to 2004, the Rand value appreciated. This was a result of factors such as strong interest rate differentials, increased interest among investors, the weakness of the dollar, and a better global understanding of the economic fundamentals of South Africa's strength (Ngandu, 2006). Eskom's power crisis in 2007 affected the mining and telecommunications sector, thus leading to large production cuts and mine closures. This resulted in the decrease in Rand's value from just above R6 to the dollar in 2006, to over R7 in 2007 (Bronkhorst, 2012). As observed, although the Rand did not depreciate and appreciate with high margins between 2004 and 2007, it can be concluded that it was volatile.

The Rand fluctuated considerably, and it was not stable enough for volatility to be ruled out. During the period 2008 to 2009, the global financial crisis took place, and it can be observed that the exchange rate was significantly volatile. Although the Rand was relatively stable in 2010, it was under pressure from 2012 to 2013 due to labour unrest, specifically in the mining industry (Tshivhase, 2019). From 2014 to 2016, the exchange rate further depreciated. From 2017 to 2018, the Rand value has steadily appreciated against the US Dollar and depreciated again in 2019.

**Figure 2: SA Rand/ US Dollar Exchange Rate fluctuation (2002 – 2019)s**




Source: Data compiled from World Bank Indicators, (2020)

## 2.8. Overview of the banking sector in South Africa

Since attaining constitutional democracy in 1994, commercial banks in South Africa have undergone immense regulatory and technological changes (Kumbirai and Webb, 2010). According to Ifeacho and Ngalawa (2014), the country has been opening its finance industry since 1994, leading to an increase in the number of banks and, as a result, a rise in loans and advances. Many new entrants in the sector have offered a range of new products aimed at the formerly unbanked population and lower-income clients, effectively increasing the level of competition in the sector. Socio-political changes have resulted in structural changes in the banking sector, and the provision of financial services (Kumbirai and Webb, 2010). South Africa has increasingly become an important financial centre due to political transformation, the relaxation of exchange controls, and the liberalisation of the economy (Mboweni, 2004; Murinde, 2009). Except for minor problems, such as liquidity pressures and a significant depreciation of the Rand in the early 2000s, plus South Africa's political isolation in the

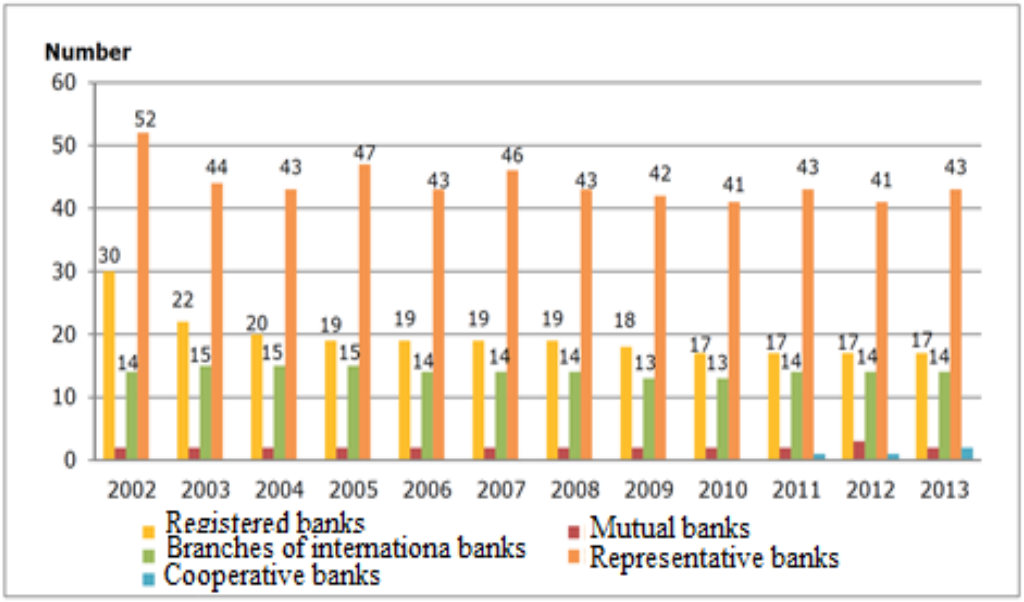
mid-80s that saw many international banks terminate operations and leave South Africa, and the early 1990s global banking crises, South Africa has established a well-developed banking system over the past two decades from the mid-nineties that compares favourably with those in many developed countries, and distinguishes it from many other emerging market economies (Khan, 2016). The banking sector is well developed and compares positively with those of the developed world and is ranked 11th out of 138 countries in the Global Competitiveness Report in terms of financial market development (Moyo, 2018).

There are a total of eighty-one banks in the South African banking industry, fifteen are locally owned, six are foreign controlled, fifteen are foreign bank branches, and two are mutual banks (SARB, 2004). Approximately forty-three registered international bank members do not take deposits. The sector witnessed the rapid entry of banks into the post-apartheid market. Most of these new entrants were small to medium-sized banks operated locally. However, by 1999, these banks were facing liquidity pressures. A substantial number left the market or were absorbed by the established larger banks. Around twenty-two banks left the industry between 1999 and 2003 (Mboweni, 2004). As a result, the industry experienced a large amount of restructuring and concentration going forward. In addition to the arrival of local banks, the market was re-entered by international banks, which had left the South African market due to the apartheid regime. By 2004, from three percent in 1994, the share of international banks in total assets had risen to nine-point five percent (Khan, 2016). Barclays purchased controlling interests in ABSA in 2004. Figure 3 indicates that the merging process was nearly complete by 2005, and that the sector had settled for relative stability with very little entry and exit from regulated local and foreign banks (Simatele, 2015).

Despite these and other problems, the South African banking industry has drawn considerable interest from foreign banks, which has resulted in a number of these foreign banks buying large stakes in big banks and opening new branches in the region (Sufian and Kamarudin, 2016). The British Barclays Group, for example, purchased and took over ABSA in 2005, and Standard Bank sold a twenty percent stake in a deal valued at five point five billion US dollars to the Industrial and Commercial Bank of China (ICBC) in October 2007. This was China's biggest

investment in the banking sector, and South Africa's largest single investment (Ifeacho and Ngalawa, 2014).

**Figure 3: Number of banks in South Africa over ten years**




Source: Adopted from (Khan, 2016)

## 2.9. Background of the five major commercial banks

In the performance and operation of modern economic operations, financial intermediaries play a critical role. Banks continue to be one of the most important financial intermediaries in the economy, providing a wide range of services (Kana, 2017). According to the latest Prudential Authority Annual Report from the South African Reserve Bank, the country's five largest banks continue to dominate the financial landscape (Business Tech, 2021). According to a breakdown of asset market share in Nedbank's 2020 annual report, the banks are split with Standard Bank as the highest at twenty-four per cent followed by First National Bank at twenty-one-point seven per cent, ABSA Bank at nineteen point five per cent, Nedbank at seventeen point two per cent, and Capitec Bank at two point three per cent.

### 2.9.1. Amalgamated Banks of South Africa (ABSA)

Absa was formed in 1991 through a merger of South African financial service providers, United Bank, Allied Bank, Volkskas Bank Group, and certain Sage Group interests (Anthony Swart, 2007). In 2004, Barclays Bank PLC recognized Absa's potential and approached Absa with a proposal to purchase a majority stake in the Group (Absa, 2006). In 2005, as part of its push to extend its worldwide commodity and international retail and commercial banking businesses to available markets outside the UK, Barclays Bank of the United Kingdom acquired a majority stake in Absa (Alcock, 2007). The company purchased Barclays Africa Limited's share capital in 2013, and issued Consideration Shares to Barclays Africa Group Holdings Limited, raising Barclays plc's shareholding to 62.5 percent (Chitamba, 2018). According to Favour, (2020:16) the name changed from ABSA Group Limited to Barclays Africa Group Limited.

### 2.9.2. First National Bank (FNB)

The First National Bank (FNB) is South Africa's oldest bank and can be traced back to the Eastern Province Bank, founded in 1838 in Grahamstown. FNB was removed from the JSE in 1998 and became a solely owned FirstRand Group subsidiary (FNB, 2020). In the commercial and retail segments, the First National Bank represents FirstRand's operations. It offers services to retail, commercial, and corporate customers nationally with a broad range of banking products and services. First National Bank has subsidiaries in Botswana, Lesotho, Ghana, Namibia, Swaziland, Tanzania, Zambia, and the Channel Islands (FNB, 2021).

### 2.9.3. Nedbank

According to the Nedbank group history (2020), the bank was established as the Nederlandsche Bank en Credietvereeniging voor Zuid-Afrika ("Dutch Bank and Credit Union for South Africa") in Amsterdam in 1888. The bank opened an office in Church Street, Pretoria, South Africa, in the same year. The bank was renamed Nederlandsche Bank voor Zuid-Afrika ("The Dutch Bank for South Africa") in 1903. The bank expanded in 1906, and an office was opened in London. In 1951, the bank split renaming its South African branch to Nederlandse Bank Suid-Afrika/Netherlands

Bank of South Africa as (NBSA). The number of South African shareholders increased dramatically in 1969, and after Bank Mees and Hope sold 20 percent of its shares, the firm became 100 percent South African owned (Nedbank group, 2020). The South African branch was independent entirely. NBSA changed its name to Nedbank in 1971(Nedbank group, 2020).

### 2.9.4. Standard Bank

In 1862, under the name The Standard Bank of South Africa, the bank now known as Standard Bank was established as a South African subsidiary of the British overseas bank Standard Bank (SAHO, 1886). Standard Bank is a financial organization established in South Africa that has been listed on the Johannesburg Stock Exchange for 51 years (Standard bank, 2021). The Standard Bank (2021) reports that the group operates in 20 African countries. In March 2019, a reduction of 91 branches and 1200 employees was announced by the bank (Business Tech, 2019). The decision was taken because of increased self-service channels used, and a branch network was becoming less relevant.

### 2.9.5. Capitec Bank

Capitec was established by the acquisition of micro-loan companies by the founding company, PSG, an independent financial services business De Lange, (2013). Eventually, it became a regulated commercial bank that was listed on the Johannesburg Securities Exchange (Coetzee, 2003). According to the 2015 Capitec bank annual financial results, Capitec Bank's asset base surpassed R53.9 billion, with R11.6 billion in equity and a 32 percent rise in retail savings deposits for the year to R19.3 billion, and a 19 percent increase in retail fixed savings to R10.7 billion for the year. For the financial year 2015, profits and headline earnings amounted to R2.547 billion compared to R2.017 billion in 2014, and the net transaction fee income was R2.6 billion.

## 2.10. Overview of the bank performance in South Africa

According to the European Central Bank (2010) concept, bank performance is the ability of a bank to produce profit for its equity holders in a sustainable manner. Post-apartheid South Africa has tried to build a sustainable, well-regulated, and highly developed banking industry with a safer business climate that attracted investment in the banking environment (Van der Walt, 1998). South Africa's banking industry is oligopolistic, highly concentrated, and dominated by four main banks namely, Standard bank, Amalgamated Banks of South Africa (ABSA), Nedbank, and First National Bank (Coppock, Forte, Ncube, Ooka, Richards, and Vyas, 2008). South Africa's banking industry is highly concentrated, with a C4 concentration ratio of more than 80 per cent (Simatele, 2015). According to Moyo (2018), competition is the key driver of strong and productive economies, it stimulates businesses to innovate, improves competitiveness, and efficiently allocates capital. A competitive environment ensures that companies compete equally and it places intense pressure on businesses to deliver the best possible variety of products at the best prices possible. In recent years, the banking sector leaders (big four) have experienced overwhelming pressure from previously smaller banks, such as Capitec (Mishi, Sibanda, and Tsegaye, 2016). Simatele (2015) argues that the key domestic and global events have affected South Africa, potentially affecting the prevailing market structure in the banking industry, and potentially having a significant impact on the level of competition in the country.

There is no question that commercial banks have an important role to play in the economic growth of any country. The need for quality and efficiency in the functioning of banks as leading players in a nation's financial services cohort cannot be overemphasised (Binuyo and Aregbeshola, 2014). South African banks have been able to hold the 60 percent international efficiency benchmark ratio in the past, however, the ratio has risen from 60.2 percent in 1999 to 67 percent in 2002. The high-efficiency volatility in 2002 suggests that in the first six months of 2002, the South African banking sector was still experiencing profitability problems. The efficiency ratio later improved to 65.2 percent in October 2004 (Mboweni, 2004).

Banks in South Africa are governed in compliance with the principles laid down by the Banking Supervision Committee of Basel (Mboweni, 2004). The Basel Banking Supervision Committee allows banks to keep capital proportionate to their degree of

exposure to market price volatility, such as interest rates, bond prices, and exchange rates (De Wet and Gebreselasie, 2004).

## 2.11. Chapter Summary

This chapter gave a review of exchange rate volatility and bank performance in South Africa. The volatility of the exchange rate has been a concern in many economies, including South Africa. In this chapter, the study explained the exchange rate regime, inflation targeting, the exchange rate, the rationale for adopting an inflation-targeting framework, analysed the exchange rate trend of the South African Rand against the US dollar, and lastly an overview of the banking sector and banks performance.

South Africa's exchange rate regimes have evolved over the past, namely from fixed, dual, floating, and finally free-floating exchange rates. In February 2000, South Africa adopted inflation targeting as a new monetary policy operating system. The implementation of the inflation-targeting framework allowed a highly competitive foreign exchange market to determine the exchange rate of South Africa. The lower and upper bands, respectively, are about three and six percent. The established benefits of inflation targeting are enhancing government and central bank management on the same inflation target and increasing central bank efficiency and reliability. The rationale behind the implementation of inflation targeting was found to be centred around, firstly, the central bank's commitment to a unique numerical target, secondly the inflation forecast over a horizon, and lastly the significant role of transparency, accountability, and communication with the public. Since the adoption of the floating exchange rate regime, and inflation targeting the trends of inflation and exchange rate, the Rand weakened from 2002 to 2007, and that was followed by year-on-year inflation increases for the same period. Lastly, after analysis of the South African Rand against the US dollar, the Rand fluctuated considerably, and it was not stable enough for volatility to be ruled out. The Rand fluctuated significantly between the period 2002 to 2019 so it can be deemed to be volatile.

The banking industry is the backbone of an economy, and a competitive banking industry is crucial to the functioning of the economy. The South African banking sector has been shown to have a significant role in the economic growth of the country. South Africa opened its financial sector in 1994, resulting in an increase in the number of

banks in the banking industry. Profitability and efficiency in the functioning of banks play a significant in the country's financial sector. Despite the political isolation and global financial crisis experienced by the banking sector, the South African banking industry has drawn considerable interest from foreign banks.

# CHAPTER 3

# LITERATURE REVIEW

## 3.1. Introduction

This chapter provides the analysis of theoretical and empirical literature. The purpose of this section is to discuss the theoretical foundations of this research study and assess theories relating to exchange rate volatility, measures of financial performance of commercial banks, and empirical literature on the relationship between exchange rate volatility and financial performance. Section 3.2 of the study presents the theoretical literature, section 3.3 presents the determinants of banks' financial performance, section 3.4 presents empirical literature and lastly, section 3.5 provides the chapter summary.

## 3.2. Theoretical literature

To achieve the objectives of this study, the following theories are discussed together with determinants of bank performance: the Purchasing Power Parity Theory, International Fisher Effect Theory, the Balassa-Samuelson Model and External Debt (B-S), the Law of One Price, the Quantity Theory of Money, the Arbitrage Pricing Theory (APT), the Keynes Liquidity Preference Theory, the Interest Rate Parity Theory, and the Monetary Approach.

### 3.2.1 Purchasing Power Parity Theory

The origin of the Purchasing Power Parity concept can be traced back to the Salamanca School in the sixteenth century in Spain. Its advanced use as a hypothesis of exchange rate determination starts with the work by Cassel (1918). Cassel (1918) proposed PPP as a method for changing pre-World War I trade rates. Some modifications were fundamental since nations that left the gold standard in 1914 experienced fundamentally various rates of inflation during and after the war.

The Purchasing Power Parity (PPP) theory expresses that those homogeneous goods in various countries cost equally in similar countries when estimated in terms of the

same currency (Brunnermeier and Pedersen, 2009). The theory is connected to the arbitrage speculation that states if two homogeneous goods are traded at various costs in various countries, this arbitrage opportunity would be used, which prompts convergence of the deviations from Purchasing Power Parity towards equilibrium without arbitrage costs (Majok, 2015).

The Purchasing Power Parity theory is better explained in two types, the absolute and relative purchasing power parity theory. Absolute purchasing power parity forecasts that the exchange rate ought to adjust to equate to the costs of national baskets of goods and services between two countries due to market forces driven by exchange rates. Under absolute purchasing power parity, the exchange rate is equivalent to the proportion of the domestic price to the foreign price of a given aggregate bundle of commodities; however, this suggests that the real exchange rate is constant (Lafrance and Schembri, 2002). The relative purchasing power parity suggests that the exchange rate between two countries ought, in the long run, to adjust to represent contrasts in inflation rates. These are countries that follow monetary approaches with various inflation rate objectives that ought to expect this distinction to manifest itself in an exchange rate movement (Lafrance and Schembri, 2002). According to Isaac (2015), the movement of exchange rates equally affects inflation, market rewards and fiscal stability, export productivity, resource allocation efficiency, international confidence, and balance of payment equilibrium. The effect of inflation is another important determinant of banking performance (Vong and Chan, 2009). Furthermore, high inflation rates are correlated with high-interest rates on loans and thus high revenues. This hypothesis is important for this analysis in that it describes the worth of one currency in terms of another country's currency in terms of the basket of goods and services it can obtain regarding the demand and supply. This theory underpins the financial forecast of the exchange rate differential of inflation between countries (Mionel, 2012).

The purchasing parity can be presented as follows:

$$\frac{(S_{t+1}-S_t)}{S_t} = \frac{i_{h,t}-i_{f,t}}{1+i_{f,t}} \qquad (3.1)$$

Where $S_t$ is the domestic currency of one unit of foreign currency at time t; $S_{t+1}$ denotes the spot exchange rate at time $t+1$; $i_{h,t}$ is the inflation rate at time t in the domestic country and finally $i_{f,t}$ is the inflation rate at time t in the foreign country.

The Purchasing power parity can also be presented as follows:

$$\frac{(S_{t+1}-S_t)}{S_t} = i_h - i_f \qquad (3.2)$$

According to Sundqvist (2002) and Ersan (2008), equation 3.2 relates inflation to changes in exchange rates, indicating that inflation differentials are offset by changes in exchange rates. Equation 3.2 is effective if the foreign inflation rate is relatively low (Demirag and Goddard, 1994; 72 and Shapiro, 1998; 159). Thus, Purchasing Power Parity (PPP) predicts that given the international price index, an increase in the domestic price level reduces the purchasing power of the domestic currency, thus the exchange rate should also reflect this reduction in purchasing power, leading to a depreciation of the domestic currency; although it is conceivable that the appreciation of that currency may be reversed (Salas-Ortiz and Gomes-Monge, 2015).

### 3.2.2. International Fisher Effect Theory

Fisher Effect, or Fisher Hypothesis, was developed by the economist Fisher (1930) in his book The Theory of Interest. The International Fisher Effect (IFE) theory plays a significant role in economics and finance, linking interest rates, inflation, and exchange rates (Shalishali, 2012). The International Fisher Effect states that changes in exchange rates are balanced by changes in interest rates. The theory of the International Fisher Effect (IFE) indicates that foreign currencies, with relatively high-interest rates, appear to depreciate as high nominal interest rates represent projected inflation rates (Madura, 2009). The International Fisher Effect (IFE) model considers market interest rates to explain why exchange rates adjust over time, rather than inflation rates. The International Fisher Effect (IFE) notes that currencies with considerably lower rates of interest are projected to appreciate, as opposed to higher interest rate currencies (Lindström and Säterborg, 2009). The Fisher hypothesis suggests that real interest rates across countries are comparable due to the likelihood of arbitrage opportunities within financial markets that typically exist in the form of capital flows (Lagat and Nyandema, 2016). According to Shalishali (2012) and

Khawaga, Esam, and Hammam (2013) the International Fisher Effect (IFE) refers to changes in exchange rates to interest rate differentials, rather than differentials in inflation rates between countries, and suggests that the interest rate differential may be used as a forecast for potential spot exchange rate shifts. The exchange rate fluctuations influence foreign investment decisions, export prospects, and competitiveness of import prices (Khawaga, Esam, and Hammam, 2013). This theory proposes that currency would depreciate from any country with a relatively higher interest rate, as high nominal interest rates represent expected inflation (Shalishali, 2012). The International Fisher Effect (IFE) holds two critical assumptions. Firstly, investors understand international and domestic assets as being ideal replacements, therefore investors postulate no risk premium. Secondly, capital markets are fully integrated without regulatory and psychological obstacles to achieve free movement of capital through countries (Ersan, 2008). The most important factor is that the arbitrage between financial markets and the gap between the two countries' interest rates would be the impartial indicator of future exchange rate adjustments (Shapiro, 1999: 228).

As postulated by (Khawaga, Esam, and Hammam, 2013) and (Madura, 1995), the international fisher effect can be represented in the following equation:

$$e_f = \frac{1+i_h}{1+i_f} - 1 \qquad (3.3)$$

Where $e_f$ is the percentage change in the value of the foreign currency expressing the foreign security, $i_h$ is the home interest rate on the domestic country securities, and $i_f$ denotes the foreign interest rate on foreign country securities. According to theory, when the domestic interest rate is greater than the foreign interest rate, a percentage change in the value of foreign currency denominating foreign security would be positive. As a result of high inflationary expectations, the domestic currency would depreciate with respect to the foreign currency. This depreciation would decrease the return on domestic securities, resulting in returns on domestic securities being less than foreign securities. The opposite ought to occur when the domestic interest rate is lower than a foreign interest rate. Therefore, the International Fisher Effect (IFE) theory suggests a positive relationship between exchange rate shifts and nominal interest rate differentials.

The sensitivity of bank returns and earnings, according to Saunders and Swary (1986), has a significant impact on interest rate and exchange rate risks through typical on-balance-sheet banking operations. Samuelson (1945) analysed the effect of interest rates on bank income and found that bank profits increase with increasing interest rates under general conditions. This ensures that the basket of goods and services purchased by each unit of the currency of a country is equal to the basket of goods and services purchased in the other country at equilibrium exchange rates.

### 3.2.3. The Balassa-Samuelson Model and External Debt (B-S)

Balassa (1964) and Samuelson (1964) defined the drawbacks of the absolute variant of the purchasing power parity as an exchange rate determination theory. They identified the difference in productivity growth between internationally traded and internationally non-traded goods sectors as a factor, which induces systemic biases in the relationship between relative prices and real exchange rate. Thus, the model, named after them, Balassa-Samuelson, says that faster productivity growth in the tradeable sector rather than in the non-tradable sector in each economy would result in higher domestic price growth, which will lead to a real appreciation of the currency of that country (Funda and Lukinić, 2007). Growth in productivity in the tradable sector will increase wages in that sector, and wages in the non-tradable sector will also rise due to labour mobility between sectors. Non-tradable manufacturers must raise the prices of their goods to be able to pay higher wages, which, in turn, leads to an increase in the economy's overall price level (Funda and Lukinić, 2007). Luehrman (1991) points out that a lower exchange rate encourages market competition as the cost of goods produced locally decline, and international demand is increasing. As a result, both loans and deposits are increasing, as are the profits of banks. However, a lower exchange rate can also reduce the purchasing power of domestic consumers, as imported goods become more costly. This may further increase loan losses and could have negative effects on the profitability of the bank (Combey and Togbenou, 1916). The theory of Balasa-Samuelson (BS) is relevant for this study as it attempts to explain the persistence of the fluctuations in exchange rates and their impact on banks' profitability.

### 3.2.4. Law of One Price

The Law of One Price (LOP) is one of the earliest economic science hypotheses (Herrmann-Pillath, 2001). The Law of One Price (LOP) states that homogeneous goods should be sold in different countries for the same price, once prices are converted into a common currency (Miljkovic, 1999). Schmitt-Grohe, Uribe, and Woodford (2014) in their study also state that when goods are efficiently allocated across markets, the price of the same goods should not differ by more than their transportation cost in different locations. The Law of One Price (LOP) also sets out market scope and analyses market integration (Stigler and Sherwin, 1985).

Therefore, for any kind of good,

$$i, P_i = EP_i^* \quad (3.4)$$

where $P_i$ is the domestic-currency price of the good $i, P_i^*$ is the foreign currency price, and E is the exchange rate, well-defined as the home-currency price of foreign currency (Miljkovic, 1999). As postulated by Herrmann-Pillath (2001), the Law of One Price (LOP) has a critical role in linking the real and monetary worlds. The monetary approach to the balance of payments, as well as the study of flexible exchange rates, is based on the premise that the law of one price would contribute to Purchasing Power Parity (PPP), only in the long term.

### 3.2.5. Quantity Theory of Money

The quantity theory of money is related to monetarism growth and the work of Milton Friedman (1956), perhaps the most influential economist of the past quarter-century (Snowdon and Vane, 2005: 50-51). While the term ‘monetarism’ did not appear until 1968 (Brunner, 1968), after the publication of David Hume’s seminal essay, “Of Money”, in 1752, his principal core proposition, the quantity theory of wealth, was well known in classical macroeconomics (Snowdon and Vane, 2005: 50-51).

According to Humphrey (1974), one of the oldest surviving economic theories was the quantity theory of money, which states that changes in commodity prices are mainly defined by changes in the amount of money in circulation. The quantity theory of money is essentially a general law that defines interest in the relationship between

demand and supply in respect to a special case (Walker,1895). The quantity theory is fundamentally a hypothesis about the main cause of changes in the value or purchasing power of money. If money is abundant, its value or buying power declines, and the average commodity prices increase accordingly. Equally, if money is scarce, its buying power will increase, and average prices will fall. The principle of quantity theory states that money stock (M) is the prime determinant of the price level (P) (Humphrey, 1974).

Within literature, there are two highly supported versions of the quantity theory that can be found. The first version is known as the Cambridge cash-balance method and is associated with Marshall (1923) and Pigou (1917). The second edition was associated with Irving Fisher (Snowdon and Vane, 2005: 50-51). According to the cash-balance method, the value of money is determined by the demand for money, money is desired as a store of value. Money, as Fisher pointed out, provides no benefits to the bearer (Maleki, Isfahani, and Barzaani, 2015). Through their version of the quantity principle, the Cambridge economists drafted a simple distinction between the demand for money (Md) and money supply (M). The demand for money was dictated mainly by the need to perform transactions that will have a beneficial relationship to the net expenditure's value of money.

As postulated by Humphrey (1974), neo-classical analysts were able to tell the exact conditions that must hold using these equations. The two highly supported approaches by Humphrey, (1974), Howden, (2013), Omanukwue, (2010) and Snowdon and Vane, (2005: 50-51), can be mathematically expressed as below.

The Cambridge money demand function can be represented as follows:

$$Md = kPY \qquad (3.5)$$

The equation can also be written as: $M(^{1}/_{k}) = PY$

Where Md is the demand to hold balances of nominal money, and k is a portion of the annual value of national income (PY) that firms and households want to hold. A money supply function is expressed on the left-hand side, which must result in the money demand on the right-hand side (Howden, 2013). According to Laidler (1993) the Cambridge monetary method recognised that k could differ in the short run, but the coefficient k is assumed to be constant in the stylised presentation in equation (3.5).

The Cambridge equation, as it stands, is a theory of the demand for money. Money supply must be implemented to understand the price level. When the monetary authorities (that is, M is exogenous) adopted the supply of money, then the monetary equilibrium condition is written as equation (3.6):

$$M = Md \tag{3.6}$$

By substituting equation (3.6) into equation (3.5), then equation (3.7) is obtained:

$$M = kPY \tag{3.7}$$

To achieve the quantity theory, changes in the quantity of money have no real long-term significance, but can influence the price level, so it is important to note that Y is determined by the role of output and the activity of a competitive labour market at its maximum employment value. With a constant of k and Y, M determines P. When the money market is initially in equilibrium, an increase in money supply produces an imbalance ($M > Md$). Subsequently, the values of Y and k are fixed, the equilibrium in the money market can only be restored when the price level rises.

In the classical model, the increase in prices is as a result that if households and companies find themselves holding more money than needed, the excess money balances are used in obtaining goods and services. As the supply of products and services is limited by the fixed production level of full employment, excess demand on the commodity market results in the general price level increase in relation to the initial increase in the supply of money.

The second approach of the quantity theory of money is based on the exchange equation of Irvin Fisher, which states that the quantity of money multiplied by the speed of money is equal to the price multiplied by the number of goods sold (Omanukwue, 2010). This relationship can be represented by the equation below:

$$MV = PT \tag{3.8}$$

Where V is the velocity of income of money circulation and represents the average number of times a unit of money is used in the conduct of total transactions that constitute nominal GDP, P is the price level, and T is the transactions. Since V can be characterized as the reciprocal of k, the consistency of V can be justified by structural

factors determining the frequency of transactions carried out by firms, and households are likely to change slowly over time.

Equation (3.9) rearranges equation (3.8), where the price level depends on the nominal money supply:

$$P = MV/T \quad (3.9)$$

P depends on M when V and T are constant, and that $\Delta M$ is equal to $\Delta P$.

According to the quantity theory of money, controlling the amount of money in circulation may affect the currency exchange rate as well as domestic inflation (Coppola, 2019). Although Friedman's famous adage remains true, today's "money" is decided more by commercial banks than by central banks, therefore commercial bank activity has become a primary driver of inflation (or deflation). As interest rates rise in the economy, banks' lending income rises as well; as a result, banks raise deposit interest rates to attract new money (Tillers, 2004).

### 3.2.6 Arbitrage Pricing Theory (APT)

Ross (1976) mainly developed the Arbitrage Pricing Theory (APT). This is the one-period paradigm in which any participant assumes that the stochastic properties of the return on capital assets are compatible with the nature of the component. Ross contended that if equilibrium prices do not provide arbitration incentives over static asset portfolios, then predicted asset returns are roughly linearly linked to factor loadings (Huberman and Wang 2005). The Arbitrage Pricing Theory (APT) embodies one of the main attempts to address the problems with testability and the anomalous empirical that plagued other theories. The theory's key principle was that returns can be broken down into diversifiable and non-diversifiable components, and that systemic risk can be considered as exposure to a few common factors (Lehmann and Modest, 1985). Bodie, Kane, and Marcus (2014) postulated that the Arbitrage Pricing Theory (APT) relies on three aspects: (1) A factor model can define security returns; (2) There are adequate securities to diversify away unique risk exposure; and (3) Well-functioning security markets do not permit arbitrage opportunities to persist.

The Arbitrage Pricing Theory (APT) by Rose (1976), and extensions of the theory, are an important branch of asset pricing theory and one of the key alternatives to the

Capital Asset Pricing Model (CAPM) (Connor and Korachczyk, 1995). The Arbitrage Pricing Theory (APT) substitutes the Capital Asset Pricing Model (CAPM) in that both propose a linear relationship between expected returns of assets and their covariances with other random variables. The covariances in the CAPM are with return on the business portfolio. Such covariances are viewed as risk factors that an investor cannot prevent by diversifying. The linear relation slope coefficients between the expected returns and the covariances are construed as risk premia. (Huberman, 2005).

An alternative approach to characterizing expected return on risky securities is Rose's proposed Arbitrage Pricing Theory (APT) (1976). According to Akpo, Hassan, and Esuike (2015), the advantage of the theory is that several empirical studies have established that empirical proof of the Arbitrage Pricing Theory is feasible. The Arbitrage Pricing Theory (APT) is one of two common theories on asset pricing along with the Capital Asset Pricing Model (CAPM). The Arbitrage Pricing Theory varies from the Capital Assets Pricing Model in that; its concept is less restrictive (Akpo, Hassan and Esuike, 2015). It provides an explanation rather than a statistical model for asset returns. In comparison to the equivalent market portfolio, it implies that each investor should hold a distinct portfolio with its specific collection of betas (Diacogiannis, 1986).

Ross stated that there was no clear economic rationale for the assumption that a single common factor such as consumer return would effectively reflect systemic uncertainty (Lehmann and Modest, 1985). According to (Huberman and Wang 2005, Huberman, 1982 and Connor and Korachczyk, 1995), the APT assumes asset returns follow a generating model.

The APT can be illustrated through the following linear equation:

$$r = E + \beta f + e \qquad (3.10)$$

Where $r$ and $e$ are $N \times 1$ vectors of random variables, f denotes a $K \times 1$ vector of random factors, E is a $N \times 1$ vector and β is the $\mathrm{N} \times \mathrm{K}$ matrix of linear of coefficients representing assets sensitivities to movements in the factors. $E\{f\} = E\{e\} = 0$, where $E\{.\}$ denotes expectation, and 0 the matrix of zeros with required dimension. Thus, the linear equation (3.10) implies $E\{r\} = E$.

According to Adler and Dumas (1983), returns in a reference currency are not only driven by the covariance with the market portfolio return, but also by the covariance with the variation in inflation, in the reference currency of all countries considered. As postulated by Mugun (2019), the ability of a bank's management to create profits from the bank's assets is measured by its return on assets. The APT is a one-period model that focuses on asset returns governed by a factor structure, and excludes arbitrage over static portfolios of these assets, resulting in a linear relationship between the anticipated return and its covariance with the factors. The APT assumes that returns differ from expectations due to unanticipated changes in production, inflation, term structure, and other economic factors (Dupačová, Hurt, and Štěpán, 2002). Following Singh, Mehta, and Versha (2011); Kuwormu, and Onwusu-Nantwi, (2011), the exchange rate is considered another important macroeconomic element.

### 3.2.7. Keynes Liquidity Preference Theory

As postulated by Ogiriki and Andabai (2014), this theory was proposed by John Maynard Keynes in 1936, whereby the theory attempts to explain the level of interest rates in relation to the interaction of two significant factors: the money supply and savers' ability to keep their savings in cash. In 'The General Theory', Keynes introduced liquidity preference theory as "Liquidity preference theory of interest", a theory that is intended to fill the void left by what he considered to be the faulty classical "saving interest theory". Bibow (2013:3) charged that the theory of liquidity preference is better interpreted as a theory of financial intermediation within a diverse context. The theory of liquidity preference reflects Keynes' effort to reinvent monetary theory based on a bank's conception as financial intermediaries, as institutions at the centre of capitalist production and accumulation.

The demand for money is dependent on two aspects: nominal income and market interest rate; alternatively, demand for money depends on real income and the real interest rate when the price level is persistent or, when the demand for money is in real terms. Keynes' research focuses on demand, and money supply as determinants of the interest rate (Afolabi, 1999). The hypothesis according to Were, Kamau, Sichei, and Kiptui (2013) claimed that people seek money for sales, as a measure and speculation. Transaction demand and precautionary demand for money increase with revenue, whereas speculative demand is inversely related to interest rates due to the

inevitable interest. The money supply is determined by the monetary authority, for example, the central bank of a country, commercial bank lending, and the preference for holding cash (Were, Kamau, Sichei, and Kiptui 2013).

The three reasons for liquidity preference, or demand for money, according to Keynes, are namely, Transaction motive, Precautionary motive, and Speculative motive.

The transaction motive of the transactions relates to the demand for money, or the need for cash for the current individual and business exchange transactions. Individuals hold cash to bridge the gap between revenue receipt and expenditure. The precautionary motive for holding money is a desire to hold cash balances for unforeseen circumstances. Individuals hold cash to provide for sickness, injuries, unemployment, and other unexpected emergencies. According to Keynes, the transaction and precautionary motives are interest rate inelastic, but, are highly income elastic. The speculative motive concerns holding one's resources in liquid form to take advantage of future interest rate or bond price changes.

Keynes holds that the rate of interest and speculative demand for money show an inverse relationship, where the higher the interest rate, the lower the speculative demand for money.

According to Stephanson (1950), the transaction and the precautionary motives are revenue features. The speculative motive, however, is solely a function of the interest rate, and it is this motive along with the amount of cash available to fulfil that motive that dictates the interest rate. Although the precautionary and transactional motives are relatively inelastic, the speculative motive for the marginal cash holder is interest-elastic. It is highly variable and prone to volatile fluctuations, as it depends on the relationship between the real interest rate and the level of expectations.

According to Dow (2002), there is a loss of confidence in the stability of the local currency's value relative to other currencies at a certain level of liquidity preference, therefore other currencies better satisfy that liquidity demand. The exchange rate will then be under pressure from capital outflows. Monetary authorities maintain a stable exchange rate, through purchasing local currency using foreign exchange reserves. Banks innovate and stretch portfolio constraints to potentially increase profits. They meet credit demand based on their liquidity preferences and profit expectations (Ultremare and Mattos, 2020). Liquidity preference is essentially a demand for money that stems primarily from uncertainty about the future and the desire to fund spending.

### 3.2.8. Interest Rate Parity Theory

Interest rate is a significant macroeconomic variable, which causes changes in the exchange rates. A country's central bank uses interest rates to manipulate exchange rates (Perera, Silva, & Silva, 2018). According to Levich (2011), arbitration is a central principle in the economics of finance. The works of early political economists such as Ricardo (1811), Cournot (1838), and Walras (1870) contain references to arbitration and its impact on prices. However, it was John Maynard Keynes who popularized the term “interest rate equilibrium” in the Tract on Monetary Reform (1923). During the twentieth century, John Maynard Keynes (1923) formalized the principle of interest-rate equilibrium. The interest rate parity (IRP) has historical roots, such as other conditions of parity in international finance that go back centuries to David Hume, David Ricardo, and possibly earlier. In global macroeconomic models, the parity relationship played such a key role that interest rate parity (IRP) was taken as a standard for faultless capital movement between markets (Levich, 2011).

Keynes (1923) established the condition of parity to link the exchange rates, interest, and inflation. It’s essentially a phenomenon that describes how interest rate differences in two separate nations are harmonized and balanced by their monetary FX adjustments (Kairu, 2016). It further states that it harmonizes interest rates, and FX and spot FX rates (Tuffa, 2018). Several studies have attempted to test the causality of interest rate and exchange rate to support the theory of interest rate parity, which is known as a widely used method in exchange rate forecasting (Zhang & Dou, 2010).

Hacche and Townsend (1981) and Meese and Rogoff (1983) indicated that other possible economic theories such as purchasing power parity and monetary model do not add much to random walk exchange rate predictions, at least at less than a year’s horizons. The study indicated a clear rejection of exposed parity of interest rates. Other later experiments confirmed those findings. Further to that is ongoing theoretical literature that seeks to decide whether the lack of exposed interest rate convergence is in relation to market inefficiency because of risk avoidance or market segmentation. According to Kairu (2016), the research reported a strong rejection of uncovered interest rate parity. Other later experiments confirmed those findings. There is also the active theoretical literature that seeks to determine whether the failure of uncovered interest rate parity is the result of risk aversion or market segmentation as

opposed to market inefficiency, or not. In comparison, Roll and Yan (2000) suggested that forward exchange rates are accurate predictors of subsequent spot prices, and no forward premium puzzle existed.

Conditions of interest parity are no-arbitrage terms of benefit for financial capital. When these conditions exist, higher returns through borrowing or lending are unfeasible for investors. Interest parity conditions therefore established, in theory, the theoretical relation between interest rates and exchange rates between countries (Chinn, 2007). The best way to understand the conditions of parity is to consider how a typical investor can save at different places. Suppose the dollar is the domestic currency, the euro the international currency, and assume that there is a forward market, then there are two conditions of interest rate parity namely, Covered interest rate parity, and Uncovered interest rate parity. According to Frankel (1992), uncovered interest parity suggests that capital flows equal expected return rates on the bonds of countries, irrespective of exchange risk exposure. Covered interest parity states that, when contracted in the same currency, capital flows equal interest rates across countries.

As postulated by Bhatt and Virmani (2005), the covered interest parity (CIP) assumes that interest rates denominated in different currencies are equal when one covers themselves from foreign exchange risk. This condition is called “covered interest rate parity”, reflecting the fact that investors are “covered” by the forward market against nominal uncertainty. Suppose individuals are averse to risk. Such an individual wishes to cover himself during the tenure of the deal for any unforeseen currency fluctuation. He would buy a forward contract provided by the forward contract market and use the exchange rate specified in the contract. According to Ersan, (2008), the covered interest parity (CIP) hypothesizes that, for securities of equivalent risk and maturity, the difference in national interest rates and international rates should be equal to, but with the opposite symbol, the forward discount or the premium for the currency. If the predicted spot exchange rate is used instead of the forward rate, then the Uncovered Interest Parity (UIP) condition is met, which asserts that the modification of the exchange rate would be equal to, but in the opposite direction, the interest rate differentials. The Uncovered Interest Parity (UIP) condition is identified as the hypothesis of the IFE and clearly states that all markets will be equalized by the predicted uncovered returns (Ersan, 2008). Uncovered Interest Parity (UIP) theory states that expected currency changes can explain differences between interest rates

across countries (Bhatt and Virmani, 2005). Uncovered interest rate parity supposes the risk is favourable for individuals. Without capital controls and perfect capital markets, the difference in interest rates between two countries is equal to exchange rate change.

### 3.2.9. The Monetary Approach

According to Akpansung (1998), the monetary theory was founded by the IMF Economist Polak (1957), Mundell (1968), Argy (1969), and later by Johnson and Frenkel (1976). The theoretical model, based on the assumption of imbalance in the balance of payments, can be corrected by changing monetary variables, mainly domestic credit. Since the end of the Bretton Woods era, the monetary model has been a favourite subject in the field of International Economics. The model notes that relative money supplies, relative income levels, and the nominal exchange rate has a long-run balance relationship, while other variables are also included (Garces-Diaz, 2004). According to Zhang, Lowinger, and Tang (2007), the monetary model states that the relative prices of commodities, considered in structured markets where prices can shift instantaneously, are exchange rates. A significant assumption of the monetary model is that the parity of purchasing power (PPP) holds steadily over time, which is well-founded as a long-run relationship, while half-lives tend to be longer than anticipated (Rogoff (1996) and Papell (1997)).

The monetary approach assumes that exchange rates are fixed, that the economy is in a long-run equilibrium of full employment, that demand for money is a constant function of income, and that changes in money supply do not affect real variables. In the long run, the level of prices and interest rates of a country converge at the world level due to the high elasticity of the substitution between commodities in international trade and highly mobile resources, and that changes in the supply of money, resulting from changes in the number of foreign assets, are not controlled by the monetary authorities (Thirlwall 1980).

Jacob Frenkel traced its origins back to Ricardo and the following informative observation made in 1924 by Keynes was revealed (Bilson, 1978). It is assumed that the demand for money, which is the core behavioural equation of the monetary technique, is of the Cagan functional form:

$$\frac{M}{P} = ke^{-\epsilon i}y^{n} \quad (3.11)$$

Where $M$ denotes the money demanded, $P$ is the price level, $i$ is the rate of interest, $y$ is the real income and lastly, $k, \epsilon$ and $n$ are the parameters.

The monetary approach consists of several theories that are used to explain exchange rate determinations. This section will discuss two, namely: The Monetary Approach to Balance of Payment and The Monetary Approach under Flexible Exchange Rates. The monetary model was established by Frenkel (1976) and further advanced by Mussa (1974) and Bilson (1978) who propose that the link between returns on the stock market, exchange rates, and interest rates is determined by the demand for money.

### a. The Monetary Approach to Balance of payment

The monetary approach to the balance of payments was proposed by Professors Robert Mundell and Harry Johnson (Frenkel and Johnson, 1977). The monetary approach to the balance of payments (MABP) rests on the assumption that fixed exchange rates, such as the gold standard, or the arrangement model developed at Bretton Woods in 1944, are accepted (Kemp, 1975). The monetary approach to the theory of balance of payments postulates that establishing a stable exchange rate is, above all, a monetary phenomenon. For that, an implicit assumption must be made that substitution elasticities are great and that the principle of purchasing power parity would hold (Fry, 1976). In the early and mid-seventies, a version associated with Harry G. Johnson became popularly known as the “strong” version. It determines a country’s balance of payments surplus under fixed exchange rates with a process of satisfying a demand for domestic money to carry over real reserves and determines a payment deficit with a process of working off a domestic money supply over the required assets (Rabin and Yeager, 1982).

The balance of payments (BOP) is a systematic statistical record of economic transactions in each period between a country’s residents and the rest of the world (Atoi, 2020). The balance of payment is divided into three accounts, namely, current account, capital account, and financial account. Paun, Mustetescu, and Munteanu (2013) argued that the surplus in other accounts should compensate for any deficit in

one account, since there is a requirement that the overall balance must be equal to zero (no deficit or surplus). The monetary approach argues that there are inflows (outflows) of international reserves associated with balance of payments (BOP) surpluses (deficits) under a fixed exchange rate system, and that these outflows cannot be treated in the long term (Kemp, 1975). The monetary approach to the balance of payments is concerned with the long term. The approach identifies that short-run behaviour is often complex because of incomplete adjustment behaviour in the short-run (Kemp, 1975). Essentially, the monetary approach is a framework for assessing how integrated open global economies minimize their excess money supplies and demands in a regime of fixed exchange rates (Humphrey, 1981).

### b. The Monetary Approach under Flexible Exchange Rates

The exchange rates of industrialized countries were permitted to float freely following the fall of the Bretton Woods monetary system in 1973. The monetary approach to exchange rate determination was developed, refined, and empirically tested in response to this new institutional climate. In the 1980s, the instability of foreign exchange markets focussed concern on the theory of exchange rates in general and especially the monetary method (Zhang, Lowinger, and Tang, 2007). Although adjustments take place gradually under fixed rates through reserve flow over national boundaries, under floating rates, since reserve flow is zero, adjustments take place rapidly and almost instantaneously through domestic or foreign prices to preserve balance both domestically and abroad in the money market. The approach adopted reflects the current reinforcement of the position of exchange rates from a monetary point of view, or more generally, from an asset point of view. In essence, the monetary approach to the exchange rate can be seen as a dual relationship to the monetary approach to the balance of payments (Frenkel, 1976). The role of money and other assets in determining the balance of payments when the exchange rate is fixed and, in determining the exchange rate when it is flexible, are emphasized in these approaches (Humphrey, 1976). The monetary approach primarily attributes exchange rate fluctuations to real and expected shifts in relative stocks of currency. It emphasizes a channel of causation that runs from money to the exchange rate to domestic prices. Essentially, the monetary approach to the exchange rate can be a dual relation to the fiscal approach to the balance of payments. These approaches

highlight the role of money and other assets in determining the balance of payments when the exchange rate is fixed, and when it is flexible in determining the exchange rate.

According to Mbabazize, Turyareeba, Ainomugisha, and Rumanzi, (2020), bank profitability is an indicator of the financial sector's health and stability, and it is important for economic growth. Profits allow banks to effectively engage in financial intermediation in the economy by mobilizing deposits, allocating credit, and setting prices. Bank behaviour is a key predictor of money and credit trends, both cyclical and long-term (Bank, 2011). In this regard, persistent advances in banks' intermediation capacity may affect the supply of money and credit, contributing to longer-term price developments, and market perception of banks' financial soundness may affect the supply of money and credit in the short term. As a result, any change in the money supply has a proportionate consequence on the exchange rate and thus on the price level (Umoru, 2013).

## 3.3. Determinants of financial performance

### 3.3.1. Asset quality

Asset quality is a critical area in determining the status of a bank. The quality of a bank's assets depends on exposure to different risks, developments in non-performing loans, and bank borrowers' performance and profitability (Baral, 2005). According to Mbella and Magloire, (2017), the quality of the credit portfolio and the credit organisation program are key factors that influence the overall quality of the asset. Credits normally include a larger portion of the resources of a bank and carry the most prominent sum of risk to its capital. In addition, securities can constitute an enormous portion of the assets that carry significant risks jointly. Management regularly uses significant time, vitality, and control of their resources, especially the portfolio of credits. Issues within this portfolio can degrade from their ability to monitor other areas of the institution effectively and productively (Mbella and Magloire, 2017).

### 3.3.2. Capital strength

According to Lee (2015), a strong and firm banking system is vital to the health and development of a country's economy, to understanding the decision-making process and, the determinants of bank profitability are relevant for both the bankers themselves and for various stakeholders, including investors in the banking industry, governments, and bank regulators. The relationship between capital adequacy and bank profitability is important in policy implications, not only for the banking regulator to carry out the banking industry reform program by controlling bank capital adequacy, but also for preserving the banking industry's soundness and profitability (Yamamura, and Mitamura, 2003).

### 3.3.3. Operational efficiency

Operational banking efficiency is critical at micro and macroeconomic levels because efficiency has a significant policy implication. Financial institutions enjoyed local oligopolies at the bank management level and thus made lucrative profits, but such advantages are diminishing because of increased competition. At the macroeconomic level, banking efficiency is a socially optimal target. It lowers the average cost of financial transactions thus enhancing the welfare of society (Hussein, 2001).

The x-efficiency concept was introduced by Leibenstein (1966) who noted that organisations are not working as effectively as they could due to a variety of reasons. X-inefficiency refers to the technical and allocative inefficiencies of the individual companies. The technical inefficiency reflects the loss of profit from choosing an inefficient production technique, while allocative inefficiency reflects the loss of profit resulting from failure to comply with the production plan (Al-Jarhi, 2001).

### 3.3.4. Bank liquidity

The creation of liquidity is a key function of a bank and an economic service important for the economy (Bouwman, 2013). Liquidity creation refers to the fact that banks provide borrowers with illiquid loans, while at the same time granting depositors the ability to withdraw funds at par value (e.g., Bryant, 1980; Diamond and Dybvig, 1983). Banks also provide liquidity off the balance sheet to borrowers through lending commitments and similar liquid funds claims (e.g., Boot, Greenbaum, and Thakor,

1993; Holmstrom and Tirole, 1998; Kashyap, Rajan, and Stein, 2002; Thakor, 2005). The creation of bank liquidity is important for the macroeconomy (e.g, Bernanke, 1983; Dell'Ariccia, Detragiache, and Rajan, 2008) and will become even more prominent in a financial crisis (e.g., Acharya, Shin, and Yorulmazer, 2009).

## 3.4. Empirical literature

Empirical research has been conducted by researchers in the past to examine the volatility of exchange rates and how this volatility affects commercial banks' performance. However, a few studies have been conducted in the case of South Africa on this topic. The chapter includes empirical literature, which includes studies from developed countries, developing countries, and South Africa. Several theories have emerged to explain the connection between these variables.

### 3.4.1. Developed countries

Wong, Wong, and Leung (2009) investigated the foreign exchange exposure of Chinese banks using the Capital Market Approach and equity price data of the fourteen listed Chinese banks. This study adopted an Ordinary Least Square (OLS) method. It was discovered that there is a significant relationship between bank size and exchange rate volatility. According to Wong, Wong, and Leung (2009) This link may represent major Chinese banks foreign exchange operations and trading positions, as well as their significant indirect foreign-exchange risk from effects of the renminbi exchange rate fluctuations on their customers. Furthermore, they suggest that the average exchange rate risks of state-owned and joint-stock commercial banks in China are greater than the banks in Hong Kong. However, Chinese banks' participation in global banking groups is still limited in contrast with their Hong Kong counterparts. It is also observed that negative foreign-exchange exposure is established for larger Chinese banks, suggesting that an appreciation of the renminbi tends to decrease their equity values. This may consequently influence the banking sector's performance. The decreases in equity values implied a greater risk on Chinese banks.

Chamberlain, Howe, and Popper (1997) explored the foreign exchange volatility of a sample of U.S. and Japanese banks. This study adopted an augmented market model. They began by constructing estimates of the exchange rate volatility of equity returns of the U.S. bank holding companies and comparing them with the Japanese banks using daily data. Chamberlain, Howe, and Popper (1997) argued that a significant fraction of U.S. stock returns moves with the exchange rate, while a few of the Japanese stock returns. The volatility of the U.S. banks was further examined by linking the U.S. estimates using accounting-based measures of currency exposure cross-sectionally. It was concluded that the sensitivity estimates provided a benchmark that enabled the assessing of the adequacy of existing accounting measures of currency exposure. The cross-sectional evidence is consistent with the use of foreign exchange contracts with the purpose of hedging.

Martin and Mauer (2003) focused on the cash flow-based technique, where the exchange rate risk was decomposed into short- and long-term elements for 105 individual U.S. banks for the period 1988 to 1998. A distributed lag model is used to capture the relationships between unanticipated operating income and changes in short- and long-term exchange rates. The significance of the long-term is that it is more dominant than short-term volatility. This reflected the challenge in recognising, modelling, and overseeing the longer-term impacts of exchange rate volatility. Their findings suggest that 72 per cent of international-orientated and 88 per cent of domestic-focused banks in the sample have a significant risk of at least one of their currency pairs. Based on their analysis, it is revealed that the results support the theory that domestic banks are more at risk and should focus on the direct effect of exchange exposure. The general conclusion can be drawn that economies of scale may still exist for banks with widespread international operations.

Hahm (2004) investigated the interest rate and exchange rate exposure of banking institutions in pre-crisis Korea. In the spirit of Choi, Elyasiani and Kopecky, (1992), this study examined the interest rate and exchange rate sensitivities of Korean banking institutions in the form of a three-factor model in which, in addition to the return on the equity portfolio, the interest rate and exchange rate variables were simultaneously present in the equation of bank stock return. The exposure was measured in the context of factor models that incorporated interest rate and exchange rate

adjustments, in addition to the return on the stock portfolio. The nature and trends of risk exposures were examined through various industries and periods, using various time series and panel regressions. This study employed the ordinary least squares (OLS) estimation technique. This research used monthly stock prices, interest rate, and exchange-rate data from March 1990 to November 1997. The evidence indicates that the sharp weakening of the Korean won, and high-interest rates at the end of 1997, together with the negative exposure of the banking institutions, further weakened the capital adequacy of the banking sector, intensifying the financial crisis. The study found that Korean commercial banks and merchant banking companies were significantly exposed to both interest rate and exchange rate risks when using the sensitivity of stock returns as an exposure factor, and that subsequent commercial bank profitability was significantly correlated with pre-crisis exposure. As a precondition for effective financial liberalization, the Korean case emphasizes the importance of improving financial regulation and risk management practices.

Chi, Tripe, and Young (2007) examined the effect of currency changes on the four main Australian banks' market value. Specifically, Chi, Tripe and Young (2007) discussed the relationship between the Australian dollar's value against the US dollar, the Sterling Pound, the New Zealand dollar, and the four banks' PB ratios. The authors noted that the negative effect of a decline in the value of offshore assets of the banks, in terms of US dollars and Sterling Pounds, is expressed in the stock price, although this is not the case for the dollar in New Zealand. It was further found that there is a negative relationship between the interest rate level and PB ratios, which indicated that the present value of future revenue streams is a significant factor for investors.

Atindéhou and Gueyie (2001) probed the Canadian chartered banks' vulnerability to exchange rate risk and evaluated it by estimating the three-factor asset pricing model (market, interest rate, and exchange rate) over the period 1988 to1995. The results suggested that banks' stock returns were resilient to exchange rate risk and, above all, to the US dollar compared to the exchange rate of the Canadian dollar. However, the response over time becomes unpredictable. In addition, the exchange rate risk was responding asymmetrically. After losses, investors responded more to a reassessment of their assets than to an improvement after consecutive gains.

Martin (2000) explored the sensitivity to the exchange rate for key financial institutions, country-specific portfolios, and global portfolios in the foreign exchange market. The author estimated the model using the seemingly unrelated regression (SUR) technique of Zellner (1962) over the period 1994 to 1996 using weekly data. Results revealed that most key institutions are exposed substantially. The portfolios in the U.K., Swiss, and Japan were found to be substantially exposed, while the portfolios in the U.S. were not exposed. Furthermore, there is evidence that there was no global sensitivity to the exchange rate. This was to the degree that most currency trading is carried out among the financial institutions included in the portfolio, so exposure is assumed to be negligible because of profits earned by one institution that would be counterbalanced by losses sustained by another institution.

Mitchell (1989) conducted an empirical investigation on interest rate risk at commercial banks and investigated the period 1976 to1983 to assess whether the banks' exposure to interest rate risk increased due to an increase in volatility of interest rate and financial deregulation. The key findings are that, after 1979, banks modified their risk management policies and that overall interest rate risk exposure remained relatively low.

Leahy (1994), in his study, seeks to determine whether the profitability of foreign exchange trading by banks is a result of a greater ability to predict fluctuations in exchange rates, or not, using data on the foreign exchange position of the five major financial institutions for the period June 1990 to March 1994. This study adopted a nonparametric and logit analysis technique. The position data provided evidence that certain financial institutions' output was first, better than predicted if their forecasts were strictly random and, secondly, consistent with the probability of having knowledge that would be useful in forecasting exchange rate changes. However, the conclusions are limited by the possibility that a time-varying risk premium exists that was correlated with the positions.

Grammatikos, Theoharry, Saunders, and Swary (1986) studied the risks and returns on foreign currency positions of U.S. banks, analysed in a portfolio setting when there are both exchange rate and foreign interest rate risks from December 1975 to November 1981 using monthly data. It was found that U.S. banks could achieve

substantial risk reductions by optimizing their foreign currency positions. The foreign currency portfolio returns were positive, on average, because of expected exchange rate changes. Those generated from interest rates, however, were negative. Though the overall portfolio returns were decent, bank return performance was relatively low on a risk-adjusted basis. Despite this relatively poor performance, the risk of ruin or failure of a "representative bank" from foreign currency activities was found to be approximately zero when compared to the capital funds available to large banks to amortize such losses.

Wetmore and Brick (1994) analysed the commercial bank risk through the market, interest rate, and foreign exchange. Due to structural changes in bank balance sheets, regulatory changes in risk-based capital standards, and the recent introduction of improvements in mark-to-market accounting, interest rate risk remained a major topic for commercial banks and a major regulatory concern. A sample of commercial banks using ordinary least squares (OLS) from 1986 to 1991, market, interest rate, and foreign exchange risk are estimated using yearly data. The approximate coefficients remained volatile in accordance with earlier research. Wetmore and Brick (1994) found that interest rate risk was decreasing, while foreign exchange risk was increasing. In addition, the results vary depending on the bank's practices (money centre, superregional, or regional). Evidence was consistent with earlier studies that hypothesise that foreign exchange risk was explained by concealed exposure to foreign loans.

### 3.4.2. Developing countries

Limo (2014) examined the effect of foreign exchange risk management on the financial performance of Kenya's commercial banks. This study adopted a descriptive design of the research. The target population was forty-three (43) commercial banks in Kenya. The study employed a census approach in selecting all 43 commercial banks in Kenya as the population is not large. A multiple linear regression analysis was used to examine the effect of foreign exchange risk management on the financial performance of commercial banks in Kenya. The results showed that the mean forward contracts, as compared with other variables, are relatively high. It revealed that the financial performance during the period 2009 to 2013 was substantial variability or high

volatility. High volatility suggested the financial performance of commercial banks was at higher risk.

Osundina, Olamide, Ademola, and Moses (2016) investigated the influence of exchange rate fluctuation on the performance of banks in Nigeria over ten years between 2005 to 2014. The exchange rate volatility was measured using average return on annual values of the US dollar to the Naira for the period 2005 to 2014. An ARCH LM technique was adopted for testing the exchange rate fluctuation, and the Hausman test for fixed and random effect preferred option. Results showed that there is an insignificant relationship between exchange rate volatility and banks' financial soundness when using return on asset as a measure. However, when using a loan to deposit ratio, it shows a significant negative effect of exchange rate volatility on a bank's performance. Osundina, Ademola, Olamide, and Moses (2016) revealed that the effect of exchange rate volatility on a bank's performance is subjective on a measure of banks performance utilised in their research study. The outcomes recommend that a further decline in the value of Naira would lead to a decrease in the bank's performance. As such Osundina, Ademola, Olamide, and Moses (2016) emphasised the importance of setting up policies within the bank to hedge in opposition to foreign exchange fluctuations. Furthermore, the banking sector in Nigeria is an essential part of the economic system and has contributed immensely to the average GDP. Osundina, Ademola, Olamide, and Moses (2016), therefore advised that the monetary authorities in Nigeria should re-assess its current exchange policies and include strategies (such as high import duties, preservation of domestic currency cost, maintain external reserves position) to improve the naira value.

Isaac (2015) sought to assess the effect of exchange rate risk on banks' performance in Nigeria. This study revealed that, in the last decade, managing exchange rate exposure has gained eminence because of unusual events such as currency crises. This study makes use of secondary information, and exchange rate exposure is measured using an auto-regression conditional model. The method adopted for data processing is the Ordinary Least Square (OLS) method. Isaac (2015) discovered that the exchange rate is significantly influenced by profit after tax, and equally showed that there is a positive relationship between the exchange rate and the financial performance of banks. Isaac (2015) recommended that banks create a centralised

entity in their operation strategy to effectively manage exchange rate volatility and enable practical execution of exchange rate forecasting. The author further suggests that the hedging approach be adopted to manage the risk of the exchange rate.

Lagat and Nyandema (2016) examined the influence of foreign exchange rate fluctuations on the financial performance of commercial banks listed at the Nairobi securities exchange. This study used a time series correlation research design with the target population being all listed commercial banks in Kenya's Nairobi Securities Exchange between the period 2006 and 2013. A multivariate Linear Regression was adopted to test the relationship between foreign exchange rate volatility, interest rates, inflation rates, and bank performance indicators. The Pearson product-moment correlation (r) was utilised to establish the relationship amongst the variables. This study observed that there was a significant relationship between foreign exchange rates and banks performance indicators. The significant relationship between exchange rate and financial performance of banks reflects how fluctuating and volatile exchange rates may have contributed to the increase in profitability of banks. The study recommended that the Government ought to place greater measures to expand the country's exports.

Sabina, Manyo, and Ugochukwu (2016) examined foreign exchange transactions on the profitability of Nigerian banks for the period 2010 to 2014. This study used annual data from the annual report of ten banks in Nigeria and used a pool panel regression model using the Ordinary Least Square (OLS) estimation method. The Ordinary Least Square (OLS) results showed that the foreign exchange income has a negative and insignificant impact on Nigerian banks' profitability for the period. The total assets used as a control variable revealed a positive impact on Nigerian banks' profitability, while the gross equity had a negative impact on the banks' profitability for the same period under review in Nigeria. The study recommends that the Central Bank of Nigeria and other monetary authorities monitor the activities of banks to ensure they do not charge high premiums for the sale or purchase of foreign exchange to their customers. A Bank should strengthen its asset base to increase profitability.

Parlak and İlhan, (2016) investigated the magnitude of an open, foreign exchange position of manufacturing and service sector companies, and determined the impact

of open positions on the financial performance of companies, and to determine the factors contributing to the propensity of companies to retain short foreign exchange positions. This study was carried out on 30 firms, from the third quarter of 2012 to the second quarter of 2015, and found that the operating profitability of firms with a short foreign exchange position was lower than that of firms with a long foreign exchange position. An ANOVA test conducted revealed that companies with short foreign positions were able to increase their overall profitability to the same level as companies with long foreign positions during periods when the local currency was overvalued but exposed to significant losses during periods of local currency devaluation. After analysis, it was discovered that companies that had a short foreign exchange position in the current period, had higher liquidity and asset efficiency and lower overall productivity than those with a long foreign exchange position in the previous period.

Wanjohi, Wanjohi, and Ndambiri (2017) carried out a study to examine the effect of financial risk management on the financial performance of commercial banks in Kenya for the period 2008 to 2012. To achieve this objective, the study assessed the current risk management practices of commercial banks and linked them to the financial performance of the banks. A self-administered questionnaire was used across the banks to determine the financial risk management activities. In data analysis, the study used multiple regression analysis. The findings of the study revealed that most Kenyan banks were engaged in good financial risk management and, consequently, the financial risk management practices showed a positive correlation with the financial performance of Kenyan commercial banks. While there was been a general understanding among banks about risk and its management, the study recommends that banks adopt modern risk assessment techniques such as risk value, simulation techniques, and risk-adjusted return on capital. The study further recommended the use of derivatives to reduce financial risk, as well as the development of training courses structured to the risk management needs of personal banking.

Singh (2013) analysed the relationship between foreign exchange trading and the financial performance of commercial banks in Kenya. According to Singh (2013), exchange rate fluctuations have become a big problem in commercial banks for creditors, analysts, managers, and shareholders. Nevertheless, little is known about

how foreign exchange trading affects the financial performance of commercial banks and, the course of the relationship, at least in Kenya. The author adopted a survey research design in which the study focussed on all 42 commercial banks to model the relationship between foreign exchange trading and the financial performance of banks. Singh (2013) employed a multiple linear regression, Pearson correlation, and descriptive statistics. It can be noted from the determination coefficients that there is a clear relationship between dependent and independent variables. It shows that the independent variables (spot trading, currency forward, and currency swaps) constitute 80.1 percent of the profitability variations as calculated by ROA. The study concludes that currency swaps and forwards are negatively linked to ROA, while currency spot is related positively to banks' performance. Therefore, currency swaps, forwards, and spots are closely linked to the financial performance of commercial banks. The study advises that commercial banks trading foreign currency options, currency forward, and spot trading variables are imperative in deciding commercial banks' performance in Kenya., Nevertheless, efforts should be focused on spot trading as it makes the most of returns.

Mbaka (2016) explored the relationship between foreign exchange trading and the financial results of commercial banks listed on Kenya's Nairobi Securities Exchange. In any economy, exchange rates play an increasingly important role, as they directly affect domestic price levels, the profitability of traded goods and services, resource allocation, and investment decisions. Commercial banks, which are the leading financial players in the economy, are particularly prone to the effects of exchange rate volatility. To understand the implications of exchange rates, numerous studies have been carried out on the influence of exchange rates in commercial banks and economies at large. A concise method of research design was used, with a focus on all eleven of the commercial banks listed on the Nairobi Securities Exchange. The analysis utilized primary as well as secondary data. The study used the published financial statements of the eleven banks for secondary data, and journal articles written in peer-reviewed journals for the period 2010 to 2015. The study targeted a population of 44 employees employed at the commercial banks for the primary results. The author discovered that three types of foreign exchange risks were exposed to commercial banks listed on the Nairobi stock exchange, namely: transaction risks, economic risks, and translation risks. The analysis further showed that a substantial

association exists between forex trading and the banks' financial performances. Lastly, the study examined how the commercial banks listed on the NSE managed foreign exchange risk. Findings on how foreign exchange rates affect the performance of commercial banks in Kenya have led to the conclusion that a significant relationship exists between Forex trading and the banks' financial performance. The study found that the strategic options for managing foreign exchange risks used by commercial banks in Kenya were centred around hedge funds, derivative instruments, and consolidated strategies. Therefore, the study recommends that NSE-listed commercial banks hypothesize both financial and operational means for controlling foreign exchange exposures. The study also proposes that companies explore ways to enhance companies' capacity to handle foreign currency risk exposure, as it is overwhelmingly noticeable that foreign exchange poses a high risk to NSE-listed commercial banks.

### 3.4.3. South African study

In 2004, De Wet and Gebreselasie examined the exchange rate volatility of South Africa's major commercial banks and employed an augmented market model. An ARIMA model was employed to generate unexpected exchange rate data. In contrast to prior studies conducted abroad, this study exhibits that all four South African major banks are significantly impacted by exchange rate fluctuation. De Wet and Gebreselasie discovered that the net foreign currency asset position is an insignificant measure for exchange rate volatility. This study reveals the averaging and offsetting effect of measuring volatility over prolonged period. The results found to provide more evidence about the occurrence of economies of scale in exchange rate fluctuation management. Since ABSA and Standard Bank are more active at domestic and have a larger presence in international markets, the lower coefficients of forex exposure could be linked to the economies of scale in forex risk management that are considered to exist.

## 3.5. Chapter Summary

This section provides a review of a specific theoretical framework supporting the research question proposed in this research study. This research aims to identify the effect of exchange rate volatility in the banking sector focusing on South Africa. In shedding light on the research question and objectives of this study, relevant studies on the exchange rate volatility on South African commercial banks' financial performance were discussed. Based on the literature reviewed, it was discovered that the bank performance of different countries showed varying sets of statistically significant responses to exchange rate exposure. The theories that were reviewed include Purchasing Power Parity, International Fisher Effect, Balassa-Samuelson Model, the Law of One Price, the Quantity theory of money, Arbitrage Pricing Theory, Keynes Liquidity Preference Theory, Interest Rate Parity, and the Monetary Approach.

The prior studies reviewed, investigated the effect of Exchange Rate Exposure and Banks Performance using an Ordinary Least Square (OLS) estimation technique (such as Wong, Wong, and Leung (2008) and Lagat and Nyandema (2016)). However, this study intends to focus on a more efficient model that deals with the limitations observed in prior studies. On the issue of modelling volatility, studies have established that the use of a standard GARCH model to measure volatility presents a weakness that, in financial data, a standard GARCH model captured only some skewness and leptokurtosis (fat tails compared to normal distribution) (Su, 2010). The models chosen for this study are adjusted to account for limitations of models used in prior studies. This study adopts an EGARCH and Non-Linear ARDL framework to model and estimate the volatility of exchange rates in South Africa and how this volatility affects commercial banks' performance. An EGARCH model has advantages over the standard GARCH model as it allows for the assessment of conditional shocks, shock persistence, and asymmetric shocks.

The following section sets out the specific methodology technique applied to investigate the research objectives outlined in this study.

# CHAPTER 4

# RESEARCH METHODOLOGY

## 4.1. Introduction

The study seeks to empirically examine the effect of exchange rate exposure on bank performance in the case of South Africa. An econometric approach is advisable for the study as this method assists in estimating actual results. This is done through utilising past data to generate new results and compare them with past forecasts. Using an econometric approach offers estimates with actual values that make it easier to indicate the direction and magnitude of change. The section is organised as follows: Variable description and data sources, stationarity test to measure against spurious problems, model specification, and estimation procedure.

## 4.2. Variable Description and Data Sources

The target industry for the study is the five major commercial banks and covers the period 2002 to 2019. The period selected is based on the availability of data. The study uses annual secondary data collected from the World Bank website, Bloomberg, and annual Banks financial reports. The secondary data collected is available in the public domain and the banks financial reports are released on an annual basis. This study focused on five key variables. The dependent variable was measured using return on asset, return on equity, and price earnings ratio to measure the financial performance of commercial banks. The exchange rate volatility was proxied by the real exchange rate as the independent variable, and the control variables are inflation and interest rate. The variables used in this study are explained in the table 4.1 below:

**Table 4. 1: Variable names, descriptions, and sources**

| Variable | Description | Source |
|---|---|---|
| ROA | Return on Assets | Banks (Absa, Capitec FNB, Nedbank and Standard bank) annual financial report |

| | | |
|---|---|---|
| ROE | Return on Equity | Banks (Absa, Capitec FNB, Nedbank and Standard bank) annual financial report |
| P/E | Price Earnings ratio | Bloomberg |
| EX | Exchange rate | World Bank website |
| INT | Interest rate | World Bank website |
| INFL | Inflation | World Bank website |

Return on Assets (ROA) is an indicator of how efficient a business utilises its assets to determine how lucrative a business is in relation to its total assets. ROA provides the idea of how effective management is in using its assets to produce profits. ROA is best used to compare competing businesses or, to compare a business with its past results. Unlike other metrics, such as Return on Equity (ROE), ROA takes into consideration the assets of a company.

The assets consist of a company's debt and its equity, both of which are used in financing the company's operations. The ratio of the return on assets provides the investors an understanding of how efficiently the business converts the money it invests in revenue.

The ROE is the main profitability index used by investors to assess the quantity of a company's revenue transferred as equity of shareholders. This measurement shows how efficiently a company generates profit from the money invested in the company (by purchasing its stock). ROE is calculated by dividing net income by the total equity of the shareholders.

ROE is a very efficient metric for assessing and comparing similar businesses, giving a strong indicator of results in earnings. The banking industry provides both development investors and value investors' prospective investment possibilities.

The asset return and equity return are both measurements of how a business makes use of its funds. ROE measures only the return on the equity of a company, leaving out the liabilities. ROA, therefore, accounts for the debt of a company and ROE does

not. The more a business assumes leverage and debt, the greater ROE is close to ROA.

The Price Earnings Ratio (P/E Ratio) is the relationship that exists between the stock price and earnings per share of a company (EPS). A price-to-earnings ratio is a tool that allows you to compare the price of a company's stock to its earnings. According to Berger (2020) this comparison helps determine whether a stock is overvalued or undervalued in the market. The PE ratio is the price at which investors are prepared to pay for the Rand's worth of earnings (Isaacs, 2015). The P/E ratio is a significant metric for determining investor confidence in a company.

Inflation refers to a continuous increase in the price of most goods and services in a country. It can therefore be described as the persistent general increase in prices. Inflation is usually given as the percentage increase in overall prices over a year. This reduces the value of money; the same amount of money buys fewer goods than could be bought before. The high level of inflation is associated with higher spending and higher income. If a bank's income rises quicker than its expenditures, inflation is expected to have a positive effect on profitability. On the other hand, a negative ratio is expected when its costs increase faster than its income, thus an opposing ratio is anticipated (Vong and Chan, 2014).

An interest rate is a value charged and is expressed as percentages of the total or unsettled principal amount by the lender to the borrower for the used assets. These assets can be cash, vehicles, consumer goods, or property. The interest rate charged depends on the risk profile of an individual. Interest rates are influenced by changes in inflation, Reserve Bank policies, and lastly the supply of or demand for credit.

### 4.3. Unit root test

Time series data are mostly used in econometric studies. Brooks (2008) notes that when the variables in a regression model are not stationary, then the assumption for asymptotic analysis will be violated. An asymptotic analysis refers to a limiting value, such as a dependent variable, when the independent variable approaches zero or infinity because of the violated assumption, the t-ratios will not follow a t-distribution,

and a hypothesis test cannot be undertaken to validate the regression parameters (Brooks, 2014: 354).

Time series variables normally exhibit non-stationary, and their linear combination can be stationary; each variable is subject to a standard unit root test. There are many tests for stationarity. For this study, however, the following test intends to use the Augmented Dickey-Fuller (ADF) test.

Augmented Dickey Fuller (ADF) test ensures that regression outcomes are reliable and non-spurious, are indicative of their mean and other significant statistical parameters and are constant over time in line with classic linear regression assumptions. The ADF test came about when Said and Dickey (1984) augmented the basic autoregressive unit root test to accommodate general autoregressive moving average (ARMA (p, q)) models with unknown orders. It is the most popular test for stationarity as it takes care of possible autocorrelation in the error terms and is also easily applied. The null hypothesis of the test is that a time series has a unit root, as evidenced by a test statistic that is less than the critical value. The null hypothesis will be rejected should the t-statistic be greater than the critical value, thus proving the time series to be stationary. By confirming the stationarity of the variables, least squares regression may then be performed as the assumptions above are upheld.

## 4.4. Model Specification and Estimation Procedures

### 4.4.1 EGARCH Model

The GARCH-Family models are used to model the volatility of financial variables. The generalised model of autoregressive conditional heteroscedasticity (GARCH) was established by Engle (1982) and Bollerslev (1986) jointly and has proved to be a helpful means to capture momentum in conditional variance.

The GARCH model allows the conditional variance to depend on previous own lags. The GARCH model became the bedrock of dynamic volatility models Alexander and Lazar (2006). The GARCH model can capture the volatility clustering, however, it has some limitations in capturing the leverage effect, since its conditional variance cannot capture the sign. To overcome the GARCH shortcomings, Nelson (1991) designed an

exponential GARCH model with the conditional variance that captures asymmetric response. Alexander (2008), in his study, also demonstrated that the EGARCH model is superior compared to other asymmetric conditional variance models. An EGARCH model has advantages over the standard GARCH model as it allows for the assessment of conditional shocks, shock persistence, and asymmetric shocks. The EGARCH technique is specified as follows:

$$ln(\sigma_t^2) = \tau_0 + \theta_1 ln(\sigma_{t-1}^2) + \gamma \frac{\omega_{t-1}}{\sigma_{t-1}^2} + AE \left|\frac{\omega_{t-1}}{\sigma_{t-1}^2}\right| \quad (1)$$

Where: $\tau_0$ is the intercept term, and $\theta_1 \gamma, \emptyset$ are parameters to be estimated. The $\theta_1$ parameter measures persistence in conditional volatility in the economy; the term $\omega_{t-1}$ is a representation of the ARCH term and measures fluctuations in the previous period; and lastly $\sigma_{t-1}^2$ GARCH term represents the variance of the previous period estimate.

### 4.4.2 Non-linear Autoregressive Distributed Lag Model

The standard ARDL model allows estimation of the long-run relationships amongst variables of the time series. However, they presume only linear or symmetrical relationships between variables. The standard ARDL model and other techniques, which presume symmetrical dynamics, are therefore not capable of capturing potential nonlinearity or asymmetry in the relationship between the variables. Considering this, the current investigation adopts the NARDL approach developed by Shin, Yu, and Greenwood-Nimmo (2014), an asymmetrical extension of the traditional ARDL. The NARDL model was developed to capture both short-term and long-term asymmetries in a variable of interest and, at the same time, reserve all the benefits of the standard approach to ARDL.

The NARDL model poses some other benefits compared to conventional models of cointegration. First, it does better to determine the relationship of cointegration in tiny specimens (Romilly, Song, and Liu, 2001). Secondly, it can be implemented regardless of whether the regressors are at level or the first difference (i.e., I (0) or I (1)). However, they cannot be used if the regressors are I (2). The other advantage of NARDL is that it enables measuring both short and long-run relationships, while also detecting hidden cointegration (Babatunde, 2017).

The empirical models in the study are specified as follows:

$$ROA_{it} = c_0 + c_1 EX_{it} + c_2 INF_{it} + c_3 INT_{it} + \varepsilon_t \quad (2)$$

$$ROE_{it} = c_0 + c_1 EX_{it} + c_2 INF_{it} + c_3 INT_{it} + \varepsilon_t \quad (3)$$

$$ESP_{it} = c_0 + c_1 EX_{it} + c_2 INF_{it} + c_3 INT_{it} + \varepsilon_t \quad (4)$$

where ROA is the return on asset, EX is the exchange rate, ROE is the return on asset, ESP is the earnings per share, INF is the inflation rate, and INT is the interest rate. The Equations (2-4) can be extended and modified to an asymmetric long-run equation as follows:

$$ROA_{it} = \alpha_1 + \alpha_1 POS_{it} + \alpha_2 NEG_{it} + \alpha_3 INF_{it} + \alpha_4 INT_{it} + \varepsilon_t \quad (5)$$

$$ROE_{it} = \alpha_1 + \alpha_1 POS_{it} + \alpha_2 NEG_{it} + \alpha_3 INF_{it} + \alpha_4 INT_{it} + \varepsilon_t \quad (6)$$

$$ESP_{it} = \alpha_1 + \alpha_1 POS_{it} + \alpha_2 NEG_{it} + \alpha_3 INF_{it} + \alpha_4 INT_{it} + \varepsilon_t \quad (7)$$

where $\alpha_0, \alpha_1, \ldots., \alpha_4$ are long-run parameters estimated, and $\varepsilon_t$ is the white-noise error term. The constant $\alpha_0$ captures all exogenous factors such as the constant term, linear trend, and dummy variables for structural breaks. In Equations (8 and 9), POS and NEG represent asymmetry in the ARDL model. The values of POS and NEG are generated through the following equations:

$$POS_{it} = \sum_{j-1}^{it} EX_j^+ = \sum_{j=1}^{it} \max(EX_j, 0) \quad (8)$$

And

$$NEG_{it} = \sum_{j=1}^{it} EX_j^- = \sum_{j=1}^{it} \min(\Delta EX_j, 0) \quad (9)$$

where POS is the partial sum of positive changes in EX, and NEG is the partial sum of negative change in EX. The impact of an appreciation in an exchange rate on a

bank's performance may be asymmetric to an exchange depreciation. This is being tested by evaluating both $\alpha_1$ and $\alpha_2$ in Equations (5-7), they capture the effect of exchange rate appreciation and depreciation, respectively. In the scenario when $\alpha_1 = \alpha_2$ indicates no asymmetry is found between a bank's performance and exchange rate movements. If $\alpha_1 \neq \alpha_2$, then the presence of nonlinear relation is concluded.

As shown in Shin and Greenwood-Nimmo (2014), Equations (4-6) can be framed into a normal ARDL bounds test as follow:

$$\Delta ROA_{it} = \beta_0 + \beta_1 ROA_{it-1} + \beta_2 POS_{it-1} + \beta_3 NEG_{it-1} + \beta_4 INF_{it-1} + \beta_5 INT_{it-1} + \sum_{p=1}^{n1} \theta_1 \Delta ROA_{it-p} + \sum_{p=0}^{n2} \theta_2 \Delta POS_{it-p} + \sum_{p=0}^{n3} \theta_3 \Delta NEG_{it-p} + \sum_{p=0}^{n4} \theta_4 \Delta INF_{it-p} + \sum_{p=0}^{n5} \theta_5 \Delta INT_{it-p} + \mu_t \quad (10)$$

$$\Delta ROE_{it} = \beta_0 + \beta_1 ROE_{it-1} + \beta_2 POS_{it-1} + \beta_3 NEG_{it-1} + \beta_4 INF_{it-1} + \beta_5 INT_{it-1} + \sum_{p=1}^{n1} \theta_1 \Delta ROE_{it-p} + \sum_{p=0}^{n2} \theta_2 \Delta POS_{it-p} + \sum_{p=0}^{n3} \theta_3 \Delta NEG_{it-p} + \sum_{p=0}^{n4} \theta_4 \Delta INF_{it-p} + \sum_{p=0}^{n5} \theta_5 \Delta INT_{it-p} + \mu_t \quad (11)$$

$$\Delta ESP_{it} = \beta_0 + \beta_1 ESP_{it-1} + \beta_2 POS_{it-1} + \beta_3 NEG_{it-1} + \beta_4 INF_{it-1} + \beta_5 INT_{it-1} + \sum_{p=1}^{n1} \theta_1 \Delta ESP_{it-p} + \sum_{p=0}^{n2} \theta_2 \Delta POS_{it-p} + \sum_{p=0}^{n3} \theta_3 \Delta NEG_{it-p} + \sum_{p=0}^{n4} \theta_4 \Delta INF_{it-p} + \sum_{p=0}^{n5} \theta_5 \Delta INT_{it-p} + \mu_t \quad (12)$$

The optimal lag lengths (n1,...., n4*)* are determined using the information criteria are Akaike's (1974) information criterion (AIC), Hannan-Quinn criterion, and Schwarz's (1978) Bayesian information criterion (SBIC). The model specification of Equations (10-12) is finalised when exempted from any misspecification biases. As demonstrated in Shin Shin, Yu, and Greenwood-Nimmo (2014), the bounds test approach (Pesaran, Shin, and Smith. 2001) can be applied to Equations (9-10) in detecting the presence of short-run and long-run relationships.

## 4.5 Diagnostic Test

A diagnostic test is a misspecification test that can provide the researcher with information concerning whether a model has desirable statistical properties, particularly regarding the residual. There are different types of diagnostic tests which will be undertaken in this study such as normality, heteroscedasticity, autocorrelation, and Ramsey reset test among others.

### 4.5.1. Test for normality of residuals: Jacque Bera test

The classical linear regression model assumption 5 states that the disturbances are normally distributed, that is the normality assumption $(ut \sim \mathrm{N}(0, \sigma 2))$ is required in order to conduct single or joint hypothesis tests about the model parameters (Brooks, 2014:209-210). The Bera-Jarque test is commonly applied in testing normality. The Bera-Jarque test makes use of the property of a normally distributed random variable that the entire distribution is characterised by the first two moments that is the mean and variance. The standardised third and fourth moment of a distribution are known as its skewness and kurtosis. A normal distribution is not skewed and is defined to have a coefficient of kurtosis of 3. Bera and Jarque Classical linear regression model assumptions (1981) formalised these ideas by testing whether the coefficient of skewness and the coefficient of excess kurtosis are jointly zero (Brooks, 2014).

### 4.5.2. Breusch-Pagan-Godfrey test for heteroscedasticity

The Breusch-Pagan-Godfrey test is a test for heteroscedasticity of errors in a regression. One of the assumptions of the classical linear regression model (CLRM) is that the variance of the errors is constant, that is homoscedasticity. A regression is said to be heteroskedastic when the variance of errors changes over time. If the errors are heteroskedastic, the standard error estimates could be wrong (Brooks, 2008:386). A test of this assumption is therefore required.

### 4.5.3. Autocorrelation

Assumption 3 of the classical linear regression model (CLRM) states that the disturbance term that is the covariance between the error terms over time is zero. It is

assumed that the errors are uncorrelated with one another. If the error is correlated with one another then this assumption is violated.

### 4.5.4. Ramsey Reset test

According to Wooldridge (2013) several tests to identify general functional form misspecification had been proposed. However, the regression specification error test (RESET) proposed by Ramsey (1969) has proven to be effective in this area. According to Ramsey (1969) the original model is as follows:

$$\gamma = \beta_0 + \beta_1 x_1 + \ldots\ldots + \beta_k x_k + \mu \quad (13)$$

$$\gamma = \beta_0 + \beta_1 x_1 + \ldots\ldots + \beta_k x_k + \delta_1 \hat{y}^2 + \delta_2 \hat{y}^3 + error \quad (14)$$

To detect the general types of functional form misspecification, RESET adds polynomials to the Ordinary Least Squares (OLS) fitted values. The dependent variable is Y, the independent variables are $x_k$, and the coefficients of a general OLS model are denoted by k. In equation 14, $\hat{y}$ represents the OLS fitted values obtained from estimating equation 13. Equation 14 is used to see if equation 13 overlooked any significant nonlinearities. As opined by Ramsey (1969), the null hypothesis is that the functional form is correctly specified ($H_0$: $\delta_1 = 0, \delta_2 = 0$ for the expanded model), and the alternative hypothesis is that the functional form is incorrectly specified. A significant F-statistic indicates that there are functional form issues, and the F-statistic has a distribution of $F_{2n-k-3}$ under the null hypothesis.

## 4.6. Chapter Summary

This chapter has discussed the method, structure, and types of tests done to examine the effect of exchange rate exposure on bank performance in the case of South Africa. The chapter highlights the steps taken to test for stationarity amongst variables using the Augmented Dickey-Fuller unit root test. These tests are done to avoid violation of the classical linear regression model assumptions. Diagnostic tests are conducted to check for any misspecification and whether the model has desirable statistical properties, particularly regarding the residual. The EGARCH technique is employed for modelling volatility and the NARDL method to investigate the relationship. In accomplishing the objectives of this research, and to meet the objectives in chapter

one, the statistical estimation techniques discussed in this chapter will be applied using the available data collected annually from the World Bank, Bloomberg, and the commercial banks' financial reports for the period starting from 2002 to 2019. The empirical findings will be presented in the next section, chapter five of this research study.

# CHAPTER 5

# EMPIRICAL RESULTS

## 5.1. Introduction

In accomplishing the objectives of this research and to meet the objectives in chapter 1, the statistical estimation techniques discussed in chapter 4 are applied using the available annual data collected from the World Bank, Bloomberg, and the commercial banks' financial reports for a period starting from 2002 to 2019. The empirical findings are presented in this section of this research.

This study focused on three key variables. The dependent variable was measured using return on asset, return on equity, and price earnings ratio to measure the financial performance of commercial banks. The exchange rate volatility was proxied by the real exchange rate as the independent variable, and the control variables are inflation and interest rate.

This chapter provides an analysis of empirical results generated using the EGARCH technique for modelling volatility, and the NARDL method to investigate the relationship. The chapter is divided into four sub-sections, namely: descriptive statistics, unit root tests, EGARCH model, NARDL model, and lastly, a summary for the chapter.

## 5.2. Descriptive Statistics and Stationarity Tests

This section deals with the basic statistical properties of the data. Descriptive statistics and unit root tests of the series are presented in Table 5.1. The descriptive statistics include: The mean, median, maximum, and minimum values, standard deviation, skewness, and kurtosis, and Jarque-Bera test for normality. The descriptive statistics represented in table 5.1 seek to describe the data sample, but do not attempt to make inferences from the sample. Descriptive statistics present quantitative data in a manageable form by simplifying large amounts of data.

Table 5.1 reports summary statistics of the bank's financial performance, independent variable, and control variables data. The sample period starts from 2002 to 2019. Taking all variables together, table 5.1 displays that Nedbank’s price earnings ratio

has the highest mean value, while Nedbank's return on asset has the lowest mean value. Nedbank's price earnings ratio also has the highest maximum value and inflation rate with the lowest minimum value. The standard deviation measures how numbers are spread-out. The price earnings ratio for Nedbank has the highest standard deviation and Standard bank's return on asset displayed the lowest standard deviation. Relative to other variables, the price earnings ratio for Nedbank data points are more spread out over a large range of values. Price earnings ratio returns are therefore far more volatile taking all variables together. Skewness is a measure of the degree of asymmetry of a distribution. The price earnings ratio for Nedbank has the highest skewness value, positively skewed to the right, and FNB with the lowest skewness value negatively skewed to the left. Regarding the Kurtosis statistics, it is observed that the kurtosis coefficient return on asset for Nedbank is platykurtic (flat) with a kurtosis value greater than 3, whereas the Kurtosis statistic for ABSA's price earnings ratio variable shows that the variable is leptokurtic (thin). The kurtosis of any univariate normal distributions accepted benchmark is 3. It is therefore common to compare the kurtosis of a distribution to this value. The Jarque-Bera test is a measurement of whether a sample is drawn from a normal distribution, or not. The Jarque-Bera test also indicates that the variables are not normally distributed with a p-value greater than zero, except for price earnings ratio for Nedbank. As shown in Table 5.1 all variables are stationary at the first difference for both cases, intercept, and intercept and trend. The presented the results are where the tests were done at first difference.

## Table 5. 1 Descriptive Statistics and Unit Root Results

| Panel A | ABSA | | | CAPITEC | | | FNB | | |
|---|---|---|---|---|---|---|---|---|---|
| | ROE | ROA | P/E | ROE | ROA | P/E | ROE | ROA | P/E |
| Mean | 18.582 | 1.281 | 9.95 | 23.63 | 6.24 | 15.17 | 23.01 | 1.61 | 11.01 |
| Median | 16.65 | 1.33 | 10.04 | 26.50 | 5.260 | 16.00 | 23.700 | 1.57 | 10.99 |
| Maximum | 27.400 | 1.74 | 13.33 | 34.00 | 11.74 | 28.54 | 28.00 | 2.12 | 13.98 |
| Minimum | 10.17 | 0.50 | 6.80 | 8.00 | 3.43 | 1.46 | 13.100 | 0.88 | 6.95 |
| Std. Dev. | 4.94 | 0.28 | 1.75 | 7.11 | 2.179 | 6.598 | 3.63 | 0.36 | 1.94 |
| Skewness | 0.52 | -0.77 | 0.03 | -0.87 | 0.98 | -0.19 | -1.18 | -0.10 | -0.25 |
| Kurtosis | 2.21 | 4.68 | 2.41 | 2.83 | 3.26 | 2.84 | 4.28 | 2.11 | 2.49 |
| Jarque-Bera | 1.27 | 3.91 | 0.26 | 2.27 | 2.93 | 0.13 | 5.37 | 0.63 | 0.38 |
| Probability | 0.53 | 0.1434 | 0.88 | 0.32 | 0.23 | 0.94 | 0.07 | 0.73 | 0.83 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sum | 334.48 | 23.06 | 179.25 | 425.29 | 112.38 | 273.06 | 414.10 | 28.94 | 198.17 |
| Sum Sq. Dev. | 415.02 | 1.35 | 52.17 | 859.62 | 80.73 | 740.17 | 224.53 | 2.17 | 63.76 |
| ADF (Intercept) | -5.77*** | -4.09*** | -7.43*** | -3.40** | -8.96*** | -3.53** | -3.92** | -3.73** | -4.32*** |
| ADF (Intercept & Trend) | -5.26*** | -3.94** | -7.79*** | -3.84** | -8.81*** | -3.20 | -3.78** | -3.65 | -4.34** |
| Panel B | NEDBANK | | | SBSA | | | Independent and Control Variables | | |
| | ROE | ROA | P/E | ROE | ROA | P/E | EX | INFL | INT |
| Mean | 15.18 | 1.07 | 28.20 | 22.22 | 2.43 | 10.63 | 9.63 | 5.27 | 4.32 |
| Median | 15.40 | 1.14 | 11.25 | 18.45 | 2.40 | 10.84 | 8.37 | 5.43 | 4.002 |
| Maximum | 21.90 | 1.57 | 326.47 | 34.20 | 2.90 | 14.63 | 14.71 | 10.06 | 8.66 |
| Minimum | 8.49 | 0.45 | 6.72 | 14.40 | 2.00 | 7.61 | 6.36 | -0.69 | 2.21 |
| Std. Dev. | 3.53 | 0.29 | 74.46 | 7.25 | 0.25 | 1.90 | 2.91 | 2.46 | 1.56 |
| Skewness | -0.01 | -0.81 | 3.88 | 0.51 | 0.38 | 0.12 | 0.56 | -0.25 | 1.10 |
| Kurtosis | 2.93 | 3.12 | 16.04 | 1.51 | 2.55 | 2.54 | 1.81 | 3.85 | 4.34 |
| Jarque-Bera | 0.004 | 1.99 | 172.66 | 2.43 | 0.58 | 0.20 | 1.10 | 0.73 | 4.98 |
| Probability | 0.998 | 0.37 | 0.00 | 0.30 | 0.75 | 0.90 | 0.37 | 0.69 | 0.08 |
| Sum | 273.27 | 19.29 | 507.53 | 400.00 | 43.70 | 191.28 | 173.25 | 94.92 | 77.69 |
| Sum Sq. Dev. | 212.01 | 1.48 | 94251.48 | 892.97 | 1.06 | 61.28 | 143.80 | 102.63 | 41.61 |
| ADF (Intercept) | -7.76*** | -4.70*** | -5.13*** | -2.99* | -4.76*** | -5.03*** | -3.45** | -4.35*** | -9.57*** |
| ADF (Intercept & Trend) | -8.12*** | -4.34** | -5.98*** | -2.51 | -4.59*** | -4.95*** | -3.25 | -5.25*** | -11.66*** |

Note: Asterisks ***, **, * represent 1%, 5%, and 10% level of significance, respectively. ROA, ROE, P/E, EX, INFL and INT represent return on assets, return on equity, price earnings ratio, exchange rate, inflation, and interest rate respectively.

Source: Author's computation using Eviews

## 5.3. EGARCH Model

The EGARCH results are presented in Table 5.2. The ARCH term has a p-value of 0.01, demonstrating the ARCH impact in the real exchange rate series. This compels the study to employ the EGARCH model. The ARCH term is negative, which shows that there is a negative relationship between the past variance and the current variance. This means the bigger the magnitude of the shock to the variance, the higher the volatility. Therefore, the size of the shock has a significant impact on the volatility of returns. The leverage effect is positive and significant at 5 per cent, which indicates that negative news has a higher impact than positive news. The GARCH term has a

p-value of 0.00, this confirms the presence of the GARCH effect. According to Mlambo, Maredza, and Sibanda, (2013), over the past few years, the Rand has been the most volatile among emerging currencies.

### Table 5. 2: EGARCH results

| Constant, Arch, leverage, and GARCH Terms | Coefficient | Prob. |
|---|---|---|
| C(2) | 2.50 | 0.00 |
| C(3) | -2.44 | 0.01 |
| C(4) | 1.78 | 0.00 |
| C(5) | 0.53 | 0.00 |

Source: Author's computation using Eviews

C(3)=ARCH term

C(4)=leverage term

C(5)=GARCH term

## 5.4. NARDL

The current investigation adopts the NARDL approach developed by Shin, Yu, and Greenwood-Nimmo (2014), an asymmetrical extension of the traditional ARDL. The NARDL model was developed to capture both short-term and long-term asymmetries in a variable of interest.

### 5.4.1. Bound F-Test

From Table 5.3, the return on asset (ROA) F-statistic for ABSA, Capitec, First National Bank, Nedbank, and Standard Bank is larger than the upper bound critical value (3.61) at a 5 percent significance level, which indicates the occurrence of a long-run relationship between return on assets and its determinants. Hence, the study rejects the null hypothesis of no long-run relationship between the variables employed in the model.

The return on equity (ROE) F-statistic for all five banks is larger than the upper bound critical value (3.61) at a 5 per cent significance level, which indicates the occurrence of a long-run relationship between return on equity and its determinants. From the table, the price earnings ratio (P/E) F-statistic for ABSA, First National Bank, and Standard bank is smaller than the upper bound critical value (3.61) at a 5 per cent significance level, which indicates that there is no long-run relationship between price

earnings ratio and its determinants. While the F-statistic for Capitec and Nedbank is larger than the upper bound critical value (3.61) at a 5 per cent significance level, which indicates the occurrence of a long-run relationship between return on equity and its determinants.

### Table 5. 3: Bound F-Test Results

| | Test Statistic (F-statistic) | | |
|---|---|---|---|
| BANK | ROA | ROE | P/E |
| ABSA | 5.51 | 3.84 | 1.22 |
| CAPITEC | 4.80 | 23.003 | 4.80 |
| FNB | 20.70 | 297.63 | 1.19 |
| NEDBANK | 9.22 | 32.51 | 3445.46 |
| STANDARD BANK | 5.41 | 7.79 | 2.17 |
| Significance value | I(0) Bound | I(1) Bound | |
| 90% | 2.12 | 3.23 | |
| 95% | 2.45 | 3.61 | |
| 97.5% | 2.75 | 3.99 | |
| 99% | 3.15 | 4.43 | |

Source: Author's computation using Eviews

## 5.6. Long-run and Short-run results

In this section, the NARDL model in the long-run and short-run is presented. The banks' performance (return on asset, return on equity, price earnings ratio) is the explained variable, whilst exchange rate volatility, interest rate, and inflation are explanatory variables.

### 5.6.1 Long-run relationship results

The long-run estimated results for ABSA present that return on asset and exchange rate volatility (EX_NEG) suggests that a one percentage point decrease in exchange rate volatility leads to approximately a 0.63 percent decrease in return on asset. This result is also in line with those of Wong, Wong, and Leung (2009) when they reported that an appreciation of the renminbi tends to decrease their equity values. This may consequently influence the banking sector's performance. There is a long-run relationship between the control variables and bank performance proxies, return on asset, as well as return on equity.

In the long run, Capitec has a significant relationship between exchange rate volatility and bank performance for both returns on equity and price earnings ratio. When

comparing the return on equity and price earnings ratio as proxies for bank performance to return on asset, it showed that the effect of exchange rate on bank performance depends on the type of measure used for bank performance. This finding is in line with Taiwo, and Adesola (2013) that the influence of exchange rate on bank performance varies depending on the type of proxy employed to measure bank performance. The inflation rate and interest rate both display a significant relationship with exchange rate volatility.

First National bank long-run results indicate that positive changes in exchange rate volatility have a positive relationship with banks profitability. The same results reveal a negative and significant relationship for return on asset, return on equity, and price earnings ratio. There is a positive relationship significant at a 1 per cent level between an appreciation in exchange rate volatility (EX_POS) and bank performance, when the return on asset and return on equity are proxies for Nedbank. The estimated results show that a one percent increase in return on assets resulted in a decrease of 1.06 percentage points, and that a one percent increase in return on equity results in a decrease of 0.29 percentage points in exchange rate volatility (EX_NEG): significant at 1 per cent level. However, a one percent increase in price earnings ratio suggests an increase of 13.52 percentage points in exchange rate volatility (EX_NEG). The control variables have a significant relationship with exchange rate volatility for both First National bank and Nedbank.

According to the estimated equation for Standard bank return on equity and price earnings ratio exhibits a significant relationship with exchange rate volatility. A negative relationship between inflation rate (INFL_POS) and price earnings ratio results in a 0.32 percentage decrease in the inflation rate. The is a positive and significant at 10 per cent relationship between an appreciation in inflation (INT_NEG) and return on equity as well as price earnings ratio; significant at 5 per cent level. The estimated results showed that a one percentage point increase in inflation (INT_POS) increased to 2.47 percentage points in the price earnings ratio.

## Table 5. 4: Long-Run Results

| PANEL A (ABSA, CAPITEC, AND NEDBANK | | | |
|---|---|---|---|
| | **ABSA** | **CAPITEC** | **FNB** |

| VARIABLE | ROA | ROE | PE | ROA | ROE | PE | ROA | ROE | PE |
|---|---|---|---|---|---|---|---|---|---|
| EX-POS | 0.11 | 1.26 | 1.02 | 2.28 | 4.24** | 6.37*** | -1.06* | 3.43*** | -1.56** |
| EX-NEG | -0.63** | -8.05 | 1.78 | 0.26 | -10.18** | -17.59*** | -2.47* | -17.58*** | 6.27** |
| INF-POS | -0.13** | -1.85* | 1.40 | 0.37 | 3.41*** | 2.59*** | -0.78** | -0.68** | -0.93*** |
| INF-NEG | 0.12** | 1.88 | -0.51 | -0.29 | -1.50 | -2.01 | 0.54** | 4.42*** | -0.65 |
| INT-POS | -0.23 | -1.90 | -2.16 | -2.66 | -10.55** | -11.97*** | -0.01 | -7.71*** | 4.02** |
| INT-NEG | -0.20* | -1.55 | 1.90 | 5.57 | 6.43** | 10.44*** | -3.06** | -3.90** | -0.41* |
| C | -0.03 | 3.27 | 37.27* | 27.39** | 46.03* | 32.10** | -17.07* | 25.80** | 4.45* |

| PANEL B (NEDBANK AND STANDARD BANK | | | | | | |
|---|---|---|---|---|---|---|
| | NEDBANK | | | STANDARD BANK | | |
| VARIABLE | ROA | ROE | PE | ROA | ROE | PE |
| EX-POS | 0.29*** | 3.77*** | -2.44 | 0.31 | 5.20* | -1.60*** |
| EX-NEG | -1.02*** | -12.93*** | 13.52* | -0.22 | -9.66** | 3.21* |
| INF-POS | 0.13** | 2.09*** | -0.83 | 0.03 | 0.73 | -0.32** |
| INF-NEG | 0.28*** | 3.87*** | -1.30 | -0.15 | -0.17 | -0.24 |
| INT-POS | -0.57*** | -7.09*** | 6.05 | -0.45 | -8.46 | 2.47** |
| INT-NEG | -0.01 | 1.15* | -1.63 | 0.44 | 6.93* | -1.18** |
| C | 2.51*** | 41.83*** | 17.58 | 5.02** | 71.56*** | 3.70** |

Note: Asterisks ***, **, * represent 1%, 5%, and 10% level of significance, respectively. ROA, ROE, and P/E represent return on assets, return on equity, and price earnings ratio, respectively.

Source: Author's computation using Eviews

### 5.6.2 Short-run relationship results

The CointEq(-1) term is negative and statistically significant at a 5 per cent level for all four commercial banks and thus, it proves the evidence of cointegration among variables in the model and indicates the speed of adjustment in the short-run towards the long run. Nedbank's return on equity, however, has an insignificant short-run relationship. The results of the short-run analysis are presented in table 5.5 In the short run, there is a negative and significant relationship between changes in return on asset and exchange rate volatility (EX_NEG). After considering any possible non-linearities, the results show that depreciation in exchange rate volatility decreases return on the asset; significant at 10 per cent level for ABSA Bank.

A positive change of exchange rate volatility (EX_POS) has a positive and significant effect on return on asset and price earnings ratio for Capitec bank, implying that when the exchange rate volatility increases, there is a significant effect on the banks

performance. The price earnings ratio results reveal that a negative change in exchange rate volatility (EX_NEG) has a negative and significant effect on the banks' performance. This finding is consistent with that of Kemisola, Olamide, and Moses (2016), as the results show exchange rate volatility has a negative and significant effect on banks' profitability. There is a negative and significant relationship between the inflation rate (INFL_POS) and return on assets. Return on asset and price earnings ratio results indicate a significant relationship with all the control variables.

According to the short-run results for First National bank, the exchange rate volatility has a positive and significant effect on return on equity at a 1 per cent level. There is a positive relationship between exchange rate volatility (EX_POS) and return on equity. This result is consistent with that of Babazadeh and Farrokhnejad (2012), that there is a significant relationship for both the long and short run of exchange rate and its effect on banks profit. The exchange rate volatility (EX_POS), on the other hand, has a negative and significant effect on the price earnings ratio. Control variables results indicate a significant relationship with bank performance in the short run, except for inflation rate (INFL_NEG) for both returns on equity and price earnings ratio, as well as the interest rate for return on asset and equity.

There is a negative and significant relationship between exchange rate volatility (EX_POS), as well as inflation rate (INFL_POS) and price earnings ratio in the short run for Nedbank. Both Nedbank and Standard bank results indicate there is an insignificant relationship between exchange rate volatility and return on assets. Okika, Udeh, and Okoye (2018) revealed that exchange rate fluctuations have no significant effect on the Return on Assets. A positive change of exchange rate volatility (EX_POS) has a positive and significant at 10 per cent level effect on return on equity for Standard bank, which means that when the exchange rate volatility increases, there is a significant effect on banks performance. There is a negative and significant relationship between exchange rate volatility (EX_POS) and price earnings ratio. All control variables prove to have a significant relationship with return on equity and price earnings ratio in the short run.

## Table 5. 5: Short-Run Results

| PANEL A (ABSA, CAPITEC, AND NEDBANK) |
|---|

| | ABSA | | | CAPITEC | | | FNB | | |
|---|---|---|---|---|---|---|---|---|---|
| **VARIABLE** | **ROA** | **ROE** | **PE** | **ROA** | **ROE** | **PE** | **ROA** | **ROE** | **PE** |
| EX-POS | 0.13 | 1.49 | -1.02 | 1.26** | 0.84 | 6.46** | 0.004 | 4.22*** | -2.11** |
| EX-NEG | -0.25* | -3.41 | 3.07 | 0.84 | -2.05 | -7.53* | -0.38*** | -7.65*** | 2.85* |
| INF-POS | 0.02 | 0.73 | -0.60 | -0.77** | 0.93 | 0.35 | 0.15*** | 0.82** | -1.25*** |
| INF-NEG | -0.08 | -0.75 | 0.86 | -0.30 | -2.07** | -2.78* | 0.12*** | -0.09 | 1.10 |
| INT-POS | -0.05 | 0.11 | -3.74 | 0.12 | -9.20** | -11.20** | -0.001 | -6.71*** | 4.49*** |
| INT-NEG | -0.28 | -2.63 | 4.55 | 1.59** | 6.30*** | 12.37*** | -0.22*** | 0.39 | -1.91* |
| CointEq(-1) | -1.17*** | -1.18** | -1.73*** | -0.55* | -0.93** | -1.38*** | -0.15* | -1.12*** | -1.35*** |
| **PANEL B (NEDBANK AND STANDARD BANK)** | | | | | | | | | |
| | **NEDBANK** | | | **STANDARD BANK** | | | | | |
| **VARIABLE** | **ROA** | **ROE** | **PE** | **ROA** | **ROE** | **PE** | | | |
| EX-POS | 0.74 | 11.31 | -3.55** | 0.18 | 2.56* | -2.60*** | | | |
| EX-NEG | -0.82 | -14.33 | 4.16 | 0.07 | -1.33 | -1.90 | | | |
| INF-POS | 0.08 | 2.52 | -1.48* | -0.12 | -1.38* | -0.52** | | | |
| INF-NEG | 0.16 | 4.34 | 2.02 | -0.03 | -0.17 | 1.21* | | | |
| INT-POS | -1.37 | -23.82 | 3.29 | -0.13 | -4.93** | 1.51 | | | |
| INT-NEG | 0.62 | 14.10 | -1.58 | 0.31 | 5.79** | -1.93** | | | |
| CointEq(-1) | -3.09 | -3.97 | -0.97*** | -1.29 | -0.99** | -1.63*** | | | |

Note: Asterisks ***, **, * represent 1%, 5%, and 10% level of significance, respectively. ROA, ROE, and P/E represent return on assets, return on equity, and price earnings ratio, respectively.

Source: Author's computation using Eviews

## 5.7. Diagnostic Tests

This section presents diagnostic tests carried out in the NARDL model. Diagnostic checks are done to validate the parameter evaluation outcomes achieved by the estimated model. Diagnostic checks are important in the analysis because if there is a problem in the residual from the estimated model, it then means that the model is not efficient, and the estimated parameters may be biased. The model was tested for serial correlation, normality, and heteroscedasticity.

From the results below of the Jarque Bera normality test, the p-value is greater than 5 percent level of significance for Absa's return of asset and return on equity, Capitec, FNB's return on equity and price earnings ratio, Nedbank's price earnings ratio, lastly Standard bank's return on equity and price earnings ratio. Therefore, the study fails to reject the null hypothesis that the residuals are normally distributed for the mentioned variables. The null hypothesis for the test is that residuals are normally distributed. A

heteroscedasticity test was conducted using the Breusch-Pagan Godfrey, and the results are presented in the table below. The null hypothesis for the test is that there is no heteroscedasticity. The null hypothesis is rejected if the probability is less than 5 percent. From the results above, the Breusch-Pagan Godfrey test produced a probability greater than 5 per cent, hence the null hypothesis cannot be rejected. This, therefore, means the model does not suffer from any misspecifications and hence can be relied on. In table 5.6 below we fail to reject the null hypothesis because there is no serial correlation for all the commercial banks except for Standard bank. The Ramsey reset test results presented by an f-statistic value which is greater than 5 percent for Absa, Capitec, FNB, and Standard Bank, which indicates that the functional form of the model is right. The Ramsey reset test results for Nedbank's price earnings ratio is less than 5 percent, therefore we reject the null hypothesis for Nedbank's price earnings ratio is not correctly specified.

## Table 5. 6: Diagnostic Test Results

| ABSA | | | | |
|---|---|---|---|---|
| Diagnostic tests | P-value | ROA | ROE | P/E |
| Normality (Jarque Bera) | 0.78 | 0.75 | 0.42 | |
| Heteroskedasticity | 0.25 | 0.08 | 0.58 | |
| Serial Correlation | 0.09 | 0.12 | 0.10 | |
| Ramsey reset | 0.31 | 0.37 | 0.49 | |
| CAPITEC | | | | |
| Diagnostic tests | P-value | ROA | ROE | P/E |
| Normality (Jarque Bera) | 0.82 | 0.73 | 0.75 | |
| Heteroskedasticity | 0.39 | 0.59 | 0.34 | |
| Serial Correlation | 0.12 | 0.53 | 0.09 | |
| Ramsey reset | 0.49 | 0.57 | 0.12 | |
| FNB | | | | |
| Diagnostic tests | P-value | ROA | ROE | P/E |
| Normality (Jarque Bera) | 0.45 | 0.97 | 0.63 | |
| Heteroskedasticity | 0.94 | 0.52 | 0.47 | |
| Serial Correlation | 0.27 | 0.60 | 0.12 | |
| Ramsey reset | 0.37 | 0.56 | 1.11 | |
| NEDBANK | | | | |
| Diagnostic tests | P-value | ROA | ROE | P/E |
| Normality (Jarque Bera) | 0.51 | 0.58 | 0.87 | |
| Heteroskedasticity | 0.84 | 0.76 | 0.11 | |
| Serial Correlation | 0.09 | 0.06 | 0.07 | |
| Ramsey reset | 0.42 | 0.05 | 0.03 | |
| STANDARD BANK | | | | |
| Diagnostic tests | P-value | ROA | ROE | P/E |
| Normality (Jarque Bera) | 0.56 | 0.87 | 0.76 | |
| Heteroskedasticity | 0.67 | 0.21 | 0.46 | |

| | | | |
|---|---|---|---|
| Serial Correlation | 0.05 | 0.00 | 0.00 |
| Ramsey reset | 0.78 | 0.48 | 0.47 |

Source: Author's computation using Eviews

## 5.8. CUSUM and CUSUM of Square Results

A model is stable, according to Pesaran et al, (2001), if the blue CUSUM lines are within the red lines that have been modelled at a 5 per cent level of significance. As the cumulative sum of recursive residuals and cumulative sum of the square of recursive residuals are within the critical bound at a 5 per cent significance level, the model is stable to estimate both short-run and long-run coefficients.

### 5.8.1. ABSA Bank

Figures 1a and b in Appendix A illustrate the CUSUM and CUSUM of squares tests for return on assets and return on equity, the results depicted in the figures indicate that the red line has been modelled within a 5 per cent range of significance. Lastly, for the price earnings ratio the plots indicate that for CUSUM is significant at 5 per cent, and for the CUSUM of squares, the red line is slightly out of the 5 per cent significance level.

### 5.8.2. Capitec Bank

The results represented in figure 2a to c in Appendix A, show that the CUSUM used to test the stability lies within the line for return on asset and therefore reject the null hypothesis at 5 per cent significance, and the CUSUM of squares the red line is slightly out of the 5 per cent significance level. Both the CUSUM and CUSUM of squares tests are significant and therefore do not reject the null hypothesis, and the model is stable for return on equity. The price earnings ratio plots indicate that for CUSUM is significant at 5 per cent and the CUSUM of squares the red line is slightly out of the 5 per cent significance level.

### 5.8.3. First National Bank and Nedbank

Figures 3a to c and 4a to c, in Appendix A, reveal that both tests show stability as the model estimated for return on assets, return on equity, and price earnings ratio are within the 5 per cent significance line for CUSUM and CUSUM of squares tests.

### 5.8.4. Standard Bank

Appendix A, figure 5a and 5b, illustrate the CUSUM results for return on asset and return on equity is outside the limit of the red line. However, the CUSUM of squares test reveals that return on asset as well as return on equity is within the red lines, and therefore do not reject the null hypothesis of 5 per cent significance. In Figure 5c (Appendix A), both tests show the stability of the model coefficients as the model estimated for price earnings ratio lies within the 5 per cent significance line for CUSUM and CUSUM of squares tests.

## 5.9. Chapter Summary

This chapter describes the empirical estimates from the analysis of secondary data obtained from the World Bank, as well as the commercial banks' financial reports for a period starting from 2002 to 2019. The empirical results began by investigating the descriptive statistics properties of the data and formal tests for stationarity. This chapter performed a unit root test using the Augmented Dickey-Fuller (ADF and overall, the test showed that all variables were stationary at the first difference. This study employed an EGARCH technique in modelling volatility. The estimated results found that the size of a shock has a significant impact on the volatility of returns, and that past volatility helps to predict future volatility. The NARDL bounds test results indicate a long-run cointegration among variables except for ABSA Bank, First National Bank, and Standard Bank under price earnings ratio. The diagnostic test results justified the use of the model by endorsing that residual were normally distributed and there was no serial correlation except for Standard bank, no heteroscedasticity in the model, and the model was stable. The study findings reveal that both a positive and negative change in exchange rate volatility has a significant

effect on banks' performance in both the long and short-run, depending on the bank performance proxy used (return on asset, return on equity, or price earnings ratio).

The next chapter is the conclusion and recommendations chapter, which will introduce and provide a summary of the previous chapters and provide a recommendation. This chapter will also stipulate the limitations of the study and prospective areas for future research.

# CHAPTER 6

# CONCLUSIONS, POLICY RECOMMENDATIONS, AND FUTURE RESEARCH

## 6.1. Introduction

The purpose of this chapter is to present a summary of all the research study chapters, including policy recommendations as well as future research areas for the study.

## 6.2. Summary and Conclusion

The main aim of this study was to empirically investigate the effect of exchange rate exposure on bank performance in the case of South Africa. The study examined the relationship using data adopted from each bank's annual financial reports covering the period 2002 to 2019. The study is divided into six chapters: The first chapter is the background and introduction of the research study; the second chapter provides an overview of exchange rate volatility and banks performance in South Africa; the third chapter presents the literature review; the fourth chapter sets the methodological structure of the study; the fifth chapter undertakes an empirical analysis and results and, finally, chapter six concludes the study.

To achieve the study objective, the study performed several assessments. Firstly, the study presented an introduction and background, a problem statement, research objectives, hypothesis, and lastly the significance of the study. Furthermore, the study gave an overview of how exchange rate regimes have evolved over the years, as well as commercial banks in South Africa. The banking industry changed dramatically with several amalgamations between banks, as well as the exchange rate regime, which evolved from fixed, floating management, dual, and finally, free-floating over the years. The study provided a theoretical literature review that examined the relationship between exchange rate volatility and bank performance. Some of the theories that were reviewed were the Purchasing Power Parity Theory, International Fisher Effect Theory, the Balassa-Samuelson Model and External Debt (B-S), and the Monetary Approach. All the theories examined suggested that there are varying opinions on the

relationship between these variables. This study also provided empirical literature, which included studies from developed countries, developing countries, and the South African context. An econometric approach was adopted for this study through the estimation of the EGARCH technique in modelling volatility and the NARDL method to investigate the relationship.

## 6.3. Main Findings

The Augmented Dickey-Fuller (ADF) test was used to test for the stationarity of the data. The ADF unit root test conducted included intercept, as well as results, including intercept and trend at the level and first difference. All variables were stationary at the first difference for both cases, intercept, and intercept and trend. The study employed the EGARCH method to model volatility, and the results revealed a negative relationship between the past variance and the current variance, meaning the bigger the magnitude of the shock to the variance, the higher the volatility. Therefore, the size of the shock has a significant impact on the volatility of returns.

The NARDL technique was used to capture both short-term and long-term asymmetries between the exchange rate volatility and banks' performance. A bound F-test was estimated, and results indicated the occurrence of a long-run relationship between bank performance and exchange rate volatility when the return on assets and return on equity are used as proxies. Hence, the study rejected the null hypothesis of no long-run relationship between the variables employed in the model. However, when the price earnings ratio was used as a bank performance proxy, the results revealed no long-run relationship for ABSA, First National Bank, and Standard bank. The results from the NARDL model suggest that there is a long-run relationship between exchange rate volatility and bank performance. However, the influence of exchange rate on bank performance varies, depending on the type of proxy employed to measure bank performance. The short-run results for the four commercial banks revealed evidence of cointegration among variables in the model and indicated the speed of adjustment in the short run towards the long run. Nedbank's return on equity, however, has an insignificant short-run relationship. The study findings reveal that both a positive and negative change in exchange rate volatility has a significant effect on

banks' performance in both the long and short-run, depending on the bank performance proxy used.

Diagnostic checks were done to validate the parameter evaluation outcomes achieved by the estimated model. Results show that the study fails to reject the null hypothesis and that the residuals are normally distributed for the mentioned variables, as the residuals are normally distributed. A heteroscedasticity test was conducted, and the model does not suffer from any misspecifications and hence can be relied on.

## 6.4. Policy Implications and Recommendations

The findings reveal both a positive and negative relationship between exchange rate volatility and bank performance. It was also shown that exchange rate exposure varies by bank and performance proxy used. Overall, given the impact of exchange rate exposure, this study recommends that management of banks should place a greater emphasis on evaluating and managing economic exposure and factoring this into strategies in decision making.

## 6.5. Possible Areas for Future research

In concluding this study, although a significant link between the exchange rate exposure and bank profitability is evident, few studies have been or are conducted in the South African context on this topic. Future studies in this area should be expanded and could include more variables, such as non-macroeconomic drivers of exchange rate volatility. The study examined the relationship between exchange rate volatility and bank performance over the period 2002-2019. The causality amongst the variables should be investigated and compared with the findings of this study and the years going forward. In addition, the exchange rate is constantly changing, and the financial industry continues to evolve. It is important to continuously monitor the impact on this relationship. This will be of benefit for commercial banks managers and will also shed light on exchange rate loss mitigation policies and strategies.

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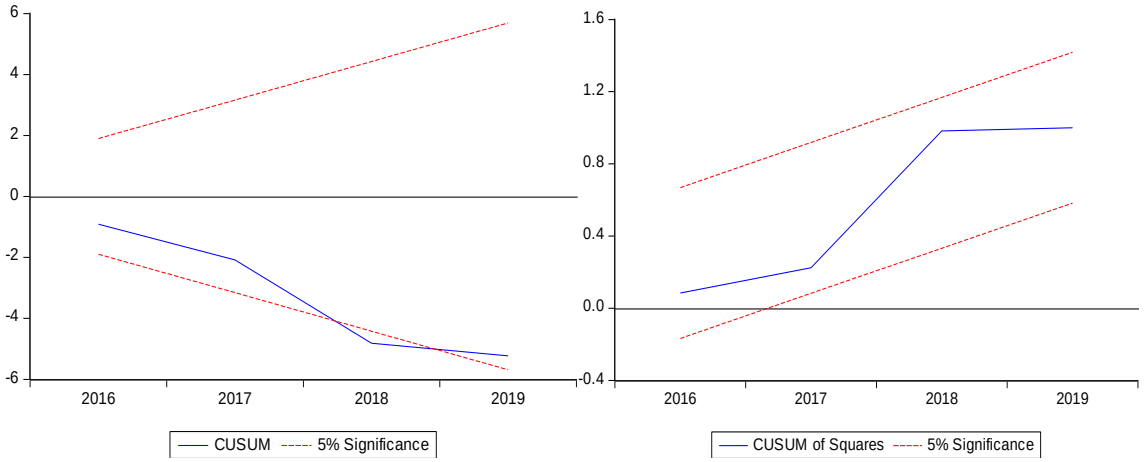
# APPENDIX

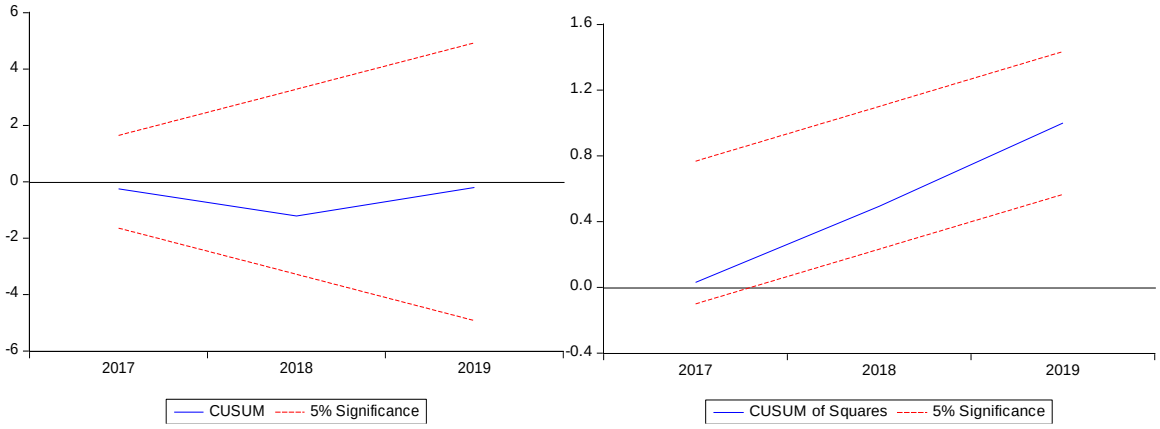
## Appendix A: CUSUM and CUSUM of Square Results

## Figure 5. 1: ABSA

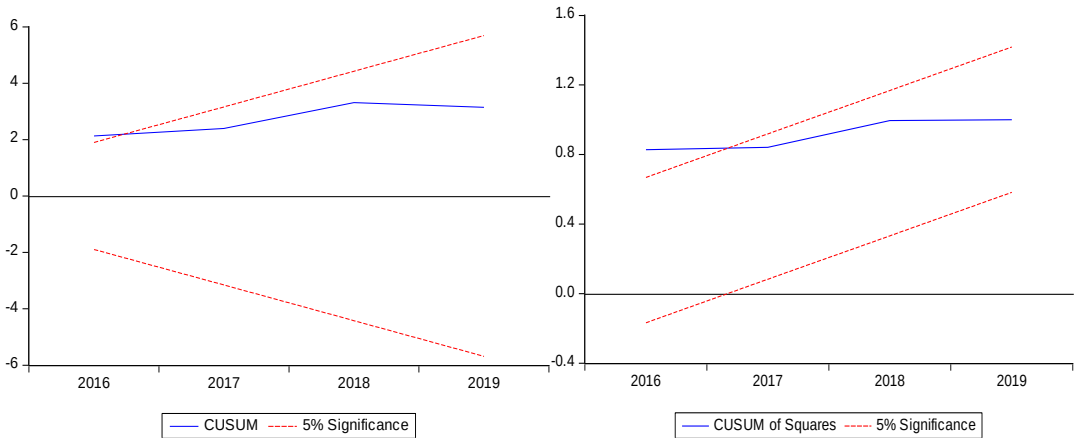
### a. ROA




### b. ROE

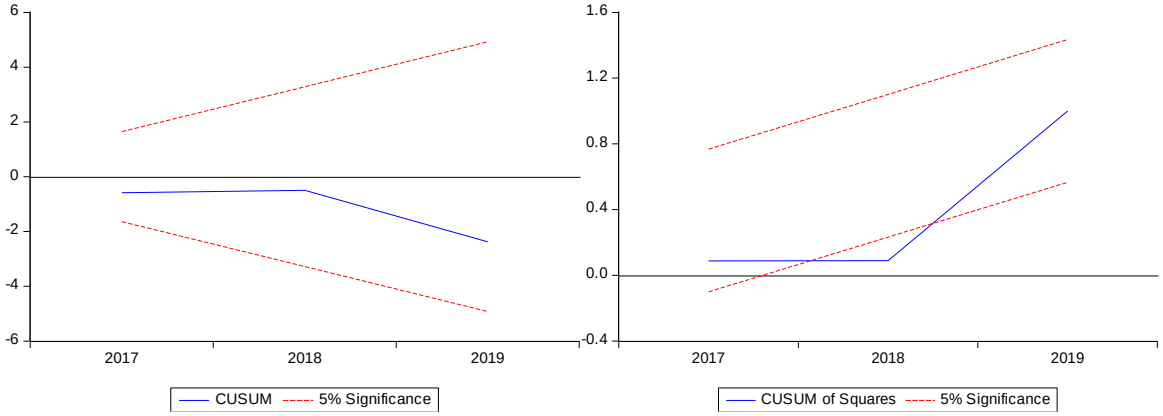


### c. P/E




## Figure 5. 2: CAPITEC

### a. ROA

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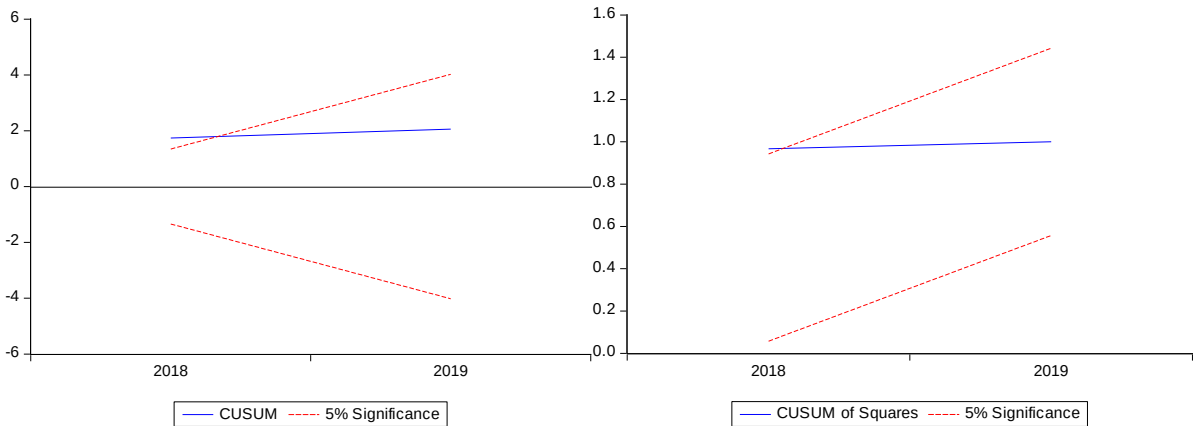

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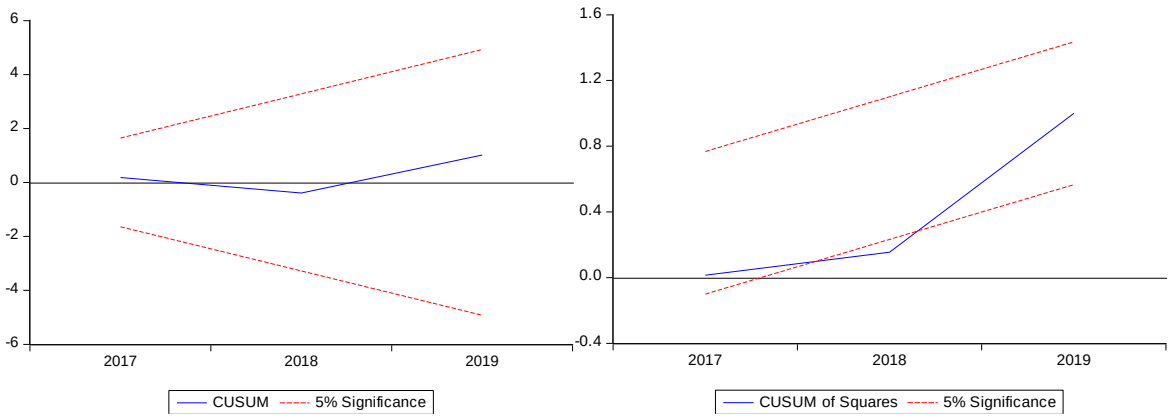
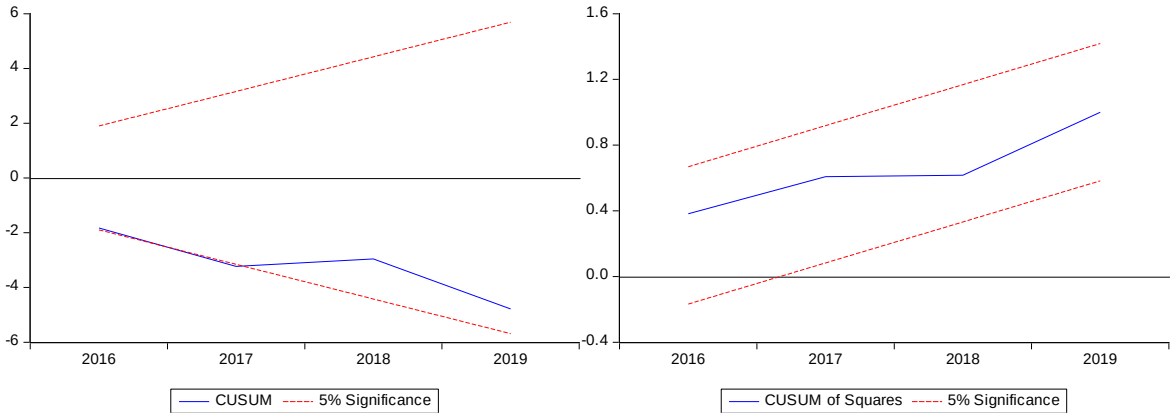



## Figure 5. 3: FNB

### a. ROA

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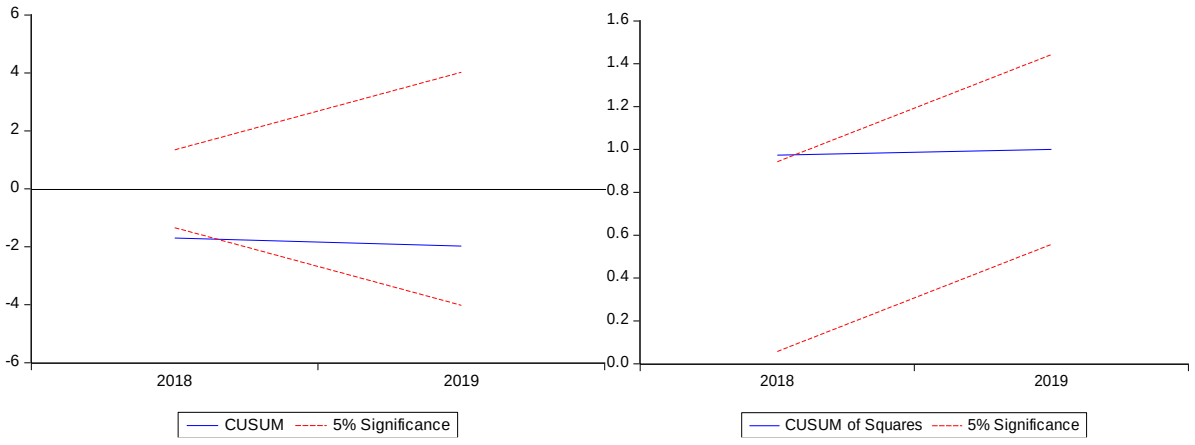
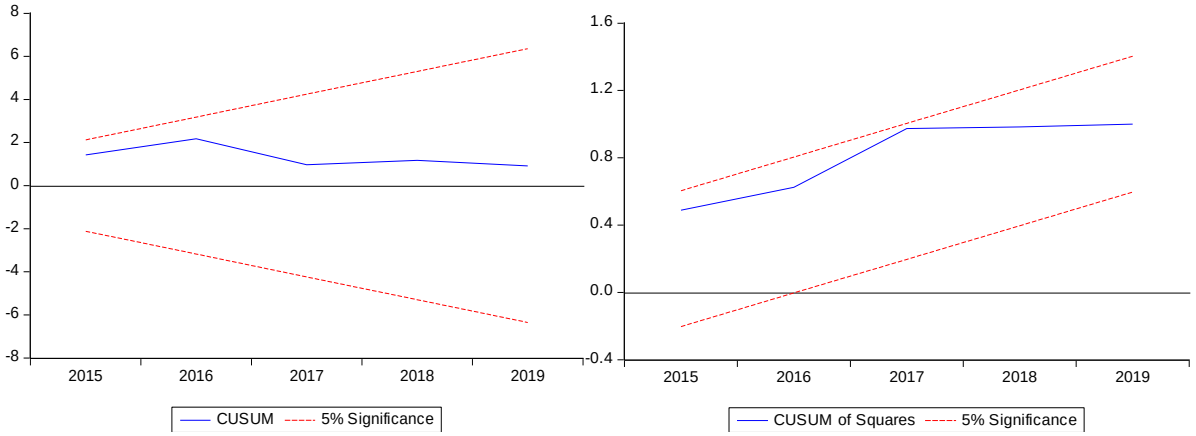
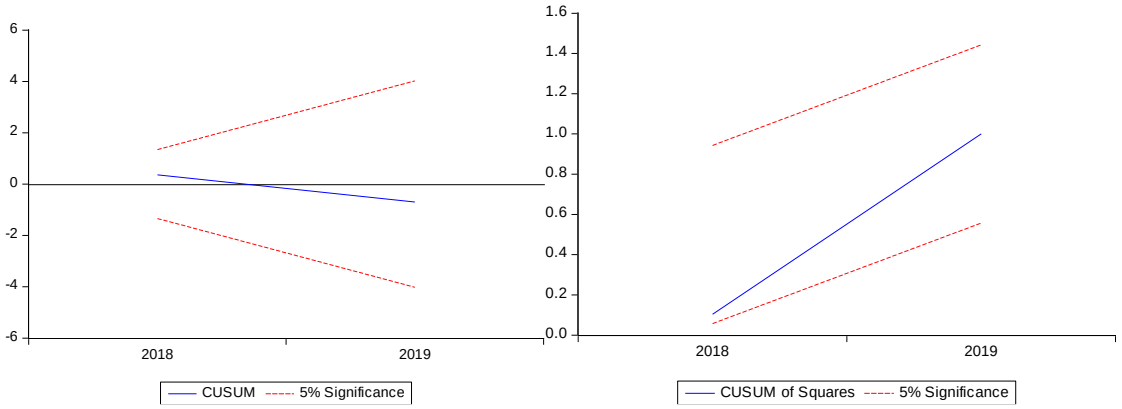


### c. P/E

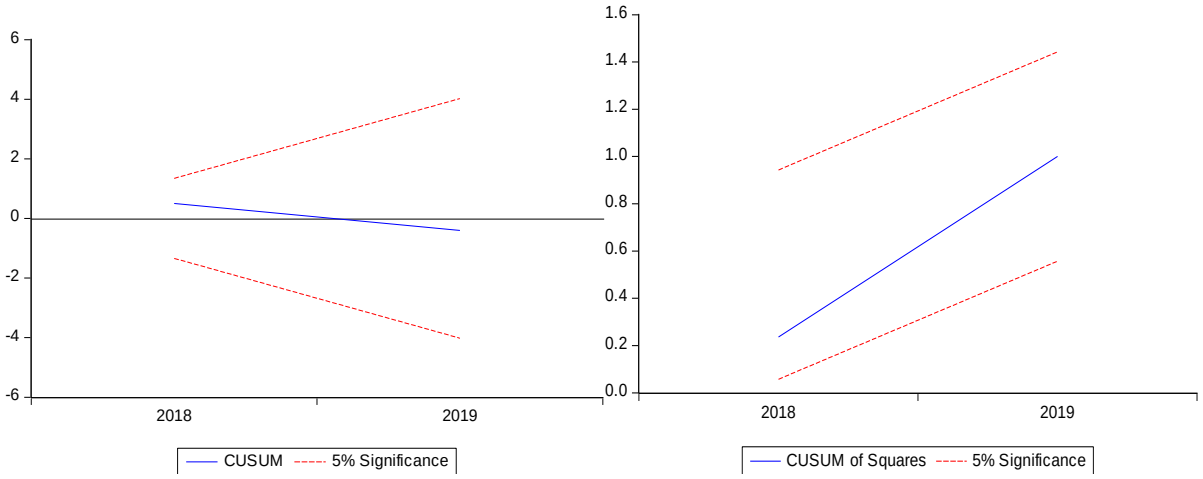



## Figure 5. 4: NEDBANK

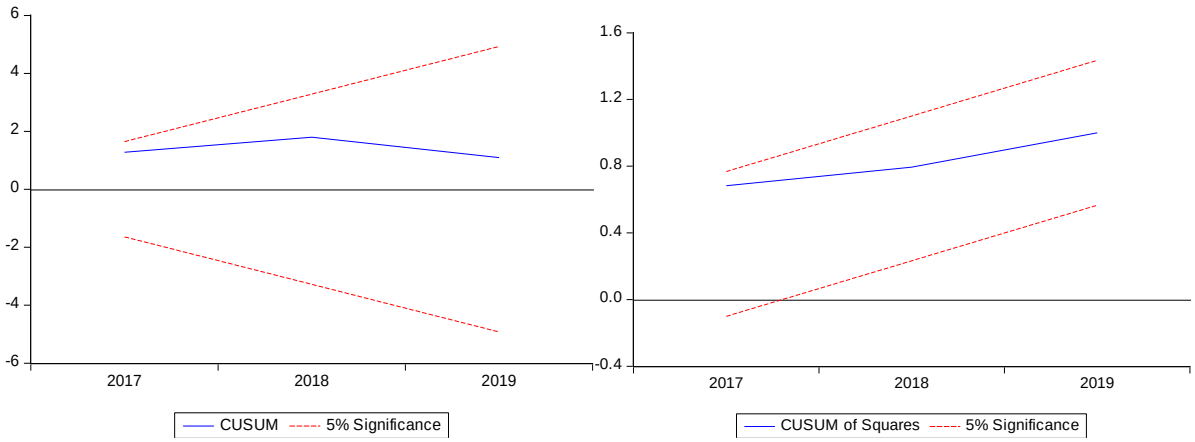
### a. ROA




### b. ROE

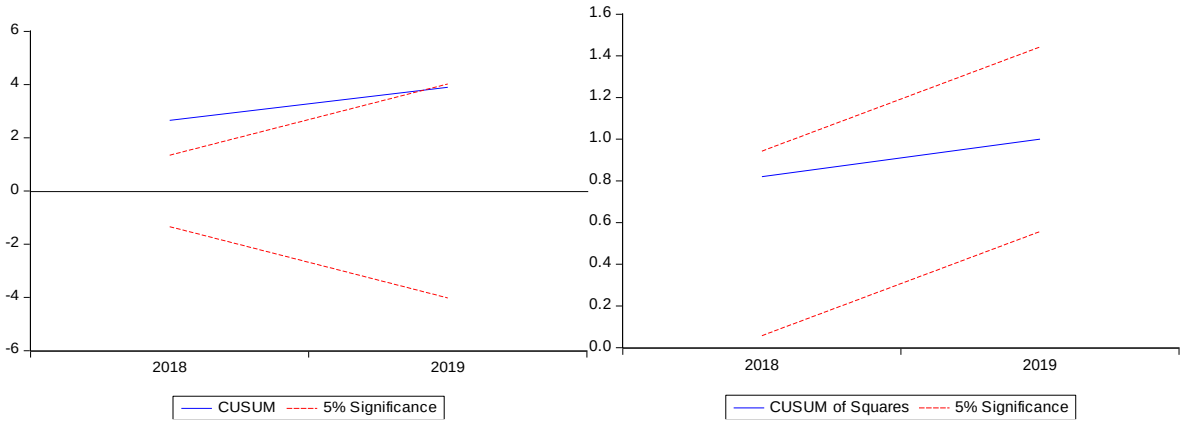


### c. P/E

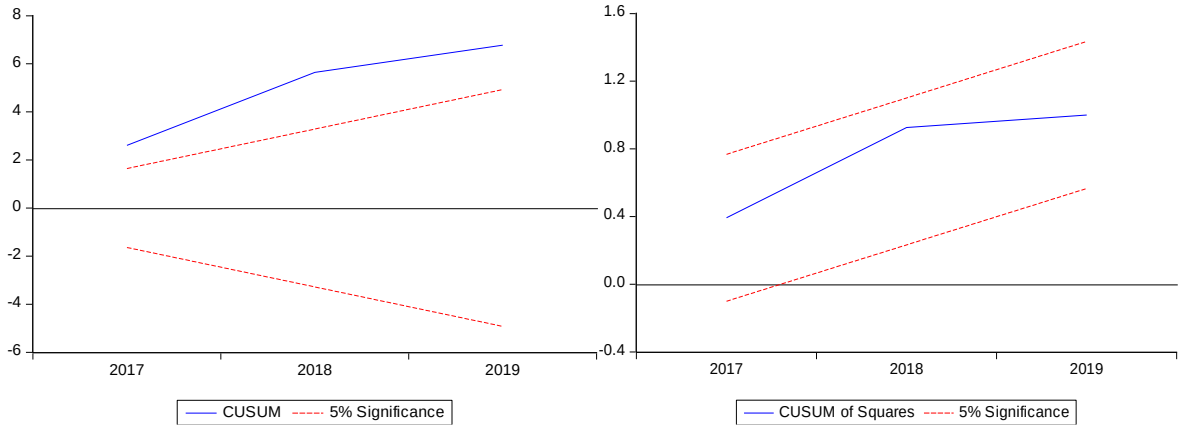



## Figure 5. 5: STANDARD BANK

### a. ROA




### b. ROE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2018
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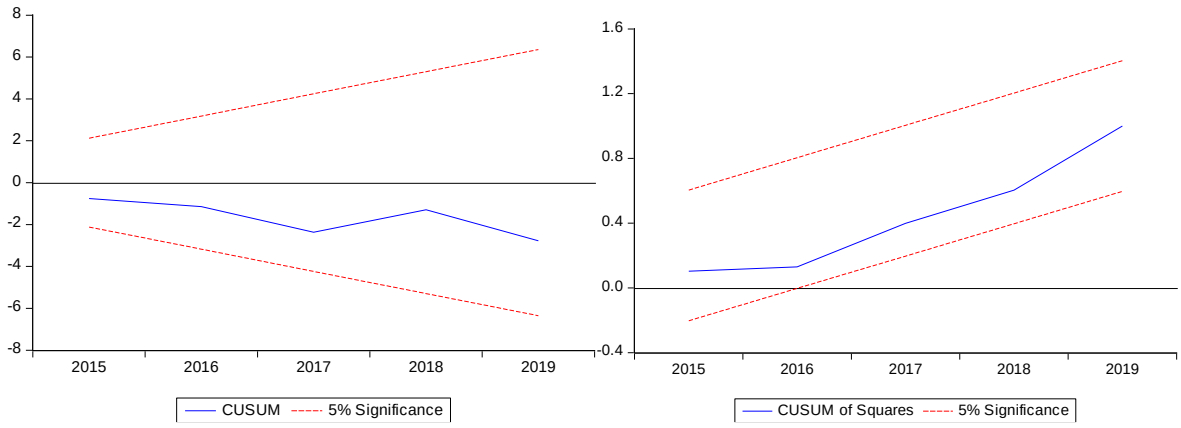
5% Significance

## c. P/E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-8
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2017
2018
2019
CUSUM
5% Significance
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0.8
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0.0
-0.4
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2016
2017
2018
2019
CUSUM of Squares
5% Significance

## Appendix B: SUMMARY OF THE TURNITIN REPORT

# ZR Dissertation

*by* Zukiswa Nokulunga Rozani

**Submission date:** 18-Dec-2021 02:23PM (UTC+0200)
**Submission ID:** 1733348226
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## Appendix C: DECLARATION BY LANGUAGE EDITOR

BRUCE WESSON - NMU Language Editor
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Mitchell Street
SOUTH END 6001
2021-12-72

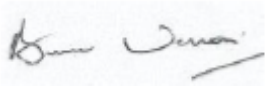
Email bruce@wesson.co.za
Mobile 082 555 5204

TO WHOM IT MAY CONCERN

I, Bruce Wesson, hereby declare that I have proof read and copy edited the research work given to me by Zukiswa Rozani, Student No : S 214 116 573

I declare that the content remains solely that of the student, and that any changes made, were only to language and grammar errors.

Yours faithfully,



BRUCE WESSON
NMU Language Editor